



Volume III: Resources

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Appendix A: Community Profile

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Appendix A:

Community Profile

Community resilience can be defined as the community’s ability to manage risk and adapt to natural hazard impacts. The Community Profile describes Wallowa County’s sensitivity to and resilience against natural hazards with respect to the natural environment, demographic and socio-economic factors, the regional economy, the built environment, community resources and capacity for resilience. It provides a snapshot in time when the plan was developed and is intended to assist in evaluating the risk of natural hazard events to work toward greater community resilience in the face of natural hazards identified by the Wallowa County NHMP Steering Committee during the update process.

Wallowa County is the northeastern most county of Oregon with Idaho to the east divided by the Snake River, Washington to the north, Umatilla and Union counties to the west, and Baker County to the south. Its 2013 population of 7,045 was an increase of 0.5% over 2010. Wallowa County spans 3,153 square miles and had a 2010 census population of 7,008 and a 2020 estimate of 7,160, about 28% of which live in the City of Enterprise, the county seat (Table 1).^{1 2} The scenery in the county serves as a magnet for tourism, which along with agriculture and forestry serve as the county’s primary economic engines.³

This area was claimed by the Chief Joseph band of the Nez Perce as its hunting and fishing grounds. The Nez Perce used the word “wallowa” to designate a tripod of poles used to support fish nets. In 1871, the first white settlers came to Wallowa County crossing the mountains in search of livestock feed in the Wallowa Valley. In 1877 the younger Chief Joseph of the Nez Perce, incensed at the government’s attempt to deprive his people of the Wallowa Valley, refused to be moved to an Idaho reservation. Several regiments of United States troops were dispatched to force him onto the reservation. After a number of battles and a thousand-mile retreat, Chief Joseph was compelled to surrender. He and the remnants of his band were removed to Oklahoma and later relocated to a reservation in Washington State.⁴

Wallowa County was established on Feb. 11, 1887, out of the eastern portion of Union County. Subsequent boundary changes occurred in 1890, 1900, and 1915 when land was acquired from or transferred to Union County.⁵

Wallowa County is a land of rugged mountains, gentle valleys, and deep canyons. Peaks in the Wallowa Mountains soar to almost 10,000 feet in elevation and the Snake River drops over 8,500 feet in elevation over its length. Hells Canyon, carved by the Snake, is the nation’s deepest gorge averaging 5,500 feet from rim to river.⁶ The county is also home to Wallowa Lake and the Eagle Cap Wilderness Area.

¹¹ PSU Population Center 2020 Annual Population Report Tables, [Population Estimate Reports | Portland State University \(pdx.edu\)](#)

² Oregon Blue Book [State of Oregon: Blue Book - Wallowa County](#) Consulted August 2021

³ ibid

⁴ ibid

⁵ ibid

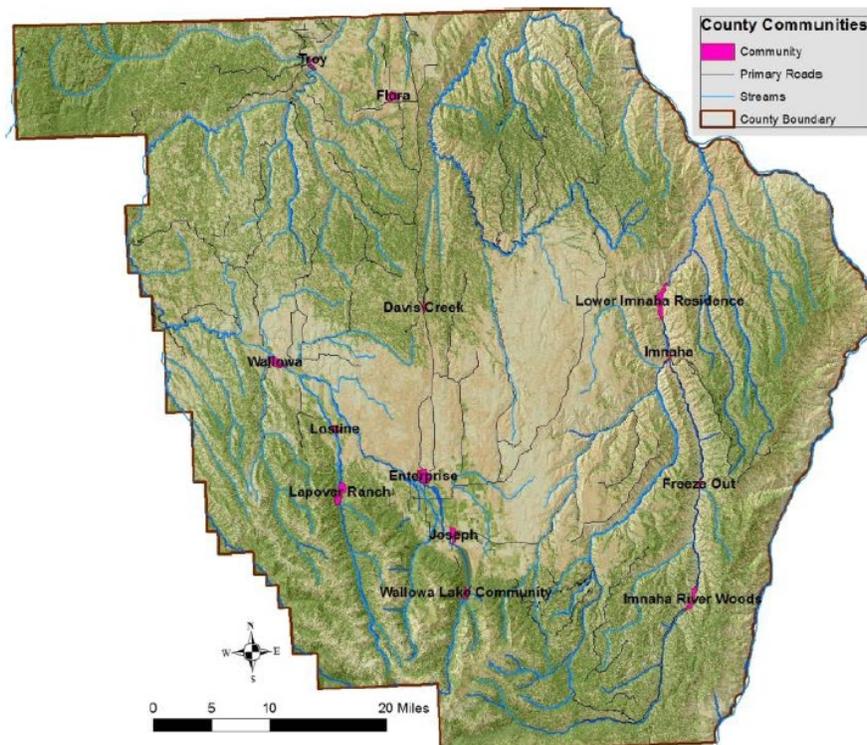
⁶ Oregon Blue Book [State of Oregon: Blue Book - Wallowa County](#) Consulted August 202

The scenery in the county is spectacular and serves as a magnet for tourists. Unrivaled opportunities for outdoor recreation create the county's reputation as a visitors' paradise. Permanent residents enjoy the same recreation opportunities, adding to a high quality of life supported by traditional farm, ranching, and forest industries, as well as art and tourism.

Wallowa County has a 2020 estimated population of 7,160 year-round residents.⁷ In the past, the County has earned revenues through timber and agriculture, but in recent years it has become a destination area for recreation and those on vacation. During the summer months, the County averages 10,000 persons or more. The south end of Wallowa Lake also becomes heavily populated during the summer months, and the Chief Joseph Days rodeo draws as many as 20,000 spectators.⁸

These natural features make the environment and population vulnerable to natural disaster situations. The county is subject to flooding, earthquakes, landslides, wildfires, severe winter snowstorms and summer thunderstorms, windstorms, and extreme temperatures. It is impossible to predict exactly when such natural hazard events will occur or the extent to which they will affect the county. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, this plan intends to minimize the losses that can result from natural disasters

Figure 1. Distribution of Populated Communities throughout Wallowa County



Source: Wallowa County Wildfire Protection Plan, Chapter IV, p.3

⁷ PSU Population Center 2020 Annual Population Report Tables, [Population Estimate Reports | Portland State University \(pdx.edu\)](https://popcenter.pdx.edu/population-estimate-reports/)

⁸ Oregon Blue Book [State of Oregon: Blue Book - Wallowa County](https://www.oregon.gov/bluebook/) Consulted August 2021

Environmental, Demographic, and Socio-Economic Profile

The Wallowa Mountains are an important geographical feature of the county. They are unlike other mountain ranges in the state due to their granitic rather than volcanic origin. They take their name from the Wallowa River that is formed by the confluence of the east and west forks about a mile south of Wallowa Lake and eventually flows into the Grande Ronde River.

Wallowa County contains the watersheds of the Lower Grand Ronde River and the Wallowa River, both of which form a portion of the Grande Ronde watershed. Wallowa County also contains the Imnaha River watershed which forms part of the larger Snake River watershed. Most of the rivers are well known by outdoor enthusiasts, geologists, and others, and all flow into the Snake River Basin.

Four established incorporated cities—Enterprise (County seat), Wallowa, Lostine, and Joseph—are located in the county. In addition, it contains three remote year-round populated areas: Troy, Imnaha, and Flora, which are close-knit communities. Approximately one half of the county lies in State or Federal holdings, including two federally designated wilderness areas.⁹

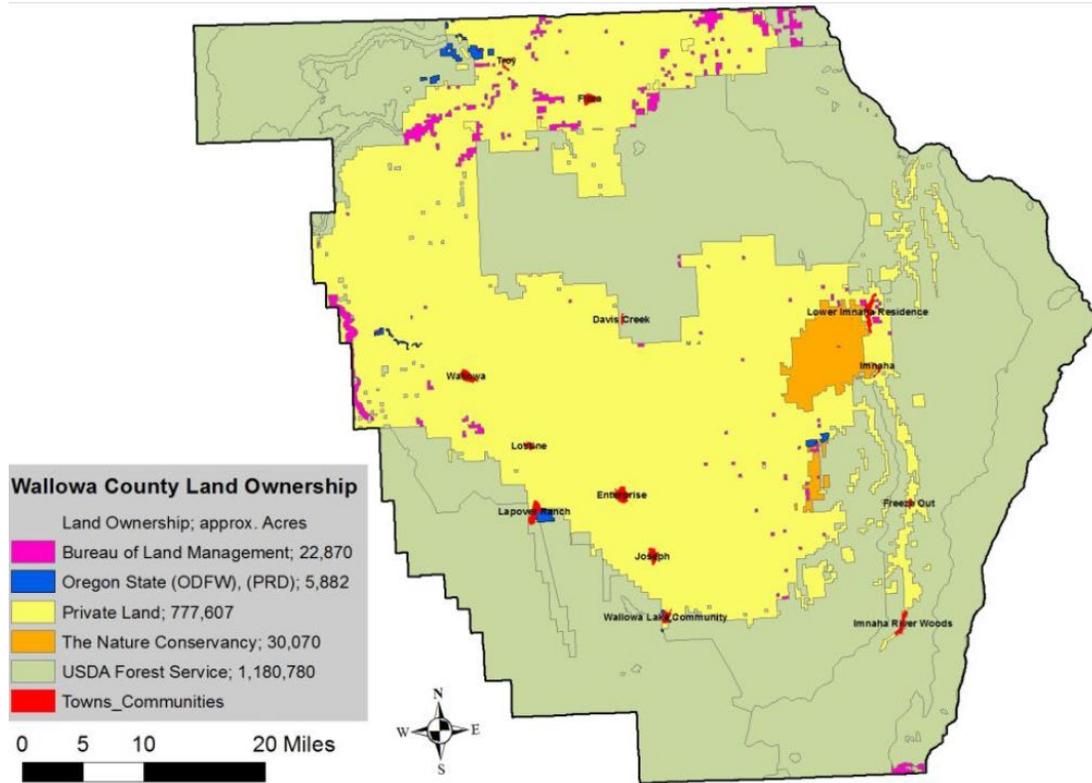
Federal agencies manage approximately 59% of the land in Wallowa County, comprising a total of 1,203,650 acres. Approximately 58% of the county is managed by the US Forest Service (USFS), 1% is managed by the Bureau of Land Management (BLM), and an additional 5,882 acres, or 0.5% of Wallowa County, is managed by the State of Oregon. The Nature Conservancy owns 30,070 acres of land on the Zumwalt Prairie Preserve. The remaining 39% of the land in the county, approximately 777,607 acres, is privately owned. There are three wilderness areas in the county including Eagle Cap Wilderness and Hells Canyon Wilderness in the Wallowa Whitman National Forest and the Wenaha-Tucannon Wilderness located in the Umatilla National Forest in the county's northwestern corner.

The Forest Service provides land management and fire protection on their lands that generally occur at higher elevations of mountainous areas and in deep canyons surrounding the private lands. Privately owned land totaling 777,607 acres, includes all of Wallowa Valley, Promise, Troy area and the Imnaha River corridor. These private lands, including those of the Nature Conservancy are under Oregon Department of Forestry protection agreements. The Bureau of Land Management lands speckle the landscape and are under a mutual aid agreement for fire protection with the Forest Service, Wallowa-Whitman National Forest.¹⁰

⁹ Wallowa County, Oregon Emergency Operations Plan, June 2009

¹⁰ Wallowa County Wildfire Protection Plan, 2017

Figure 2. Wallowa County Land Ownership



Source: Wallowa County Wildfire Protection Plan, 2017

By the beginning of the 20th century, unregulated grazing had led to the severe deterioration of the open rangelands of the Wallowa Mountains and canyon country. An estimated 3,000 cattle and horses and 260,000 sheep, the latter of which were favored by early ranchers as competitive grazers and sources of both meat and wool, grazed the Wallowa Mountains in the summer of 1904. With the creation of the Wallowa Forest Reserve and the US Forest Service in 1905 came grazing regulation and the allotment system. This system was generally supported by local ranchers and farmers because it slowed the deterioration of local watersheds, which were a source of irrigation water, and because the allotments were established according to the location of “base” private properties. Since the early 1900s, the number of animal unit months permitted in what is now the Wallowa-Whitman National Forest have decreased from almost 300,000 to less than 100,000.

The growing labor costs of tending sheep led to the decline of sheepherding, and by the 1950s there were more cattle than sheep in Wallowa County. A once thriving dairy industry declined starting in the 1960s, and the county’s last creamery closed in 1980. The general trend over the 20th century was towards consolidation of small, outlying ranches and farms and towards the increasing dominance of a few key commodities, primarily beef cattle, wheat, and barley, which are frost-hardy grains.

Both the 2007 and the 2013 NHMP update Steering Committees identified natural resource assets and concerns about their vulnerability to natural hazard events. These included vulnerability of homes at

the head of Wallowa Lake (south end) that may be subject to flooding from the Wallowa River, concern in the City of Enterprise about flooding and potential damages to sewer lines, and potential dam failure of the Wallowa Lake Dam.

Although the risk of Dam Failure continues to be elevated and is now identified in this NHMP update, the members of the Steering Committee for this update were more concerned about wildfire risks and the impact of drought than during previous updates to the NHMP.

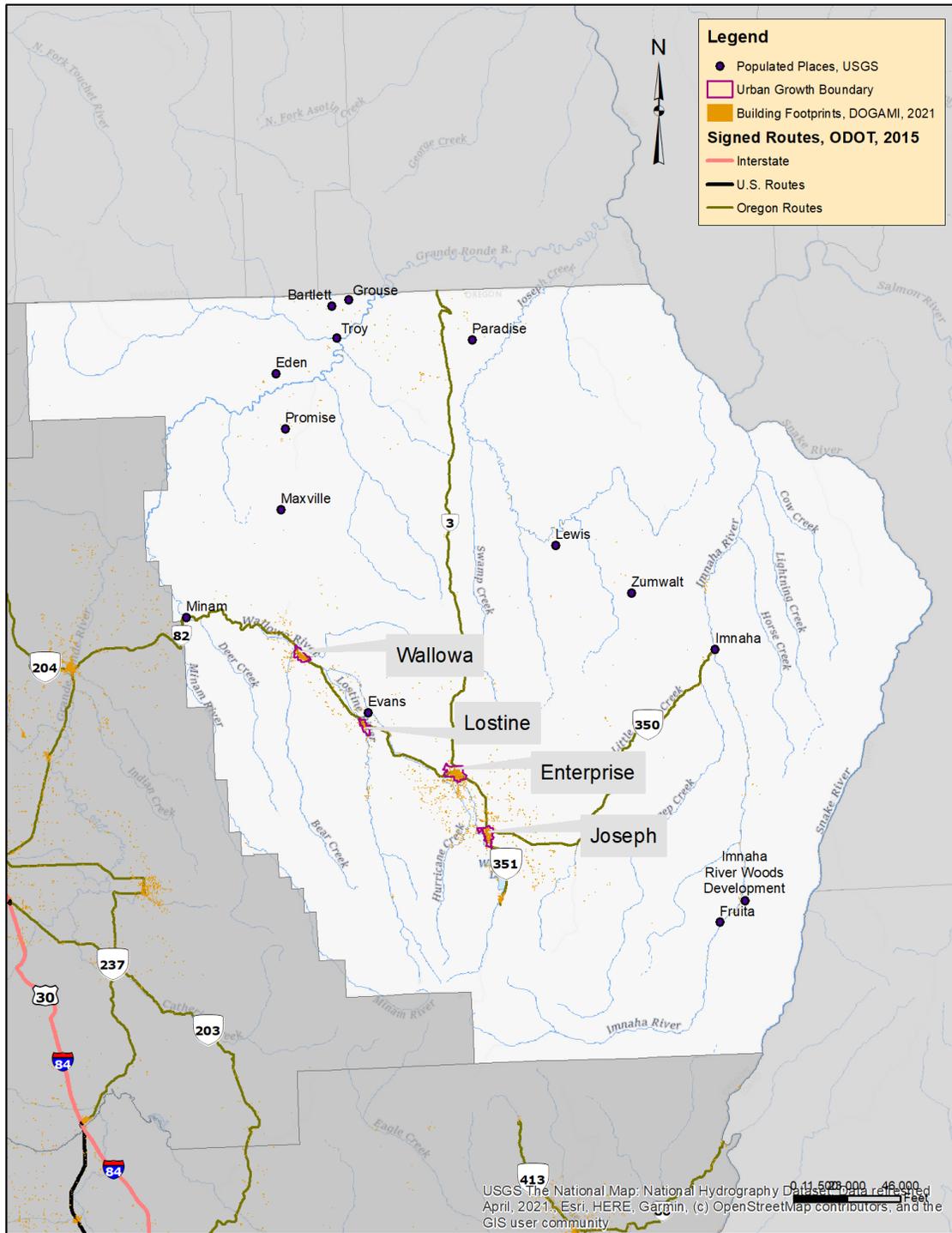
Of continuing concern to the members of the 2020-21 Steering Committee is the safety of summer visitors to the county. Wallowa County attracts visitors to the Wallowa-Whitman National Forest, the Eagle Cap Wilderness Area, and Hells Canyon Recreation Area. Wallowa Lake is a major tourist destination during late spring and summer months. Populations in Joseph and Enterprise temporarily increase during these seasons. Temporary increases in populations place heightened demands on emergency response systems; additionally, uninformed hikers and campers may increase the community's risk to wildfire.

Wallowa County has experienced recurring large-scale wildfire events that pose threats to the area's natural resources, community and visitors to the community, public health and safety and economic development opportunities. Wallowa Resources, a non-profit organization in Wallowa County, has identified forest health as a concern for wildfire – particularly the increase in standing and downed dead wood within the county's forests.

The NHMP Steering Committees in 2007 and 2013 identified human capital assets and concerns including information on vulnerable population types, organizations that serve them, and lists large festivals and events that attract visitors from outside the county. Among these are Hells Canyon Mule Days, Chief Joseph Days Rodeo, Wallowa County Fair, Oregon's Alpenfest and others.

The 2020-21 Steering Committee confirmed the identification of vulnerable groups of people in Wallowa County by prior Steering Committees. These groups include visitors who may be unfamiliar with the county's weather conditions, people with disabilities who live in rural areas where there is little or no access to cell service, internet service and limited mail delivery service. Vulnerabilities that may accompany aging and limited incomes also impact some residents of Wallowa County. Community organizations that serve vulnerable populations are concerned with the lack of emergency transportation and services available to persons with special needs.

Figure 3. Buildings, Cities and Populated Places in Wallowa County, Oregon



Source: Map prepared by K. Daniel using DLCD GIS library and publicly available data layers

Environmental Profile

The natural environment's capacity to withstand natural hazard events involves its geography, climate, and land cover. Natural resources 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. However, natural systems are often impacted or depleted by human activities adversely affecting community resilience.

Geography

Wallowa County contains the Wallowa River Valley between the Wallowa Mountain Range and the northern Blue Mountains. Wallowa Valley lies in the center of the county and supports the highest population base. The valley starts where the Minam Canyon opens near the town of Wallowa and runs 32 miles to the southeast to where McCully Creek enters the valley, just south of Kinney Lake. The valley is approximately 16 miles at the north (Trout Creek) to south point near (Ski Run).¹¹

Wallowa Mountains

The Wallowa Mountains are known as the "Alps of Oregon". The range is part of the Wallowa–Whitman National Forest.¹² They are located between the Blue Mountains to the west and the Snake River and Idaho to the east. A large portion of the range belongs to the Wallowa-Whitman National Forest. The mountains can receive over 100 inches of precipitation, primarily in the form of snow, as opposed to the valley which generally receives less than 20 inches.

Rising precipitously from the flatlands in Oregon's far-northeastern corner, the Wallows dominate Wallowa County and have 19 peaks over 9,000 feet in elevation. Ice-age glaciers carved sharp crags and deep canyons into the mountains. Much of the high country, including the only remaining glacier (Benson Glacier, whose status these days is debated) and Eastern Oregon's highest peak (the 9,838-foot Sacajawea), is part of the Eagle Cap Wilderness, a 715 square mile natural area studded with alpine meadows and lakes that occupies most of the range.¹³

Blue Mountains

The rest of Wallowa County includes other parts of the Blue Mountains. The Blue Mountains are not a single cohesive range, but rather a complex of ranges and inter-mountain basins and valleys that extend from southeast Washington into central Oregon, ending near Prineville. The Blue Mountains extend from the northeast corner of the state into the John Day Valley. The precise boundaries of the Blues, as they are often called, are indistinct, but the western extent roughly coincides with the western edge of the Ochoco and Maury Mountains and the eastern edge with the Snake River in Hells Canyon. The Blue Mountains extend northwest to the Columbia Plateau and south to the High Lava Plains and Owyhee Plateau.¹⁴ The Blue Mountains also include the Greenhorn Range and the Aldrich, Strawberry, Elkhorn,

¹¹ Wallowa County Wildfire Protection Plan, Chapter IV, p. 2, 2017

¹² Wikipedia, Wallowa entry

¹³ <https://www.lonelyplanet.com/usa/oregon/wallowa-mountains>

¹⁴ Idaho Power Boardman to Hemingway Transmission Line Project; Exhibit H

and the Wallowa Mountains. Elevations range from about 3,000 feet in the valley bottoms to higher than 9,800 feet at Sacajawea Peak.¹⁵

Surface Water Resources

The headwaters of the principal rivers of Wallowa County originate in the Eagle Cap Wilderness and drain either toward the Grande Ronde River or the Snake River. The Lostine, Minam, Wenaha, and Imnaha Rivers are recognized as National Wild and Scenic Rivers. The Minam River along with the Grande Ronde River are also classified as Oregon State Scenic Waterways.

The Imnaha River is a 73.3-mile-long tributary of the Snake River that flows east near the headwaters and then north. It is joined by the Little Sheep Creek and Big Sheep Creek at the community of Imnaha. From the central mountains Joseph Creek and Chesnimnus Creek originate in the center of the county and drain north toward the Snake River as well.

The Wallowa River is a tributary of the Grande Ronde River, approximately 55 miles long, which flows into the Snake River. Bear Creek, Mud Creek and Grossman Creek also form a part of this watershed.

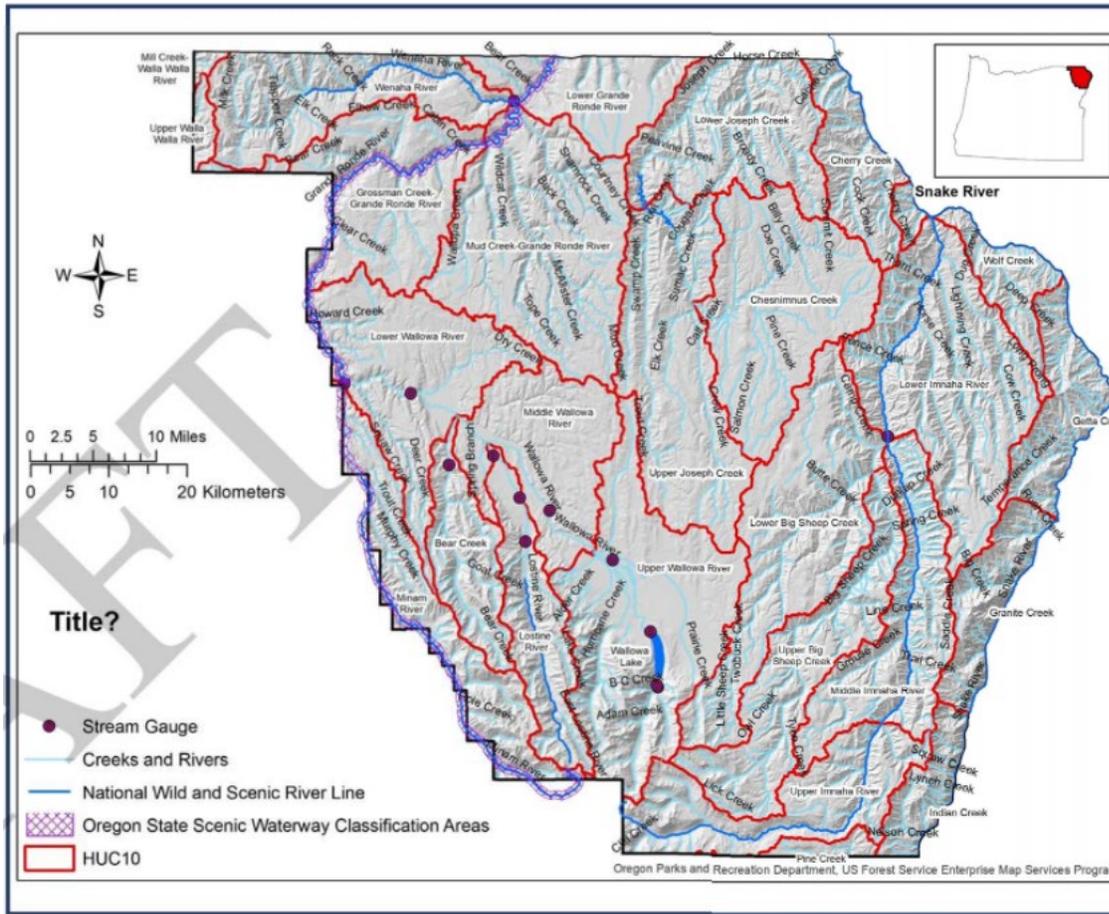
All the watersheds of Wallowa County eventually drain into the Snake River, which divides Oregon from Idaho at the eastern boundary of Wallowa County. The three major river systems are the Grande Ronde, the Wallowa, and the Imnaha. Small watersheds also drain directly into the Snake River on the eastern border of the county.¹⁶

The history of flooding in the county shows notable flood events on Hurricane Creek near Joseph and in the northern panhandle on the Wenaha near Troy.

¹⁵ The Oregon Encyclopedia, entry for The Blue Mountains, accessed August 2020

¹⁶ Draft NRMP

Figure 4. Watersheds in Wallowa County (HUC 10)



Source: Draft Natural Resource Management Plan

The draft Wallowa County Natural Resource Management Plan provides a ridgetop to ridgetop approach to watershed management. The Natural Resource Advisory Committee (NRAC) is reviewing this draft as this NHMP is being updated and they provided a copy to the convener of the NHMP and the DLCD project manager for comment. They recommend strengthening linkage with this plan to spread the opportunities for funding implementation of both plans.

[Natural Resource Management Plan](#)

More than a quarter century ago, Wallowa County produced one of the first community-generated, countywide salmon recovery plans in the nation. The landmark Wallowa County-Nez Perce Salmon Plan laid a foundation for restoration of salmon habitat, and for some revised practices in agriculture and forestry. The county has adopted a comprehensive management plan for the protection of salmonid listed as threatened or endangered and is now in the process of updating the 20-year-old plan.

The original 1993 document addressed issues related to salmon that were just listed under the Endangered Species Act. The Nez Perce Tribe collaborated with Wallowa County farmers, ranchers, foresters, agencies, environmentalists, and commissioners to recognize problems, and designate areas

that would benefit from habitat restoration. They provided landowners and agencies documentation for grants to fund improvements.

The 1993 plan, updated in 1999 to include multiple fish species, is being revised and expanded as a new Wallowa County-Nez Perce Natural Resources Management Plan (NRMP). The 20-person Wallowa County Natural Resources Advisory Committee (NRAC) is taking the lead. A related technical committee of mostly agency and tribal-based scientists and engineers is providing data and expertise.

According to Katy Nesbitt, Wallowa County Natural Resource Department Director the new version, like the old one, will likely become part of the Wallowa County Comprehensive Plan, pending approval by the Wallowa County Board of Commissioners.

“It is supposed to be a guiding document for the commissioners when they are working on natural resource issues,” said Jean Jancaitis, the Wallowa Resource Programs director who also co-ordinates the NRAC’s grants. “It’s time to give them an update.”

The NRMP will help plan for emerging threats to ecosystems and the economy. Those threats include climate change, water quality and quantity, land use change, and habitat connectivity, said NRAC secretary and NRMP technical writer Caitlin Rushlow. The NRMP will also provide a long-term vision for natural resources management to meet those challenges.

A \$35,000 grant from Meyer Memorial Trust in 2019 helped get the new effort off the ground.

“We know that much of the 1993 science is now outdated” Jancaitis said. “But there were some really wonderful things about the original plan that we want to maintain, including that it looks at the county and its landscape on a broad scale, and was meant to go far beyond salmon.”¹⁷

Wallowa Soil and Water Conservation District

Surface water resources are also the focus of work by the Wallowa Soil & Water Conservation District (Wallowa SWCD). The Wallowa SWCD is a non-regulatory local organization that can help or direct landowners to additional resources. Wallowa SWCD programs are geared toward facilitating natural resource conservation in Wallowa County. Wallowa SWCD is involved in supporting water conservation, water quality monitoring and noxious weed control throughout the county. Among the district’s priority projects are Irrigation efficiency projects and monitoring in the Prairie Creek watershed, conducting irrigation related inventories in the Alder Slope area and continuing working on large and small OWEB funded projects for thinning, water developments, and weed control.

Watershed Councils

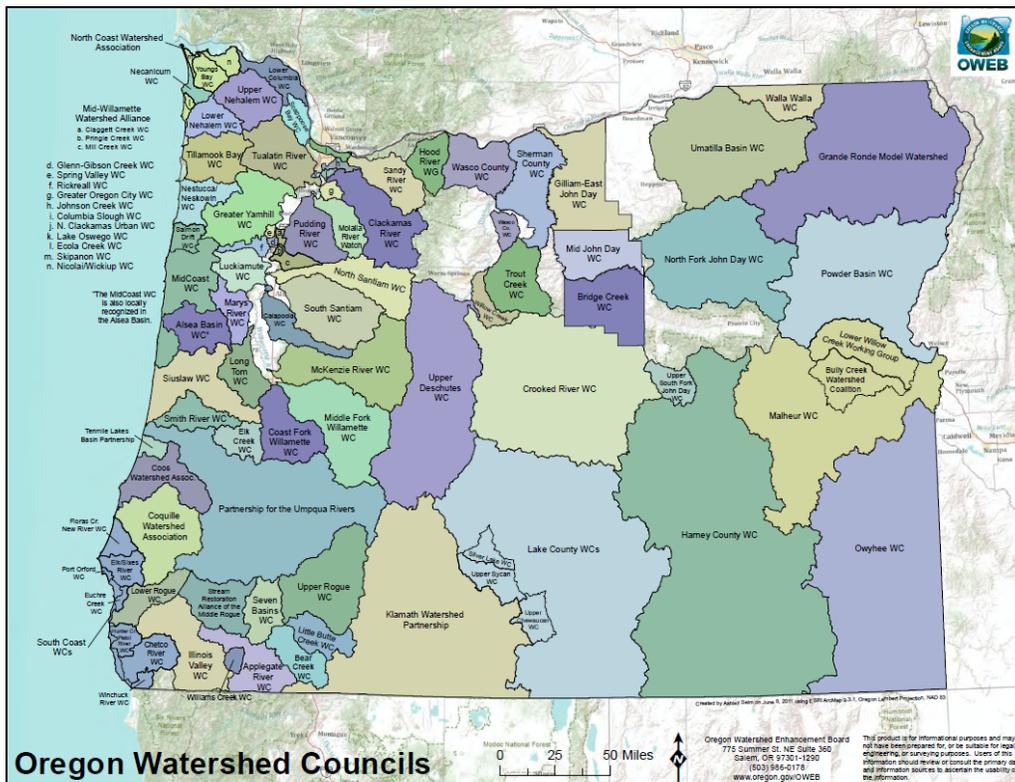
A watershed council is a community-based, voluntary, non-regulatory group that meets regularly in their local communities to assess conditions in a given watershed (usually a river or creek and the lands that drain into them) and to conduct projects to restore or enhance the waters and lands for fish and native plants in their areas. Oregon is one of the few states to have this community-based model – supported by the state and recognized by local governments – to focus on restoring land and water from “ridgetop

¹⁷ Wallowa County Chieftain, June 24, 2020, article by Ellen Morris Bishop

to ridgetop.” The Grand Ronde Model Watershed council represents the entire county covering the Wallowa, Lower Grande Ronde watersheds as well as the Imnaha watershed that drains to the east.

A small sliver of the eastern part of the county drains directly to Hells Canyon on the Snake River. Another small section of the northwestern part of the county drains to the Walla Walla River in Washington State.

Figure 5. Location of Oregon Watershed Councils



Source: Oregon Watershed Enhancement Board “Watershed Councils in Oregon”
<https://www.oregon.gov/oweb/resources/Pages/Watershed-Councils.aspx>

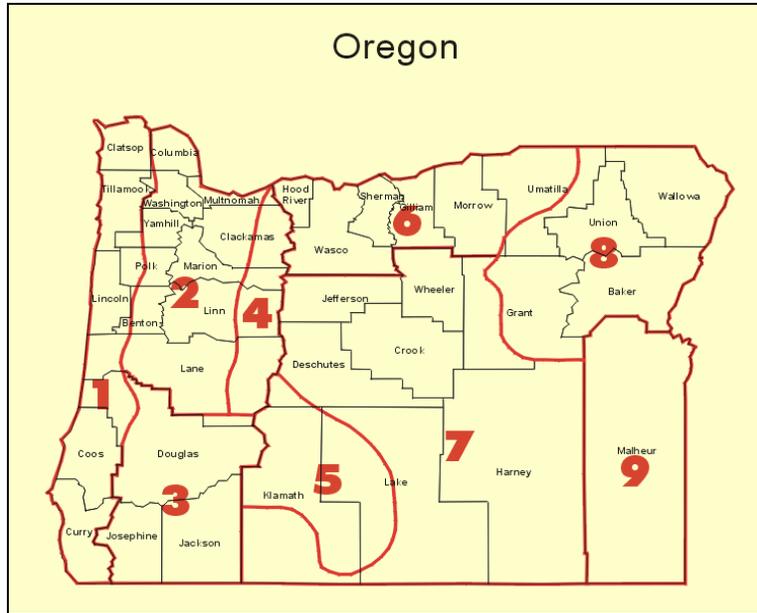
Climate

Wallowa County lies within Oregon Climate Division 8 shown in Figure 5 below.¹⁸ The region is generally dry and there are large seasonal variations in temperature ranging from high temperatures of 80 to 90 °F from June to September to average highs of low teens in the winter months. In most winters, there are frequent and severe winter storms characterized by temperature, wind velocity, ground saturation, and snowpack. Winter storms can slow or halt traffic, damage power lines, and kill livestock.

¹⁸ Climate divisions are created by the National Oceanic Oregon and Atmospheric Administration to separate regions that have similar climates.

Figure 10 below shows the mean monthly annual average temperature for Wallowa County averaged over a thirty-year period. Temperatures can reach as low as -28° F and as high 106° F. There is nearly a 39-degree temperature swing between the mean temperature in January (27) and July (65.7).

Figure 6. Map of Climatic Divisions



Source: National Oceanic and Atmospheric Administration, National Weather Service “Climate Divisions within Counties”

Precipitation: Rainfall and Snowfall

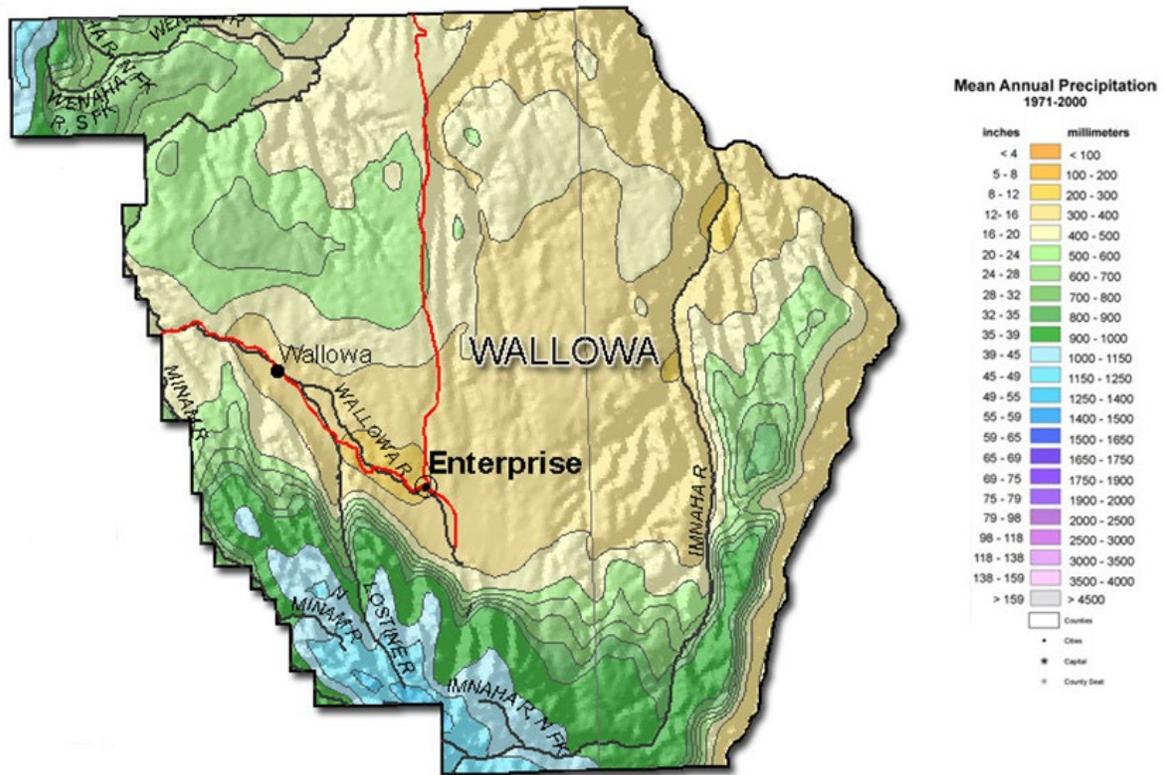
Figures 7 and 8 below show the thirty year monthly average precipitation and snow fall for NOAA stations at Enterprise, Wallowa, and Joseph. The bulk of the area’s precipitation occurs between November and June each year. Locations on the valley floor receive less than 20 inches of precipitation per year, particularly those surrounded by high mountains which may receive less than 10 inches. Higher elevation locations receive higher annual precipitation totals, generally in the form of snowfall. Generally, precipitation for the region is evenly distributed throughout the seasons, although precipitation tends to spike in spring and again in the late fall with dry months in July, August, and September. ¹⁹

Snowfall similarly varies by elevation, with nearly 30 inches falling on average annually in Wallowa City.²⁰ Because snowpack is the principal source of in-stream flow within Wallowa County streams and rivers, snow water equivalent measurements are used to determine the future availability of water for the county residents. Figure 9 shows a sample dataset for Mt. Howard in 2020 showing historic ranges for a thirty-year period.

¹⁹The Oregon Climate Service “Climate of Wallowa County.”

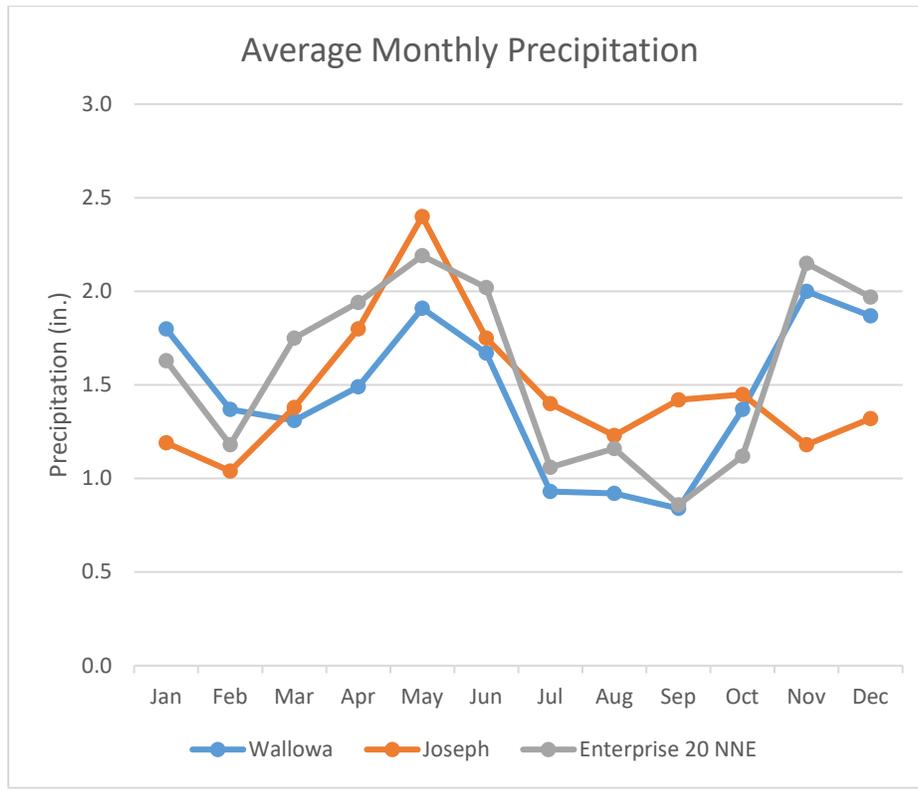
²⁰ NOAA Climate Data Online, accessed August 2020

Figure 7. Mean Annual Precipitation



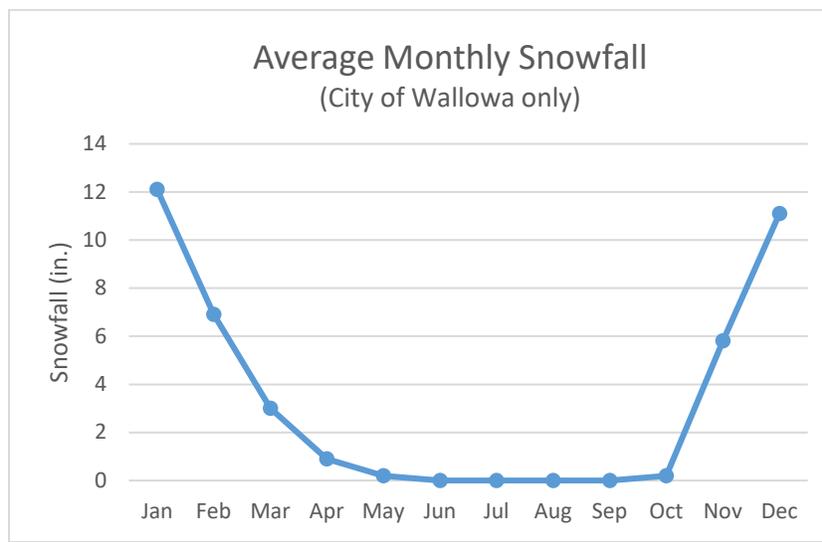
Source: 2013 Northeast Oregon MJ NHMP referencing the Oregon Climate Service

Figure 8. 30 Year Average Monthly Precipitation in Wallowa County (1981-2010 averages)



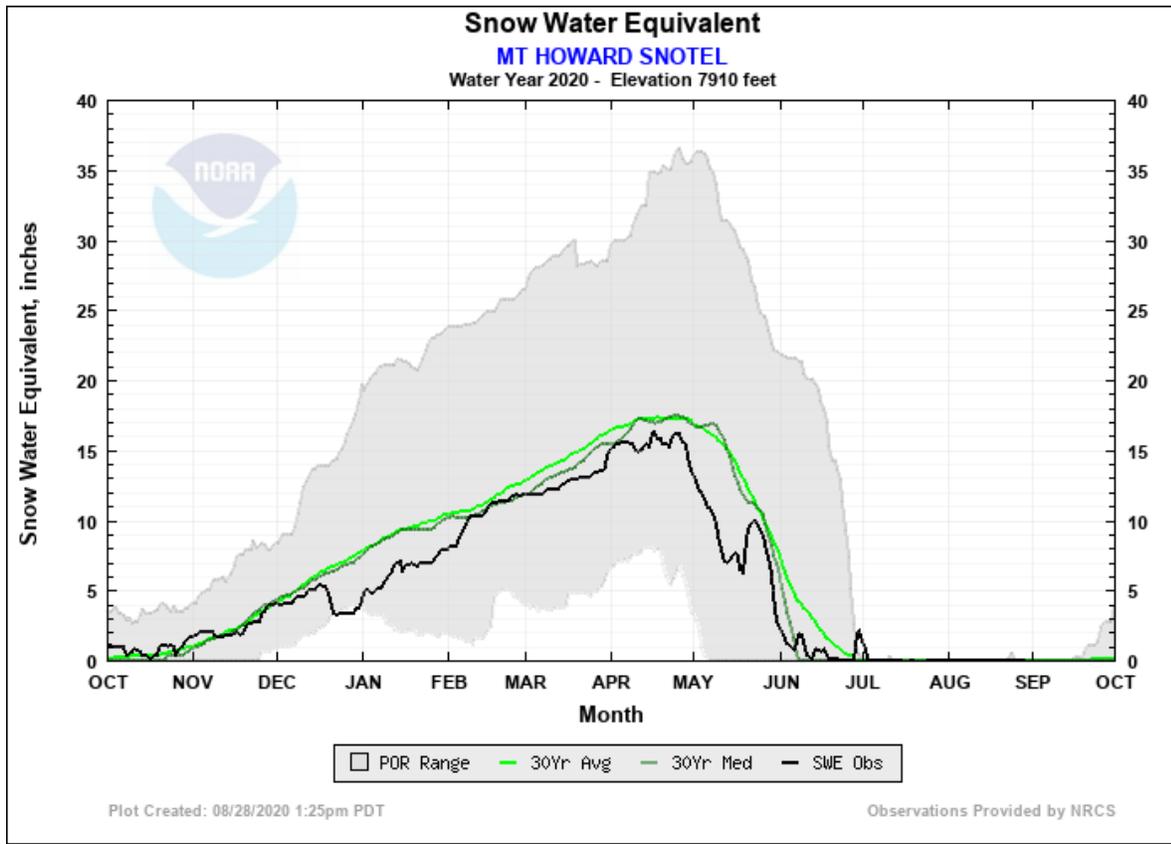
Source: NOAA National Centers for Environmental Information 1981-2010 Normals, <https://www.ncdc.noaa.gov/cdo-web/datatools/normals> data for the following NOAA stations: Wallowa, Joseph and Enterprise 20 NNE

Figure 9. 30 Year Average Monthly Snowfall in Wallowa County (1981-2010 averages)



Source: NOAA National Centers for Environmental Information 1981-2010 Normals, <https://www.ncdc.noaa.gov/cdo-web/datatools/normals> data for the following NOAA stations: Wallowa, Joseph and Enterprise 20 NNE.

Figure 10. Snow Water Equivalent for Water Year 2020 at Mt. Howard Snotel



Source: NOAA National Centers for Environmental Information 1981-2010 Normals

Temperature and Climate Change Variability

Temperatures in the Pacific Northwest region increased in the 20th Century by about 1.5 degrees Fahrenheit. Climate projection models indicate that temperatures could increasingly rise by an average of 0.2 degrees to 1.0 degrees Fahrenheit per decade. Average temperature change is projected to be 3.2 degrees Fahrenheit by 2040 and 5.3 degrees Fahrenheit by 2080. Temperature increases will occur throughout all seasons, with the greatest different in summer months.

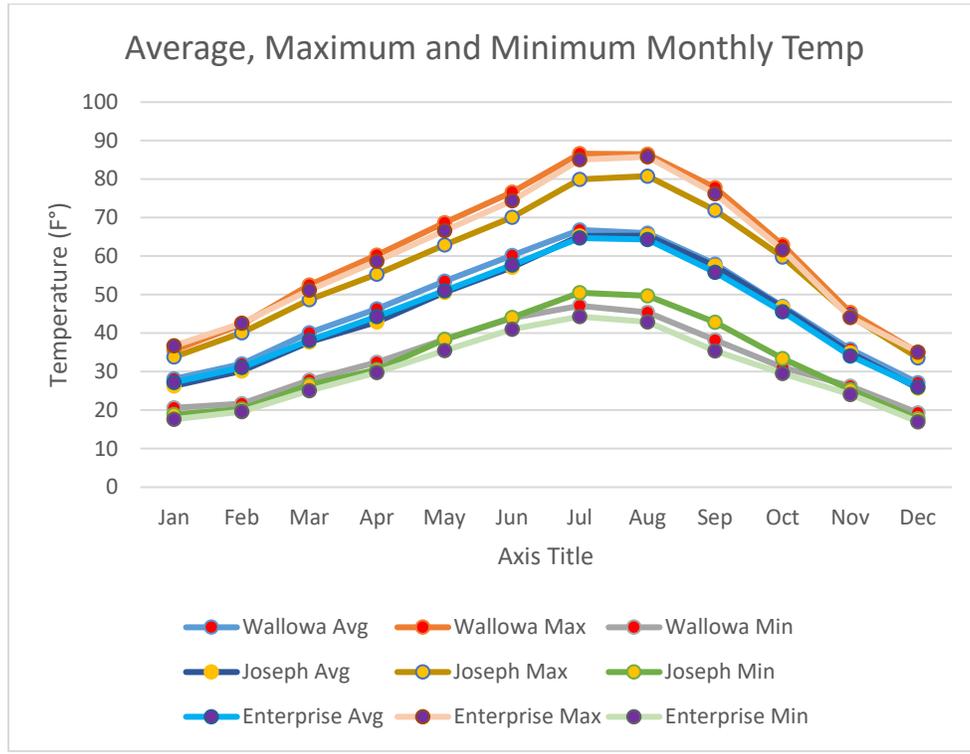
Increasing temperatures affects hydrology. Spring snowpack has substantially decreased throughout the Western part of the United States, particularly in areas with milder winter temperatures, such as the Cascade Mountains. In other areas of the West, such as east of the Cascades Mountains, snowfall is affected less by the increasing temperature because the temperatures are already cold and more by precipitation patterns.

Spring flooding could be affected by warming climate. Mid- to low-elevation areas in Wallowa County's Blue Mountain and Wallowa Mountain ranges that are near the freezing level in winter, receiving a mix

of rain and snow, are projected to experience an increase in winter flood risk due to warmer winter temperatures causing precipitation to fall more as rain and less as snow.²¹

Figure 11 below shows monthly average, maximum and minimum temperatures averaged over a 30-year period from 1981 to 2010.

Figure 11. 30-Year Temperature Averages in Wallowa County (1981-2010 averages)



Source: NOAA National Centers for Environmental Information 1981-2010 Normals, <https://www.ncdc.noaa.gov/cdo-web/datatools/normals> data for the following NOAA stations: Wallowa, Joseph and Enterprise 20 NNE.

The physical geography, weather, and climate of an area represent various interrelated systems that affect overall risk and exposure to natural hazards. Climate change variability also has the potential to increase the effects of hazards in the area. These factors combined with periods of population growth and development intensification can lead to increasing risk of hazards, threatening loss of life, property, and long-term economic disruption if land management is inadequate.

²¹ Fifth Oregon Climate Assessment, 2021 [OCAR5.pdf](#) | Powered by Box

Demographic Profile

The demographic profile characterizes the community population in terms of age, language, race and ethnicity, age, educational attainment, income, and health. These attributes can significantly influence the community’s ability to cope, adapt to, and recover from natural disasters. Additionally, the status of other socio-demographic capacity indicators in the region such as graduation rate, quality of schools, median household income can have long term impacts on the economy and stability of the community ultimately affecting future resilience.

Population

Wallowa County is the most lightly populated county in Northeastern Oregon and most of the structures in the county are located along the Wallowa and Lostine Rivers with significant settlement along the Imnaha River and in the northern near the towns of Promise, Troy, and Paradise. (Figure 3). The cities of Enterprise, Joseph, Wallowa and Lostine together were home to about 59% of the county’s population in 2010 and comprised only 57% of the county’s population in 2019. (Table 1).

Portland State University’s annual Certified Population Estimate dated December 15, 2019 reports Wallowa County’s population to be 7,150. This differs from the 2019 American Community Survey estimate of 7,208. Nonetheless, both are an increase in population from the April 1, 2010 census date on which 7,008 people lived in Wallowa County.

The American Community Survey, a product of the US Census, provides population estimates for 2019, the most recent year reported by the US Census. Those estimates represent a decline in population for most cities in Wallowa County except for Lostine, where an estimated increase of 113 people is a large proportion of the 2010 population thereby reflected in a high percentage increase since 2010.

Table 1. Population Growth 2010-2019 in Wallowa County

Community	2010 Census Population	2019 Population Estimate	Change since 2010	Percent change since 2010
Enterprise	2,064	2,033	-31	- 1.5%
Joseph	1,081	989	-92	- 8.5%
Lostine	213	307	+94	+ 44.0%
Wallowa	808	797	-11	- 1.4%
Subtotal of Cities	4,166	4,126	-40	+ 0.96%
Unincorporated Wallowa County	2,842	3,082	+ 240	+ 8.4%
Total	7,008	7,208	+200	+ 0.26%

Source: US Census and American Community Survey, Demographic and Housing Estimates, Table DP05 consulted March 2021

Urban and rural growth patterns can impact how agencies, cities and counties prepare for emergencies, because changes in development can increase risk associated with hazards. Table 1 shows urbanization trends in the region. Wallowa County is becoming marginally more rural. Table 1 shows that between the years 2010 and 2019, the total population of Wallowa County is estimated to have been very stable with a slight increase of 0.26%.

In the broader region Eastern Oregon's²² population increased by 8,048 people during this eight-year time period. Natural increase (+4,508) combined with net in migration (+3,540) pushed the total number of residents in the region to 190,180 people.

Population size itself is not an indicator of vulnerability. More important is the location, composition, and economic stability of the population within the community. Research by social scientists demonstrates that socio-economic factors such as language, race, age, income, education and health status can affect community resilience to natural hazards.

People of certain population groups may be more vulnerable to natural hazards by virtue of age, both the youngest and the oldest; language, for example non-native English speakers having less access to information; educational background; and household characteristics. Combinations of these factors may further exacerbate vulnerability. Elderly residents living alone are among the most vulnerable during natural disasters.

Age

Age may be the most significant indicator that influences socio demographic capacity in Wallowa County. As depicted in the following figure, population age characteristics of the county vary from Oregon as a whole. The region has a greater percent of its population in the age cohorts above age 55 than the state. The population of Wallowa County who are older than 55 is 46.8%, which is larger than the state of Oregon's (30%) for the same age groups. Conversely, the age cohorts from 25 to 54 account for 31.6% of the county's population, while those cohorts represent 39.8% of the population of Oregon.

Both children and the elderly are more vulnerable than are others to the risks posed by natural hazards. Figure 11 below shows Wallowa County's population by age group.

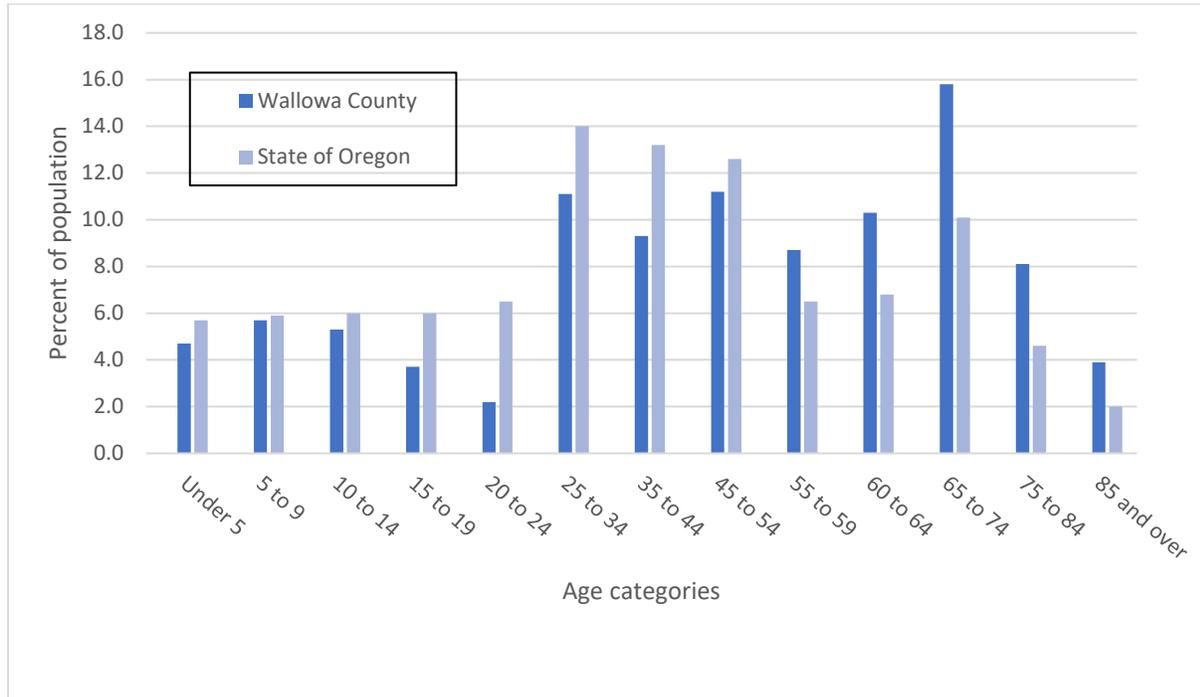
Older adults require special consideration in the planning process. They are more likely to have a disability and require assistance from others to complete routine tasks. Family or neighbors who might ordinarily assist them might be unable to help during a disaster event (Flanagan, Gregory, Hallisey, Heitgerd, & Lewis, 2011). Moreover, an older population requires special consideration due to sensitivity to heat and cold, reliance upon transportation to obtain medication, and comparative difficulty in making home modifications that reduce risk to hazards. In addition, older people may be reluctant to leave home in a disaster event. This implies the need for targeted preparatory programming that includes evacuation procedures and shelter locations accessible to all ages and abilities (Morrow, 1999).

The percentage of children in the region—and in three of the four regional counties—is slightly smaller than the statewide estimate. Special considerations should be given to young children, schools, and parents during the natural hazard mitigation process. Young children are more vulnerable to heat and

²² Eastern Oregon is comprised of the following counties: Wallowa, Umatilla, Union, Morrow, Grant, Baker, Harney and Malheur.

cold, have fewer transportation options, and require assistance to access medical facilities. Parents might lose time from work and money when their children’s childcare facilities and schools are impacted by disasters (Cutter, Boruff, & Shirley, 2003).²³

Figure 12. Population by Age Group in Wallowa County and the State of Oregon



Source: U.S. Census Bureau, 2019 American Community Survey.

Another measure of vulnerability for people is the age dependency ratio. The age dependency ratio expresses the number of people 65 or older and 15 or younger for every 100 working aged adults. There are three types of age dependency ratio. The youth dependency ratio is the population ages 0-15 divided by the population ages 16-64. The old-age dependency ratio is the population ages 65-plus divided by the population ages 16-64. The total age dependency ratio is the sum of the youth and old-age ratios.

The following table displays the population by age groups and the age dependency ratio. As of 2019 American Community Survey, nearly 28% of the county’s population is over the age of 64, a number that is projected to rise by 2040. The region has a higher percent of its population over the age of 64 compared to Oregon. Wallowa County’s age dependency ratio is 86.1, which is significantly higher than that of the State of Oregon (61.3). The dependency ratio indicates a higher percentage of dependent aged people to that of working age; this trend is projected to continue.

²³ Oregon Natural Hazard Mitigation Plan, Department of Land Conservation and Development, 2020

In Wallowa County the age dependency ratio is 86.1 comprised of a child dependency ratio of 34.4 and an old-age dependency ratio of 51.8. The age dependency ratio for Oregon is 61.3 representing 61.3 elders and children for every 100 working aged individuals. One Wallowa County community has an age dependency ratio greater than 100. These data are provided below in Table 2. Dependency ratios reveal the population breakdown of a place and broadly represents how well dependents can be taken care of.

Table 2. Age Dependency ratios for Wallowa County and its cities

Jurisdiction	Total Age Dependency	Old-age Dependency	Child Dependency
United States	61.4	24.6	36.8
Oregon	61.3	27.0	34.3
Wallowa County	86.1	51.8	34.4
Enterprise	86.9	41.3	45.5
Joseph	72.4	51.1	21.3
Lostine	102.5	49.7	52.8
Wallowa	96.5	50.5	46.1

Source: US Census 2019 American Community Survey 5-year estimates

By this measure, the communities of Lostine and Wallowa may be particularly vulnerable to the impact of natural hazard events due to the higher proportion of older and younger people as compared to the portion of the population between 15 and 64, the assumed wage earners. The age dependency of these communities is dominated by the impact of a cohort of those 65 and older as compared to the cohort between the ages of 15 and 64.

The age profile of an area has a direct impact both on what actions are prioritized for mitigation and how response to hazard incidents is carried out. School age children rarely make decisions about emergency management. Therefore, a larger youth population in an area will increase the importance of outreach to schools and parents regarding fire safety, earthquake response, and evacuation plans. Furthermore, children are more vulnerable to the heat and cold, have few transportation options and require assistance to access medical facilities. Older populations may also have special needs prior to, during and after a natural disaster. Older populations may require assistance in evacuation due to limited mobility or health issues. Additionally, older populations may require special medical equipment or medications, and can lack the social and economic resources needed for post-disaster recovery.

Other important considerations for high-risk populations are the number of people over the age of 64 living alone and single parent households with children under 18. The American Community Survey estimates that there were 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), these populations may require additional support during a disaster.

Language

Special consideration should be given to populations who do not speak English as their primary language. Language barriers can be a challenge when disseminating hazard planning and mitigation resources to the general public, and it is less likely they will be prepared if special attention is not given to language and culturally appropriate outreach techniques.

A small proportion of Wallowa County’s population speaks a language other than English at home. Table 3 below shows that while the vast majority of residents speak only English at home (96.7%), there are approximately 219 county residents who speak languages other than English at home. Spanish speakers comprise the majority of those.²⁴

Table 3. Language Proficiency

	Number of households	Households Speaking Spanish (limited English households)	Speaking other Indo-European language	Speaking Asian and Pacific Island language	Speaking other languages (limited English households)	Total Limited English-speaking households
Enterprise	878	39 (11)	5	10	5 (5)	16
Joseph	520	3	0	19	0	0
Lostine	107	2	0	0	0	0
Wallowa	350	0	0	0	0	0
Unincorporated Wallowa County	1,359	54	4	0	0	0
Total	3,214	98	9	29	5	16

Source: US Census Bureau, American Community Survey, DP02, consulted February 2021

The City of Enterprise is home to all sixteen households in the county where English proficiency is limited. Of these households, those that speak Spanish comprise eleven and five households speak an unidentified language that does not fit into the categories provided.

Race

The impact in terms of loss and the ability to recover may also vary among minority population groups following a disaster. Studies have shown that racial and ethnic minorities maybe more vulnerable to natural disaster events. This is not reflective of individual characteristics; instead, historic patterns of

²⁴ US Census, 2018 American Community Survey, consulted June 2020

inequality along racial or ethnic divides have often resulted in minority communities that are more likely to have inferior building stock, degraded infrastructure, or less access to public services.

Wallowa County is fairly racially homogenous with a population that is 97.3% white, most of whom identify as white only. Of those who identify as one race other than white, most individuals identify as American Indian or Alaska Native. Those in the county who identify as Hispanic represent 3.1% of the population and are predominantly Mexican with some individuals from Cuba and Puerto Rico.²⁵

While the minority population in the Region is not large, it will be important to identify specific ways to support all portions of the community through hazard preparedness and response. Culturally appropriate, and effective, outreach can include both methods and messaging targeted to this diverse audience. For example, connecting to historically disenfranchised populations through already trusted sources or providing preparedness handouts and presentations in the languages spoken by the population will go a long way to increasing overall community resilience.

Education

Educational attainment of community residents is also identified as an influencing factor in socio-demographic capacity. Educational attainment often reflects higher income and, therefore, higher self-reliance. Widespread educational attainment is also beneficial for the regional economy and employment sectors supporting potential employment in the professional, governmental and service sectors. An oversaturation of either highly educated residents or low educational attainment can have negative effects on the resiliency of the community.

According to the U.S. Census, American Community Survey for 2019, nearly 93.1% of the Wallowa County's population over 25 years of age has graduated from high school or achieved higher educational attainment, with approximately 26.4% receiving a Bachelor's degree or higher.

In 2018-19 the Oregon Department of Education reported that Enterprise High School had an on-time graduation rate of 97%. The total enrollment at Enterprise High School was 216 students in the 2018-19 school year. Wallowa County has two other options for study in the high school grades, Wallowa High School and Joseph Charter School. Joseph Charter School serves 257 students in grades K-12. Wallowa High School served 93 students during the 2018-2019 school year with an on-time graduation rate of 100%. Elementary school education is available in Wallowa County at Enterprise Elementary, Joseph Charter School, Wallowa Elementary, Imnaha Elementary and Troy Elementary located in those respective communities.²⁶

Income and Poverty

Household income and poverty status are indicators of socio demographic capacity and the stability of the local economy. Household income can be used to compare economic areas as a whole, but does not reflect how the income is divided among the area residents.

Household income and poverty rates are indicators of socio demographic capacity and the broader community resilience to natural hazards. People living in poverty suffer a disproportionate burden from

²⁵ U.S. Census, American Community Survey consulted March 2021

²⁶ Oregon Department of Education website <https://www.ode.state.or.us/data/reportcard/reports.aspx>

disasters. They are more likely to be isolated and less likely to have the assets to withstand economic setback. When a disaster interrupts work, the ability to provide housing, food, and basic necessities becomes increasingly difficult. In addition, low-income populations are hit especially hard as public transportation, public food assistance, public housing, and other public programs upon which they rely for day-to-day activities are often impacted in the aftermath of the disaster.²⁷

The median household income of Wallowa County residents in 2019 was \$51,224. Between 2010 and 2019 median income rose significantly in three of the four cities within Wallowa County while at the same time poverty rates increased in all jurisdictions except for the City of Lostine. Table 4 below shows the change in median household income for the state, the county, and the cities in Wallowa County from 2010 to 2019, as well as the family poverty rate for those jurisdictions.

Table 4. Median Household Income and Families below the Poverty Level

Community	Median Household Income 2010	Median Household Income 2019	% Change	2010 % of Families in Poverty	2019 % of Families in Poverty
Oregon	\$46,560	\$62,818	+34.9%	15.8%	8.4%
Wallowa County	\$41,116	\$51,224	+24.6%	9.6%	10.1%
Enterprise	\$34,042	\$39,375	+15.7%	4.4%	15.8%
Joseph	\$37,750	\$45,000	+19.2%	10.3%	12.5%
Lostine	\$51,667	\$56,563	+9.5%	11.6%	0%
Wallowa	\$44,531	\$41,105	-7.7%	8.9%	17.8%

Source: US Census Bureau (<https://www.census.gov/>), Tables S1901 and S1702 consulted March 2021.

Among the most vulnerable people are people living below the poverty line whether they live in families or not. Among all people for whom such status was determined, 10.1% of Wallowa County people live below the poverty line. By this measure the communities of Enterprise and Wallowa may be the communities that are most economically vulnerable to natural hazards. These cities suffer from the highest overall poverty level in the county, with 15.8% and 17.8% respectively of families living below the poverty line.

Of all families in Wallowa County, 10.1% or 210 families (out of the total 2,079 families for whom data were available) are families whose income in the preceding 12 months was below the poverty level. For people who live in families, poverty is highest among single parent households with children under 18 years old. There are 749 families with children under 18 years old in Wallowa County, of these 189 families are headed by single female householders. More than half (58.6%) of these single female parent households with children under 18 live below the poverty line. For those single parent families headed by women where the children are 5 years old or less, 100% of these 12 families live below the poverty

²⁷ FEMA Local Mitigation Planning Handbook, 2013

line.²⁸ Of all the children in Wallowa County, 20% live in poverty as compared with 16% in Oregon as a whole.²⁹

Of people living alone or in other non-family households, 23.3% (264 people) of the 1,135 single person (or non-family) households in Wallowa County are people living below the poverty line.³⁰

Health

Individual and community health play an integral role in community resiliency, as indicators such as health insurance, people with disabilities, dependencies, homelessness and crime rate paint an overall picture of a community's wellbeing. These factors translate to a community's ability to prepare, respond and cope with the impacts of a disaster.

The Resilience Capacity Index (RCI)³¹ is a resiliency tool developed by Kathryn A. Foster, director of University of Buffalo's Regional Institute, that maps more than 360 U.S. metros evaluated based on performance across 12 economic, socio-demographic, and community connectivity indicators, ranging from income equality and business environment to voter participation and the population with health insurance. The RCI recognizes those who lack health insurance or are impaired with sensory, mental or physical disabilities, have higher vulnerability to hazards and will likely require additional community support and resources. Respective counties may be obligated to provide services to the dependent aged population if their families do not have insurance, or cannot afford to care for them following a natural disaster.

The 2019 ACS data on insurance coverage indicates that 95.8% of the Wallowa County residents have health insurance, more than in Oregon as a whole (93.3% of Oregonians have health insurance).

In terms of disability status of the population, as of 2019, over 18.1% of Wallowa County residents identified with one or more disabilities; this rate is above the 14.7% of Oregonians who identify a disability.

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 on the whole. 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.³²

A community with high percentages of drug dependency and violent crimes may experience increased issues with the disruption of normal social systems. Data from County Health Rankings³³, a program of

²⁸ US Census, consulted September 2020

²⁹ [Wallowa County, Oregon | County Health Rankings & Roadmaps](#)

³⁰ Ibid

³¹ [Building Resilient Regions > USC Equity Research Institute \(ERI\) > USC Dana and David Dornsife College of Letters, Arts and Sciences](#)

³² U.S. Census, American Community Survey, Table S2101, consulted March 2021

³³ [Wallowa County, Oregon | County Health Rankings & Roadmaps](#)

the University of Wisconsin Population Health Institute, indicates that neither violent crime nor drug dependency are prominent social problems in Wallowa County.

For planning purposes, it is essential that the Wallowa County consider both immediate and long-term socio-demographic implications of hazard resilience. Immediate concerns regard the growing elderly population. These populations would serve to benefit from mitigation outreach, with special attention to appropriate methods of reaching the vulnerable populations. The status of other socio-demographic capacity indicators such as populations without health insurance, high poverty levels, and median household income can have long-term impacts on the economy and stability of the community ultimately affecting future resilience.

Economic Capacity

Economic capacity refers to the financial resources present, and revenue generated in the community. Income inequality, housing affordability, 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. Once any inherent strengths or systematic vulnerabilities become apparent, both the public and private sectors can take action to increase the resilience of the local economy.

Housing Affordability

The evaluation of housing affordability supplements the identification of socio-demographic capacity indicators, e.g., median income, and is a critical analysis tool to understanding the economic status of a community as it relates to resilience to natural hazard events. This information can capture the likelihood of individuals' ability to prepare for natural hazard events, such as through retrofitting homes or purchasing insurance. Likewise, the ability of homeowners, or renters, to implement mitigation actions may vary significantly with high-income inequality or housing cost burdens. Therefore, affordability is a mechanism for generalizing the abilities of community residents to get back on their feet without Federal, State or local assistance.

Housing affordability is a measure of economic security gauged by the percentage of a metropolitan area's households paying less than 35% of their income on housing.³⁴ Households spending more than 35% are considered housing cost burdened. Table 5 displays the percentage of homeowners and renters reflecting housing cost burden in Wallowa County compared to the state as a whole.

Compared to the State, the Wallowa County has higher percentages of homeowners paying more than 35% of their income on housing. Among homeowners, with or without a mortgage, Wallowa County has the similar rates of housing cost burdens to residents of the state. Among renters, Wallowa County has the highest rates of housing cost burden. In general, the population that spends more of their income on

³⁴ [Building Resilient Regions > USC Equity Research Institute \(ERI\) > USC Dana and David Dornsife College of Letters, Arts and Sciences](#)

housing has proportionally fewer resources and less flexibility for alternative investments in times of crisis.

Table 5. Households Spending >35% of Income on Housing in Wallowa County

	Owners		Renters
Jurisdiction	With Mortgage	Without Mortgage	
State of Oregon	22.7%	11.5%	41.7%
Wallowa County	23.8%	13.7%	38.6%

Source: U.S. Census, ACS, Table DP04, consulted March 2021

This disparity imposes challenges for a community recovering from a disaster as housing costs may exceed the ability of residents to repair or move to a new location. These populations may live paycheck to paycheck and are extremely dependent on their employer, in the event their employer is also impacted it will further the detriment experienced by these individuals and families.

Home Ownership

Housing occupancy data may relate to factors that influence resilience to natural hazards, both positively and negatively. On the positive side, length of occupancy in the same residence may reflect how strongly people are tied to their community. Strong community ties may support community resilience in the face of a flood or fire. In addition, those who own their homes may be more likely to prepare their homes to be more resistant to natural hazards, such as maintenance of defensible space to combat the threat of wildfires.

In Wallowa County, there are 3,214 occupied housing units, of which 2,236 (69.7%) are owner occupied. This is slightly higher than the Oregon statewide average of 61% owner occupied housing.³⁵ Of the owner-occupied housing in Wallowa County 47.8 % are not burdened by a mortgage.³⁶ This statistic may indicate a high degree of community stability. On the other hand, insurance requirements may be placed on borrowers by mortgage lenders, such as obligatory flood insurance purchase for structures located in the FEMA floodplain. Those homeowners who do not hold mortgages, may drop flood insurance policies after the mortgage is paid off, particularly if household income is limited.

Income Inequality

Income inequality is a measure of the distribution of economic resources, as measured by income, across a population. It is a statistic defining the degree to which all persons have a similar income. Table C-17 illustrates the regional level of income inequality. The [Gini index](#) is a measure of income inequality. The index varies from zero to one. A value of one indicates perfect inequality (only one household has

³⁵ Ibid.

³⁶ Ibid.

any income). A value of zero indicates perfect equality (all households have the same income).^{37 38} Wallowa County's income distribution is similar to the State as a whole. Wallowa County has a Gini index of .4551 and the State of Oregon has a Gini Index of .4586.

Economic Diversity

Economic diversity is a general indicator of an area's fitness for weathering difficult financial times. Business activity in the Northeast Oregon region is fairly homogeneous and consists mostly of small businesses. The Northeast Region Profile within the State Natural Hazards Mitigation Plan summarizes the current state of the area's economic environment:

“Although the Northeast Region has a high percentage of small businesses, as a whole, the Northeast Region has a more homogeneous economy than other Oregon regions. Many of the small businesses fall into the same categories of industry sectors. This low economic diversity means that certain industries are dominating the economic structure of the community and are therefore extremely important to the Northeast Region.

An economy that is heavily dependent upon a few key industries may have a more difficult time recovering after a natural disaster than one with a more diverse economic base. While a community with a diverse economic base may suffer from an industry sector being damaged during a natural disaster, they have a broader base of operating industry sectors to continue to rely upon. However, a community that relies upon specific key industry sectors may have a harder time recovering their economic base if one of those key industry sectors is damaged. Recognizing that economic diversification is a long-term issue, more immediate strategies to reduce vulnerability should focus on risk management for the dominant industries.”

One method for measuring economic diversity is through use of the Hachman Index, a formula that compares the composition of county and regional economies with those of states or the nation as a whole. According to the Hachman Index, the county with the most diverse economic activity compared to the state as a whole receives a ranking of 1, while the county with the least diverse economic activity compared to the state as a whole receives a ranking of 36. Wallowa County is ranked 28 with a Hachman Index of 0.201³⁹

Employment and Wages

According to the Oregon Employment Department and shown in Figure 12 below, unemployment declined from 2009 to 2018 reflecting recovery from the Great Recession of 2008. However, unemployment in Wallowa County, remains generally lower than the unemployment rate in the State of Oregon.

Understanding about the impact on unemployment by the COVID-19 pandemic in 2020 remains incomplete at the time of this writing. An April 21, 2020 Press Release from the Oregon Employment Department reported that statewide the department received 53,800 initial claims for unemployment

³⁷ [Building Resilient Regions > USC Equity Research Institute \(ERI\) > USC Dana and David Dornsife College of Letters, Arts and Sciences](#)

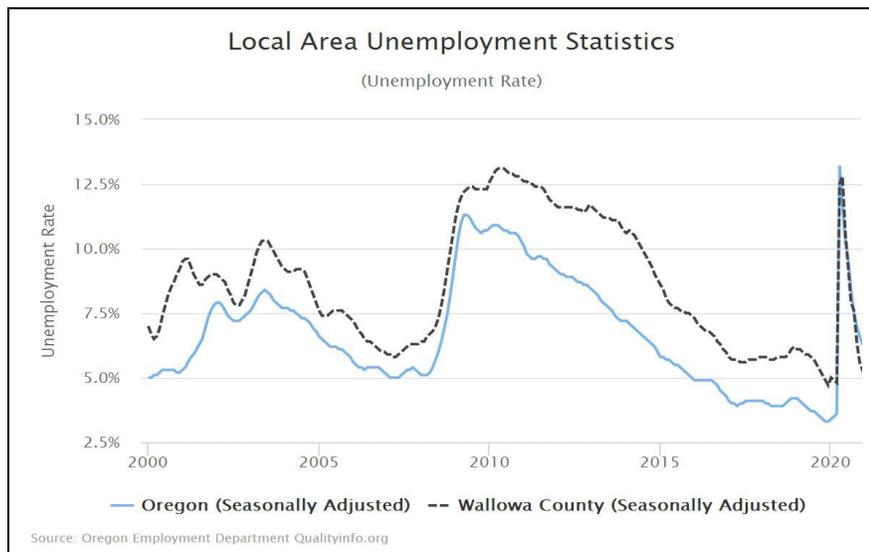
³⁸ [Gini Index Definition \(investopedia.com\)](#)

³⁹ [Measuring Local Industry Employment Diversity with the Hachman Index - Article Display Content - QualityInfo](#)

benefits from April 5-11. That’s in addition to a revised total of 243,000 initial claims filed during the prior three weeks, March 15 to April 4. In comparison, the Employment Department received just 14,820 initial claims during the comparable four-week period in 2019 (March 17 to April 13). This surge in claims is unprecedented.⁴⁰

In Eastern Oregon, initial claims had surged as well, with 2,473 processed initial unemployment insurance claims for the four-week period, March 15 to April 11. This represents a significant increase over the 379 claims during the comparable four-week period in 2019. All Eastern Oregon counties have seen a relatively large upswing in unemployment insurance claims. The majority of claims have come from four industries: accommodation and food services, health care and social assistance, manufacturing, and retail trade.⁴¹

Figure 13. Unemployment Rates in Wallowa County and the State of Oregon 2000-2021



Source: Oregon Employment Department, Local Area Unemployment Statistics, accessed March 2021.

As of 2018, there were 1,785 individuals employed in businesses in Wallowa County, whereas in 2012 there were only 1,623 individuals employed in businesses in Wallowa County. The number of establishments increased by two in that time period raising from 287 in 2012 to 289 in 2018.

In 2011, there were 1,868 employment establishments in the region of which about 93% had fewer than 20 employees, over 5 percentage points higher than the state average.⁴²The county with the highest percentage of smaller businesses was Wallowa County at nearly 98% of its businesses.⁴³ The prevalence of small businesses in the Northeast Region is an indication of sensitivity to natural hazards because small businesses are more susceptible to financial uncertainty. If a business is financially unstable before

⁴⁰ Oregon Employment Department, April 21, 2020 Press Release

⁴¹ Ibid.

⁴²U.S. Census Bureau, 2011 County Business Patterns (NAICS). <http://censtats.census.gov/cgi-bin/cbpnaic/cbpsect.pl>, accessed March 2013. Out of the 1868 establishments, 1185 had 1-4 employees, 364 had 5-9, and 194 had 10-19

⁴³ Ibid; 338 out of 346 establishments had fewer than 20 employees

a natural disaster occurs, financial losses (resulting from both damages caused and the recovery process) may have a bigger impact than they would for larger and more financially stable businesses.⁴⁴

Industry

Economic resilience to natural disasters is particularly important for the residents of Wallowa County. If key industries are negatively impacted by a natural hazard, such that employment is affected, the impact will be felt throughout the county's economy. Key industries are those that represent major employers and are significant revenue generators. Different industries face distinct vulnerabilities to natural hazards, as illustrated by the industry specific discussions below. Identifying key industries in the region enables communities to target mitigation activities towards those industries' specific sensitivities. It is important to recognize that the impact that a natural hazard event has on one industry can reverberate throughout the regional economy. Understanding and addressing the sensitivities of these industries is a strategic way to increase the resiliency of the entire regional economy. Data on employment in Oregon can be found through the Oregon Employment Department's website.

The economy of Wallowa County is dominated by agriculture and support services, as well as recreation and tourism, especially in the spring, summer and fall. Support services include government, schools, stores, and hospitality facilities. Looking at the most recent data from 2017, an upward trend is visible. From 2016 to 2017, employment in Wallowa County, OR grew at a rate of 5.75%, from 2.87k employees to 3.03k employees. The most common employment sectors for those who live in Wallowa County, Oregon are Health Care & Social Assistance (521 people), Agriculture, Forestry, Fishing & Hunting (417 people), and Construction (327 people). The total number of employed persons 3,030 is approximately forty-three percent of the total population. This figure is relatively low, not surprising given the high average age and percentage of senior citizens who are not working.⁴⁵

According to the Economic Opportunity Analysis (Oregon Statewide Planning Goal 9) Prepared for The City of Lostine, Oregon, performed by Johnson Economics in 2019 the number of jobs in the County will increase by approximately 525 to 751 over the next twenty years. An analysis done for the City of Joseph also supports this conclusion with a projected ninety new jobs over the next twenty years. Given the projected population growth, the increase in jobs locally makes sense. The growth industries are likely to be in the following categories.

- Construction
- Health Care
- Leisure & Hospitality
- Education
- Administration Services
- Professional & Technical Services
- Manufacturing
- Wholesale trade
- Retail trade
- Finance & Insurance
- Real Estate⁴⁶

⁴⁴State of Oregon Natural Hazards Mitigation Plan, Region 7 Northeast Oregon Regional Profile.

⁴⁵ *Economic Opportunity Analysis: 2021 Wallowa County*; PARC Resources

⁴⁶ Ibid.

The job growth projection appears to be contrary to the long-term projections for population decrease, however there are multiple factors at work in the figures. The jobs may be new jobs that replace old or lost positions. For example, at some point, mechanics and service stations replaced blacksmiths and forges. Similar changes may take place in Wallowa County, whereby some services or products are replaced with the new jobs that the projections reference. Determining what those employment and technology replacements might be in the future requires a measure of foresight and guesswork in connection with agriculture, tourism, travel, and technical services. Given the growing importance of tourism, combined with the potential demand for outdoor recreation, the County may find itself with significant opportunities to support undeveloped sites in proximity to campgrounds, natural areas, reserves and national forests.⁴⁷

Selected Key Industries

Health Care and Social Assistance: The health care and social assistance sector ranges from physicians and chiropractors to family planning and kidney dialysis centers to emergency food and housing organizations and child day care services. This sector is growing in Wallowa County partially as a result of the large retirement age population. The demand for health care and social assistance following a severe natural disaster may increase in the short term as extra health care and housing services may be necessary. Services that are privately subsidized and sensitive to interruptions of funding may suffer following a disaster. However, the long-term economic viability of this sector should not be adversely affected by a natural disaster. The ability of their facilities to withstand the physical impacts of a disaster and the personnel's ability to cope with a potential influx of people requiring attention after a disaster may be concerns for this sector.

Leisure and Hospitality: An analysis of "direct travel impacts" performed by Dean Runyan Associates under contract with Travel Oregon shows growth in the number of jobs related to the travel industry is particularly revealing. In less than a decade (2010-2018) the industry in Wallowa County added 180 jobs.⁴⁸ Despite the restriction in travel because of the pandemic, there is no systemic reason to suspect that the importance of travel and tourism will decrease. Instead, the industry is poised to continue to grow and be an increasingly important part of the County's economy.⁴⁹

Travel spending and related economic impacts occur within Oregon's urban areas; however, the rural impacts are arguably more impressive. A Dean Runyan Associates study on travel impacts claims that in general, more rural counties have a bigger share of travel-generated employment. NEOEDD's 2015 Comprehensive Economic Development Strategy (2018-2023) for the region including Wallowa, Union and Baker counties stated that the Leisure and Hospitality Industry is responsible for 18 percent of private employment in the region. Location Quotients (LQ, a measure of relative industry advantage based on location) over 1.0 in the region's travel industry include 1.6 LQ for retail trade and 1.1 LQ for accommodations and food. Tourism jobs are known for lower-than-average annual wage levels, which holds true in NE Oregon. However, the tourism industry provides the opportunity for many business owners to benefit from tourism-related sales, and direct earnings in the region are significant.

⁴⁷ Ibid.

⁴⁸ Dean Runyan Associates, "Oregon Travel Impacts: Statewide Estimates," Prepared for the Oregon Tourism Commission. p. 185-186.

⁴⁹ EOA, 2021

Nevertheless, according to the study tourism continues to be one of the primary diversifications of the region's economy.⁵⁰

Retail Trade: The retail trade sector in the Wallowa County is primarily composed of small businesses (98%) that tend to be more sensitive to hazard induced costs due to prior financial instability. Retail trade is also largely dependent on wholesale trade and the transportation network for the delivery of goods for sale. Disruption of the transportation system could have severe consequences for retail businesses. Retail trade typically relies on local residents and tourists and their discretionary spending ability. Residents' discretionary spending diminishes after a natural disaster when they must pay to repair their homes and properties. In this situation, residents will likely concentrate their spending on essential items that would benefit some types of retail (e.g. grocery) but hurt others (e.g. gift shops). The potential income from tourists also diminishes after a natural disaster as people are deterred from visiting the impacted area. In summary, depending on the type and scale, a disaster could affect specific segments of retail trade, or all segments.

Manufacturing: The manufacturing sector is highly dependent upon the transportation network in order to access supplies and send finished products to outside markets. Manufactures in this region are sensitive to hazard induced disruptions to the Union Pacific railroad or I-84. As base industries they are not, however, dependent on local markets for sales, which contribute to the economic resilience of this sector.

Natural Resources: Agriculture and ranching are vital parts of the Wallowa County economy. According to the United States Department of Agriculture (USDA) Agricultural Census, 2017 Wallowa County contained 589 farms ranging in size from 1-9 acres (103), 10-49 acres (114) and 50-179 acres (107) with over 21% (114 farms) containing over 1,000 acres. Total crop land amounted to 94,650 acres in the county. The 2017 Ag Census reports that 348 farms were irrigating 42,602 acres. Principal crops and livestock produced in Wallowa County include wheat, both spring and winter crops, hay, oats, barley, beef cows, sheep, and poultry.⁵¹

The agricultural and livestock industries in the county present a range of potential opportunities for value-added processing. There remains a strong interest 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. Urban area restaurants in the Pacific Northwest and even California seek locally produced and processed products. This niche industry has a lot of potential in Wallowa County.⁵²

Forest health has long been an area of great concern for the 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.⁵³

⁵⁰ [2018-2023-NEOEDD-CEDS.pdf](#)

⁵¹ [USDA/NASS Census of Agriculture Chapter 1, Table 1](#)

⁵² EOA, 2021

⁵³ EOA, 2021

Future Employment in Industry

Sectors that are anticipated to be major employers in the future also warrant special attention in the hazard mitigation planning process. Between 2010 and 2020, the largest employment growth is anticipated within construction (+21%), professional and business services (+19%), manufacturing (+18%), and educational and health services (+17%). Considering that some projected industries (shown in Tables C-22 and C-23) are among those that generate high revenue and/or income (e.g. manufacturing), the concerns mentioned above should be incorporated into future hazard mitigation planning. Currently the only mitigation action that addresses increasing resilience for businesses to natural hazards is MH #3, more information on this action item can be found in Appendix A.

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. Considering the high regional unemployment, high housing cost burden, and an economy heavily dependent on a single or few key industries, the Wallowa County may experience a more difficult time in recovering after a disaster than one with a more diverse economic base. It is important to consider what might happen to the county's economy if the largest revenue generators and employers are impacted by a disaster. It is imperative that the region recognizes that economic diversification is a long-term issue; more immediate strategies to reduce vulnerability should focus on risk management for the dominant industries.

NHMP 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 below.

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.

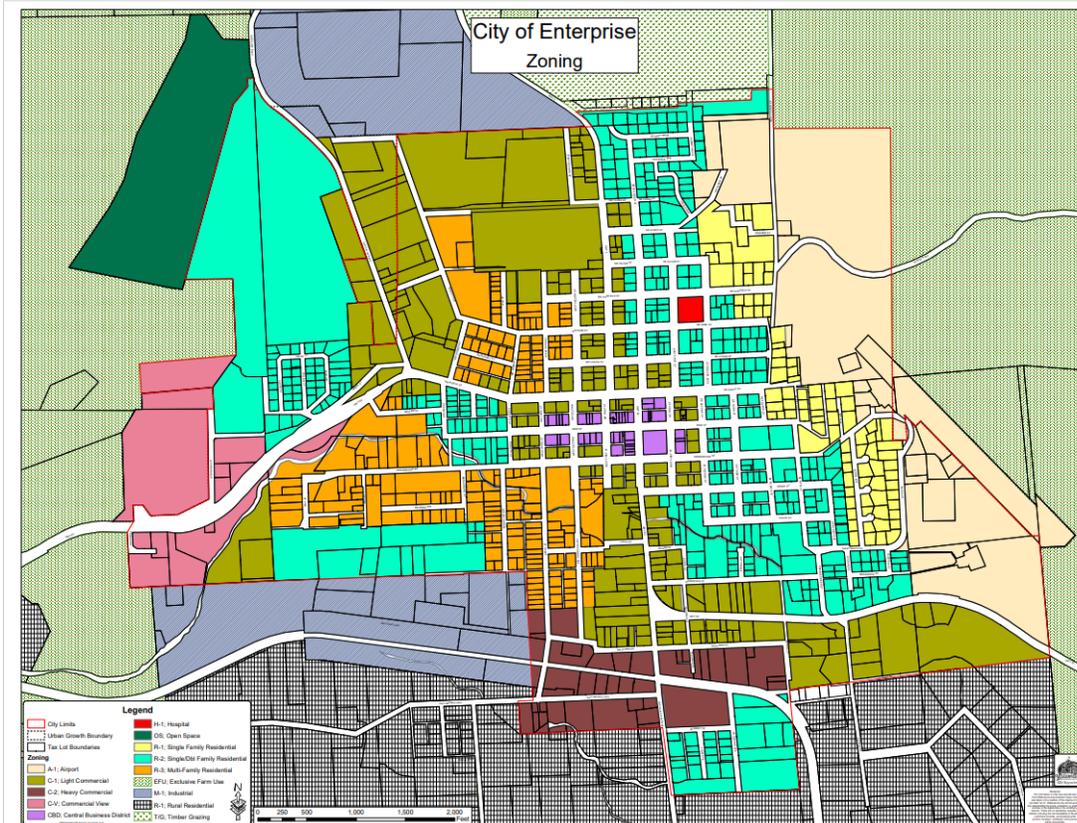
What is also at risk from natural hazard events in Wallowa County are health, safety, and life. Power outages from snow or windstorms interrupt business, commerce, education, and health care delivery. Storms can create dangerous driving conditions leading to crashes that can cost thousands of dollars,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

Figure 14. City of Enterprise Zoning Map



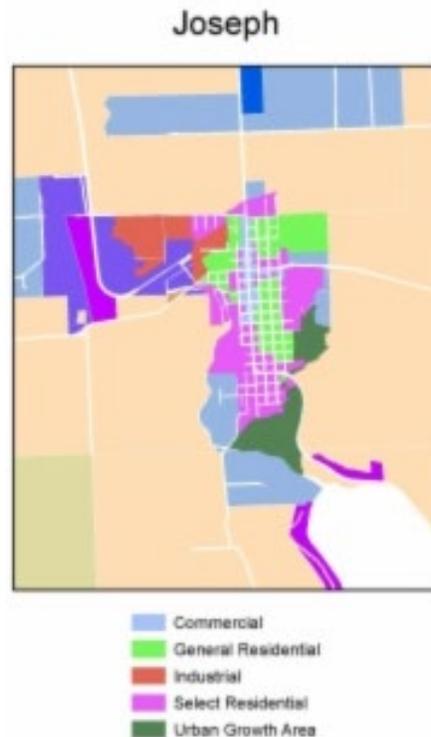
Source: City of Enterprise website consulted May 2022 [Zoning-Map.pdf \(enterpriseoregon.org\)](https://enterpriseoregon.org/Zoning-Map.pdf).

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.

Figure 15. 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.

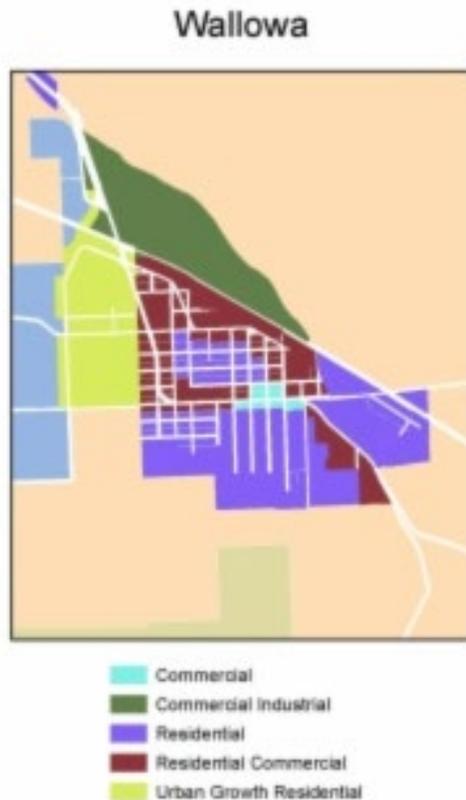
The City of Wallowa was platted in 1889 and incorporated in 1899. A new school was built in 1899 to serve 300 students from grades 1 through 8. Leonard Couch opened the Wallowa Academy to provide high school classes in business, normal and academic. C.T. McDaniel and Leonard Couch started printing a 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.⁵⁴

Figure 16. City of Wallowa Zoning Map



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

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.^{55 56}

⁵⁴ City of Wallowa Website [About - CITY OF WALLOWA, OREGON \(weebly.com\)](#)

⁵⁵ Wikipedia entry [Lostine, Oregon - Wikipedia](#)

⁵⁶ City of Lostine website [ABOUT | City of Lostine](#)

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.

Figure 17. City of Lostine Zoning Map



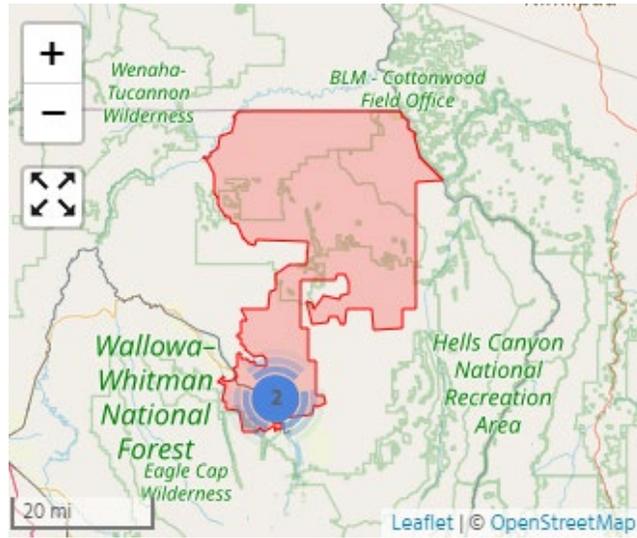
Source: Wallowa County website [Map Images - Wallowa County, Oregon](#)

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.⁵⁷ The school buildings are included in Appendix D.

⁵⁷ [2019-20 Adapted At-A-Glance Profile \(oregon.gov\)](#)

Figure 18. Enterprise School District



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

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.⁵⁸

Figure 19. Joseph School District #6



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

⁵⁸ [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 has secured grant funding and matching school bonds to seismically retrofit the gymnasium, the Cougar Dome.

Figure 20. 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. 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.⁵⁹

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 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%

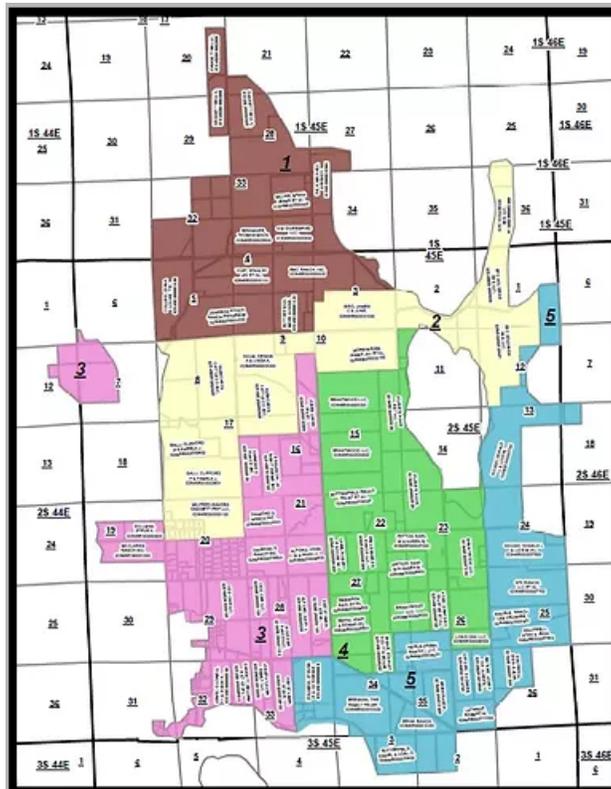
⁵⁹ John Williams, 2015, "The Value of Irrigation Water in the Wallowa Valley, Northeast Oregon"

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.⁶⁰ 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.⁶¹

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.

Figure 21. Wallowa Lake Irrigation District



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

Wallowa Soil and Water Conservation District

The Wallowa Soil and Water Conservation District 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 district

⁶⁰ Citation needed

⁶¹ Personal communication with Joe Dawson, WLID secretary, 10/2021

provides access to NRCS programs to enable landowners and agricultural producers to provide financial and technical assistance to help manage natural resources in a sustainable manner. Through these programs the agency approves contracts to provide financial 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.⁶²

Wallowa Lake County Service District

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.

⁶² Wallowa Soil and Water Conservation District Spring 2021 Newsletter, *Conservation Connection*

Built Environment Profile

Built capacity refers to the built environment and infrastructure that supports the community. The various forms, quantity, and quality of built capital mentioned above contribute significantly to community resilience. Physical infrastructures, including utility and transportation lifelines, are critical during a disaster and are essential for proper functioning and response. The lack or poor condition of infrastructure can negatively affect a community's ability to cope, respond and recover from a natural disaster. Following a disaster, communities may experience isolation from surrounding cities and counties due to infrastructure failure. These conditions force communities to rely on local and immediately available resources.

Settlement Patterns

Balancing proposals for growth with hazard planning considerations is key to building resilient communities. Therefore, understanding where development occurs, and the vulnerabilities of the region's building stock is integral to developing mitigation efforts that move people and property out of harm's way. Eliminating or limiting development in hazard prone areas can reduce exposure to hazards, and potential losses and damages.

Since 1973, Oregon has maintained a strong statewide program for land use planning. The foundation of Oregon's program is the 19 Statewide Land Use Planning Goals that "help communities and citizens plan for, protect and improve the built and natural systems." These goals are achieved through local comprehensive planning. The intent of Goal 7, Areas Subject to Natural Hazards, is to protect people and property from natural hazards.⁶³

Wallowa County, the cities of Enterprise, Joseph, Lostine and Wallowa have acknowledged comprehensive plans and implementing ordinances. Each city in the county also has identified an urban growth boundary intended to identify lands needed to accommodate population and employment growth for a 20-year period.

Most of the residents in the county are located in the Wallowa River valley that runs north from Joseph at the southern end of the valley at the base of Wallowa Lake through the cities of Enterprise, Lostine and Wallowa along State Route 82. At the head of Wallowa Lake, a small community has developed with a focus on tourist trades. A number of residences are also located along the Imnaha River corridor and in the town of Imnaha. The county is characterized by river canyons and high mountains that give way to a wide grassland, the Zumwalt Prairie in the center of the county. These grasslands are generally developed for agricultural production and ranching. The Nature Conservancy works to preserve a portion of the natural ecosystem.

⁶³ Department of Land Conservation and Development, <http://www.oregon.gov/LCD/docs/goals/goal7.pdf>

Housing Stock

In addition to location, the characteristics of the housing stock affect the level of risk posed by natural hazards. Among the types of housing most common throughout the county and of particular interest are mobile homes and other non-permanent housing structures, which account for about 14.7% of the housing in Wallowa County, nearly double the state average (7.9%).⁶⁴ Mobile structures are particularly vulnerable to certain natural hazards, such as windstorms, and special attention should be given to securing the structures, because they are more prone to wind damage than wood-frame construction.

Age of housing is another characteristic that influences a structure’s vulnerability to hazards. Generally, the older the home is, the greater the risk of damage. Structures built after the late 1960’s in the Northwest utilized earthquake resistant designs and construction. Communities began implementing flood elevation ordinances in the 1970’s, with the first FEMA flood insurance study completing in June 1978, and in 1990 Oregon again upgraded seismic standards to include earthquake loading in the building design.

Table 6. Age of Housing Units in Wallowa County

Age of Housing	Number of units	Percent of total
1990 or later	626	24.4%
1980-1989	535	12.7%
1970-1979	623	14.8%
1960-1969	310	7.4%
1959 or earlier	832	40.9%
Total number of housing units	4,215	

Knowing the age of the structure is helpful in targeting outreach regarding retrofitting and insurance for owners of older structures. Based on U.S. Census data, over 63% of the housing in Wallowa County was built prior to 1980 and the implementation of local flood elevation requirements. There is a need to identify if these homes are located in a floodplain, and target outreach to the property owners to encourage appropriate flood mitigation. Roughly 24% of the housing units in Wallowa County were built after 1990 when more stringent building codes were put in place; the remaining 76% of housing stock may have questionable seismic stability. In addition to single-family dwellings, it is also important to consider the structural integrity of multi-unit residences, as these structures will have an amplified impact on the population.

⁶⁴ U.S. Census, American Community Survey, 2019, Table DP04

Critical and Dependent Care Facilities

Critical facilities are those facilities that are essential to government response and recovery activities (e.g., hospitals, police, fire and rescue stations, school districts and higher education institutions). The interruption or destruction of any of these facilities would have a debilitating effect on incident management.

Critical facilities in Wallowa County are identified in Table 7. Lifelines and other physical infrastructure, such as transmission lines, power generation facilities, levees and dams are critical, but they are documented in the utility lifelines subsection for the purposes of this profile. This information provides the basis for informed decisions about the infrastructure and facilities already in place that can be used to reduce regional vulnerability to natural hazards.

During the risk assessment conducted by the Steering Committee the group identified a number of critical facilities with data that came from the 2020 Oregon State NHMP update (Appendices 9.1.8 and 9.1.9). The Steering Committee scrutinized and refined this list to remove duplicates and provide addresses or geographic coordinates for some of these facilities. The raw data including exposure flood, volcanic events, wildfire, and earthquake was provided by the Department of Geology and Mineral Industries (DOGAMI) for the 2020 Oregon State NHMP. There was no exposure to volcanic events based on this analysis, so the category was removed from the table.

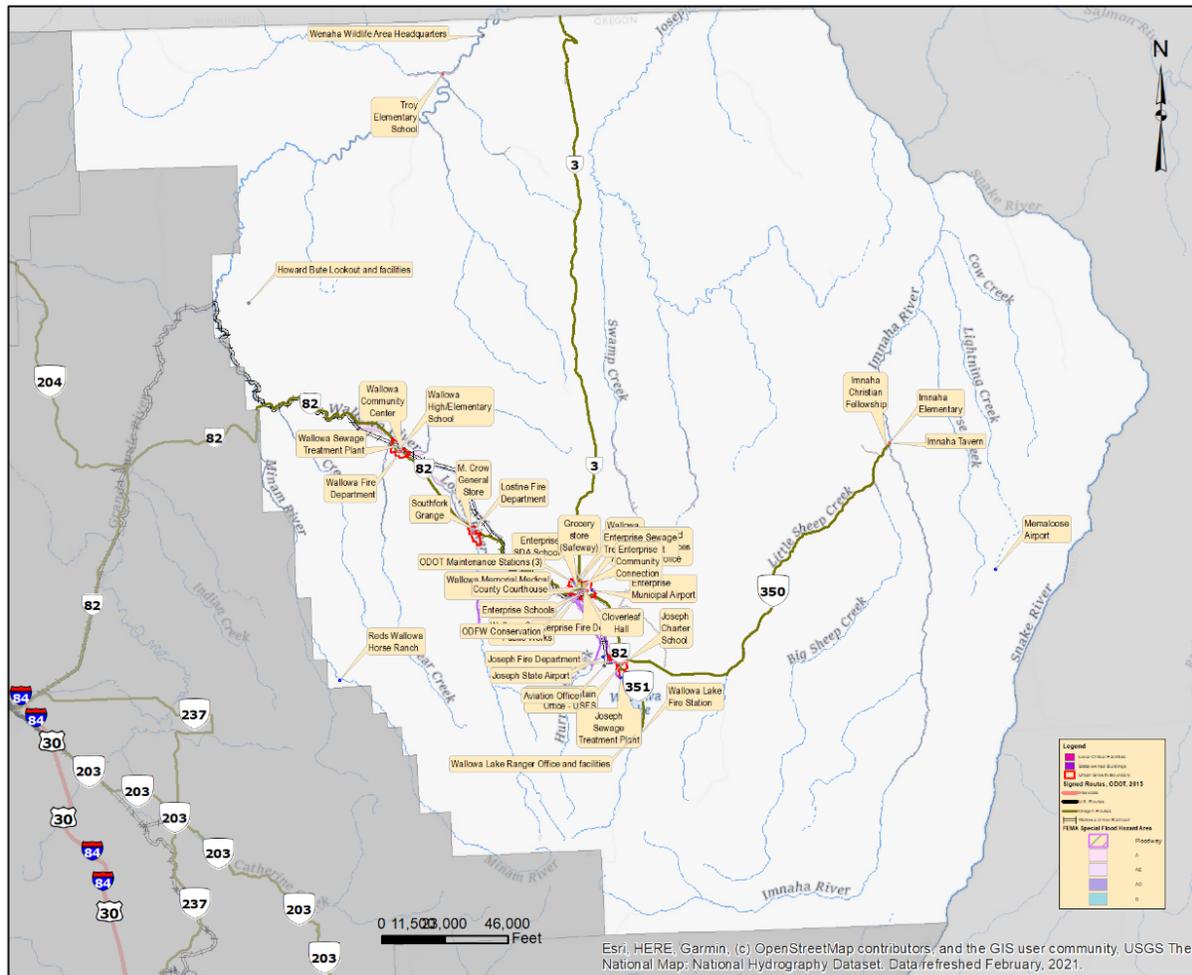
DLCD staff created a GIS layer locating these critical or essential facilities as identified by the steering committee following an evaluation of the raw data from the state plan. The critical facilities identified by the steering committee include hospitals, schools, fire stations, police stations, emergency operations, recreational facilities, and communication facilities. Critical facilities are important to note because these facilities play a crucial role in emergency response efforts. Communities that have critical facilities that can function during and immediately after a natural disaster are more resilient than those with critical facilities that are inoperable after a disaster.

Table 7. Critical Facilities within Wallowa County

Facility Name or Use	City	Total Building Value	Square Feet	Flood Hazard - FEMA SFHA 1% Annual Chance	Wildfire Hazard	Landslide Hazard	Earthquake Hazard
Cloverleaf Hall	Enterprise						
Grocery store in Enterprise (Safeway)	Enterprise						
Enterprise Community Connections	Enterprise						
Wallowa Resources	Enterprise						
Imnaha Christian Fellowship	near Imnaha						
Imnaha Store and Tavern	Imnaha						
Wallowa Senior Center	Wallowa						
Southfork Grange	Lostine						
M Crow General Store	Lostine						
Wallowa Memorial Hospital	Enterprise	\$6,732,750	44,885		Low	Low	High
Joseph State Airport	Joseph	\$750,000	5,000		High	Low	High
Office, Joseph Mobile	Joseph	\$53,471	2,060		Low	Low	High
Enterprise Municipal Airport	Enterprise	\$1,053,300	7,022		Low	Low	Low
Reds Wallowa Horse Ranch		\$750,000	5,000		High	Low	High
Memaloose Airport	near Imnaha	\$750,000	5,000		High	Low	Low
Enterprise Fire Department	Enterprise	\$1,419,000	9,460		Low	Low	High
Joseph Fire Department	Joseph	\$724,650	4,831		Low	Low	High
Wallowa Lake Fire Station	Wallowa Lake area	\$548,100	3,654		High	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
Oregon State Police - Enterprise	Enterprise	\$471,450	2,378		Moderate	Low	High
Wallowa County Sheriff's Dept	Enterprise	\$1,013,700	6,758		Low	Low	High
Enterprise Police Department	Enterprise	\$1,013,700	6,758		Low	Low	High
Wallowa County Emergency Services	Enterprise	\$1,013,700	6,758		Low	Low	High
Wallowa County Courthouse	Enterprise						
Enterprise Schools - Main School Bldg	Enterprise	\$9,217,493	44,988		Low	Moderate	Moderate
Enterprise SDA School	Enterprise	\$400,650	2,671		Moderate	Low	High
Joseph Charter School	Joseph	\$8,479,650	56,531		Low	Low	Moderate
Wallowa High/Elementary School	Wallowa	\$2,702,250	18,015		Low	Low	High
Imnaha Elementary	Imnaha	\$581,100	3,874		High	Moderate	Low
Troy Elementary	Troy	\$396,600	2,644	Exposed	High	Low	Low
Wallowa County Public Works	Enterprise	\$1,242,150	8,281		Low	Low	High
Enterprise Maintenance Station Grounds	Enterprise	\$684,927	3,855		Low	Low	High
Enterprise Maintenance Station Grounds	Enterprise	\$1,053,636	6,080		Low	Low	High
Enterprise Sewage Treatment Plant	Enterprise	\$538,800	3,592		Low	Low	Low
Joseph Sewage Treatment Plant	Joseph	\$249,000	1,660		Low	High	Moderate
Wallowa Sewage Treatment Plant	Wallowa	\$161,700	1,078		Moderate	Moderate	High
ODOT Maintenance Station - three buildings	Enterprise	\$1,138,978	6,595		Low	Low	High
Wallowa Mountain Office - USFS	Joseph						
Howard Butte Facilities and Lookout (value, square footage and hazards were combined)	Minam	\$256,294	180		High	Low	Moderate
OPRD Wallowa Lake facilities - Ranger Office (value, square footage and hazards were combined)	Joseph	\$5,397,465	19,269	Exposed (some structures)	High	Low	High
ODFW Hatchery Building & Cold Storage	Enterprise	\$132,836	11,132		Moderate	Low	High
ODFW Wenaha Wildlife Area facilities HQ (value, square footage and hazards were combined)	north of Troy	\$553,272	21,245		High	Moderate	Low

Source: Wallowa County Natural Hazard Risk Assessment, Steering Committee work product

Figure 22. Wallowa County Local and State-owned Critical Facilities



Other facilities not listed above, but which are relevant to planning for natural disaster resilience include Dependent Care Facilities and Correctional Facilities.

Dependent Care Facilities

In addition to the critical facilities mentioned above in Table 7, there are other facilities that are vital to the continued delivery of health services and may significantly impact the public’s ability to recover from emergencies. Assisted living centers, nursing homes, residential mental health facilities, and psychiatric hospitals are important to identify within the community because of the dependent nature of the residents; and also these facilities can serve as secondary medical facilities as they are equipped with nurses, medical supplies and beds.

In Wallowa County the institutionalized population consists of 76 people housed at a skilled nursing facility. The noninstitutionalized group quarters in Wallowa County consists of an adult residential treatment center housing 20 people, a worker's group living quarters or Job Corps center housing 5 people and a group home that houses 4 people.⁶⁵

Correctional Facilities

Correctional facilities are incorporated into the Built Environment Profile as the incarcerated population must also be taken into consideration during a natural hazard event. There is a holding facility at the Wallowa County Justice Center, however there are no state correctional facilities located in Wallowa County.

Cultural and Historic Resources

Historic Resources

The Oregon Historic Sites Database lists a number of structures, historic districts and sites in Wallowa County, some of which are also listed on the National Register. Among those that may be impacted by natural hazards include buildings in Enterprise that date from the early 1900's including the Gotter Hotel, the OK Theatre and the Wallowa County Courthouse.

Both the site of Old Chief Joseph's original burial and the reburial site at the base of Wallowa Lake sit in locations subject to flooding. When Old Joseph died in 1871, he had a traditional burial at the forks of the Lostine and Wallowa rivers.⁶⁶ The Wallowa band were famously forced off the land in the Nez Perce War in 1877.⁶⁷ In 1886, Old Chief Joseph's grave was desecrated by local property owners and his skull was removed as a souvenir.⁶⁸ In 1926, his grave was moved, with permission from the Nez Perce, to this location, and the stone marker was placed.

Libraries and Museums

Libraries and museums develop cultural capacity and community connectivity as they are places of knowledge and recognition, they are common spaces for the community to gather, and can serve critical functions in maintaining the sense of community during a disaster. They are recognized as safe places and reflect normalcy in times of distress. There are three libraries operating in Wallowa County, one in each of the cities of Enterprise, Wallowa and Joseph. The Wallowa County library closed in 2018 due to lack of funding. There are approximately four museums in Wallowa County. The City of Wallowa houses the Wallowa Band Nez Perce Trail Interpretive Center and the Wallowa History Center. The Sunrise Iron Museum and the David Manuel Museum are located in Enterprise. The Wallowa County

⁶⁵ U.S. Census, American Community Survey, 2019

⁶⁶ National Park Service, <https://www.nps.gov/nepe/planyourvisit/visit-old-chief-joseph-gravesite.htm>

⁶⁷ National Register of Historic Places Registration Form
https://npgallery.nps.gov/NRHP/GetAsset/NHLS/89001082_text

⁶⁸ National Park Service <https://www.nps.gov/nepe/planyourvisit/visit-old-chief-joseph-gravesite.htm>

Museum, Wallowalogy and the Maxville Heritage Interpretive Center can be found in Joseph.

Cultural Events

Other such events and institutions that can strengthen community connectivity are festivals and organizations that engage diverse cultural interests. Examples of events and institutions include Tamkaliks (a Nez Perce event in the City of Wallowa), Chief Joseph Days, the Wallowa County Fair, Hells Canyon Mule Days, the 4th of July Celebrations, Eagle Cap Extreme Dog Sled Races, Oregon Mountain Cruise (a classic car event), Mountain High Bronc and Bulls.⁶⁹ Not only do these events bring revenue into the community, they have potential to improve cultural cohesion and enhance the sense of place citizens feel for their communities. Cultural connectivity is important to community resilience.

Physical Infrastructure

Physical infrastructure such as dams, levees, roads, bridges, railways and airports support Wallowa County communities and economies. Due to the fundamental role that physical infrastructure plays both in pre and post-disaster, they deserve special attention in the context of creating resilient communities.

Dams

Dams are regulated by the Oregon Water Resources Department (OWRD). Oregon's statutory size threshold for dams to be regulated by OWRD is at least 10 feet high and storing at least 3 million gallons. Many dams that fall below this threshold have water right permits for storage from OWRD.

Under normal loading conditions dams are generally at very low risk of failure. Specific events are associated with most dam failures. Events that might cause dams to fail include:

- An extreme flood that exceeds spillway capacity and causes an earthen dam to fail;
- Extended high-water levels in a dam that has no protection against internal erosion;
- Movement of the dam in an earthquake; and
- A large rapidly moving landslide impacting the dam or reservoir.

Most of the largest dams, especially those owned or regulated by the Federal Government are designed to safely withstand these events and have been analyzed to show that they will. However, there are a number of dams where observations, and sometimes analysis indicates a deficiency that may make those dams susceptible to one or more of the events.

Oregon follows national guidance for assigning hazard ratings to dams and for the contents of Emergency Action Plans, which are now required for all dams rated as "high hazard." Each dam is rated

⁶⁹ Custom and Culture of Wallowa County, Oregon, 2009, Wallowa County Natural Resource Advisory Committee provided by staff, Katy Nesbitt

according to the anticipated impacts of its potential failure. The state has adopted these definitions (ORS 540.443–491) for state-regulated dams:

- “High Hazard” means loss of life is expected if the dam fails.
- “Significant Hazard” means loss of life is not expected if the dam fails, but extensive damage to property or public infrastructure is.

Dam failures can occur rapidly and with little warning. Fortunately, most failures result in minor damage and pose little to no risk to life or safety. However, the potential for severe damage still exists. The Oregon Water Resources Department has inventoried all dams located in Oregon. There are two high hazard dams in Wallowa County, including the Hells Canyon Dam, last inspected in October 2008; and the Wallowa Lake Dam, last inspected in August 2020. Four other low hazard dams are located in the county at Kinney Lake, Lostine Reservoir, Promise Reservoir and the Wallowa Salmon Pond 1.⁷⁰

Hells Canyon Dam is the single federally regulated dam located in Wallowa County and it is designated as a high hazard dam. The Hells Canyon Dam was constructed in 1967 and forms part of the Hells Canyon Complex, a system that generates 30% of the power sold by Idaho Power. The power is principally sold to Idaho Power’s 570,000 customers in service areas located outside of Wallowa County (Eastern Oregon and Southeastern Idaho). This dam is permitted to generate 450 MW of electricity and forms the third dam on the Snake River that generates power for Idaho Power.

The company’s original license to operate the three-dam complex expired in 2005. Since prior to that date, the company has been in the process of seeking a new license from the Federal Energy Regulatory Commission and has been operating on temporary licenses issued on a year-to-year basis.

Idaho Power is seeking a new 50-year license for the dams that were built between 1958 and 1967. When they were built, the dams lacked adequate fish passage and wiped out 80 percent of the spawning habitat for Snake River fall chinook and eliminated other salmon and steelhead runs from reaches above the projects. To compensate, the power company agreed to fund salmon and steelhead hatchery programs downstream of the dams. The Nez Perce Tribe and two environmental groups challenged Oregon’s water quality certification of the dams for what they say is a failure to provide fish passage and adequately ensure water quality standards for temperature and mercury will be met.

The second is the Wallowa Lake dam. The Wallowa Lake Dam was constructed in 1917. This dam was designated as a significant hazard and a breach would put at risk 1,335 people. Funds to replace the dam with one built to modern standards that includes fish passage have been allocated by the State of Oregon, but the process of dismantling it and constructing a new dam has not yet begun at this writing.

Utility Lifelines

Utility lifelines are the resources that the public relies on daily, (i.e., electricity, fuel and community lines). If these lines fail or are disrupted, the essential functions of the community can be severely impaired. Utility lifelines are closely related to physical infrastructure (i.e. dams, and power plants) as they transmit power generated from these facilities. Electricity lines in the Northeast Region are often vulnerable to severe weather patterns, such as winter storms and windstorms.

⁷⁰ Oregon Water Resources Department Dam Inventory query March 2021

The Northeast Region is an important throughway for oil and gas pipelines and electricity transmission lines, connecting Oregon to Idaho and Washington; however, no gas or hazardous material pipelines run through Wallowa County.

The infrastructure associated with power generation and transmission plays a critical role in supporting the regional economy.

The primary electric company in Wallowa County is Pacific Power and Light. A substation for Pacific Power and Light is located in the City of Wallowa and is a critical piece of infrastructure for the city and serves the other Wallowa Valley cities.

Pacific Power serves Wallowa County, portions of Portland and other customers located in southern Oregon and northern California. The company website indicates that the company owns 10,880 megawatts of generation capacity from a diverse mix of hydro, wind, natural gas, coal, solar and geothermal resources.

Among the micro-hydro projects run by the company is the Wallowa Falls hydro project. Pacific Power, Wallowa Resources Community Solutions Inc., and Wallowa Lake State Park, who together with Energy Trust of Oregon, have helped bring the project to the park.

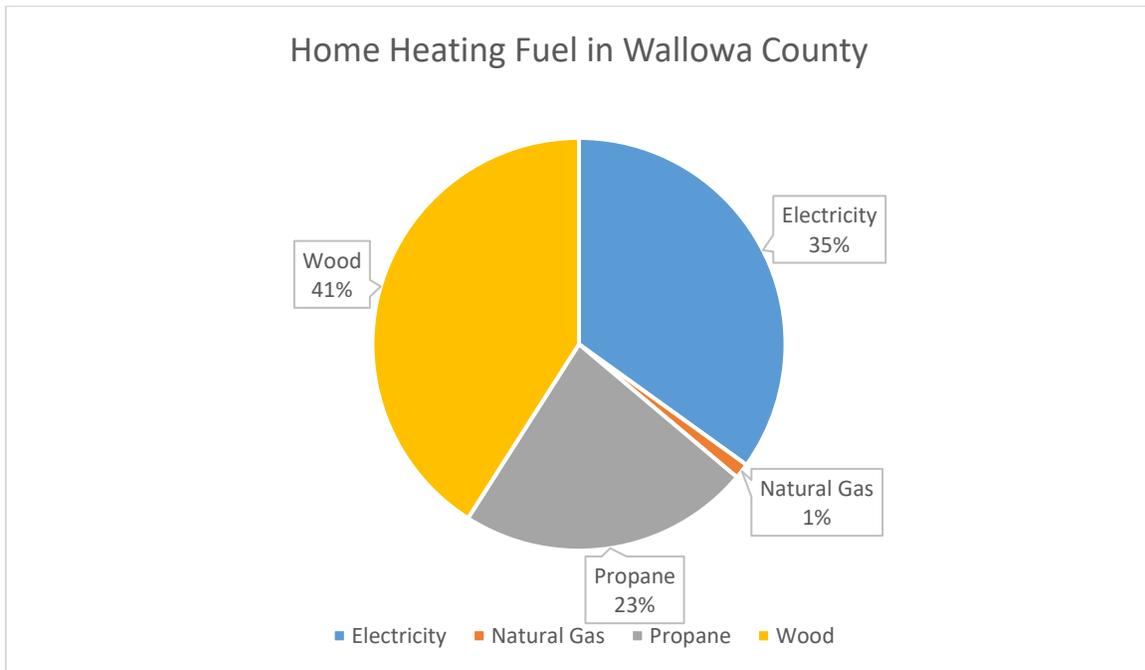
The dam was recently relicensed for the next 40 years, while also requiring additional protections for bull trout in the Wallowa River. The facility consists of a dam on the Wallowa River's east fork that diverts water to a small powerhouse with a single 1.1-megawatt generator capable of producing enough electricity for about 500 homes. Pacific Power has run the system since 1942 when it acquired the original operating license from Inland Power and Light.

The Wallowa Chieftain updated its reporting on December 13, 2018 to state that as part of the relicensing agreement issued by the Federal Energy Regulatory Commission (FERC) with Pacific Power the company will invest \$3 million over the next three years to improve stream flow and habitat for bull trout. The species is now listed as threatened in Oregon under the Endangered Species Act. Most of the work will involve leaving more water in stream for fish and blocking passage into areas where bull trout may be vulnerable.⁷¹

Although about 35% of Wallowa County residents use electricity to heat their homes, wood is the fuel used most commonly by 41% of households in Wallowa County with 24% of households using propane or natural gas for heating their homes. The high prevalence of wood as a heating fuel may contribute to the condition of air quality. This factor in combination with concerns about wildfire smoke as a natural hazard may help the county identify mitigation actions to improve air quality.

⁷¹ [Pacific Power relicensed to run Wallowa County hydro project | Local News | wallowa.com](#)

Figure 23. Home Heating Fuel Use in Wallowa County.



Source: Oregon Department of Energy, 2020 Biennial Energy Report.

Rail Ways

Railroads are major providers of regional and national cargo and trade flows. Railroads that run through the Northeast Region provide vital transportation links from the Pacific to the rest of the country. The Union Pacific Railroad (UP) is the major railroad in the region; however no freight rail service comes to Wallowa County.

The Wallowa Union Railroad line extends from Joseph to Minam paralleling State Highway 82 and then into Union County by along the Minam River and then south through Elgin and to the city of La Grande. Only portions of this line are utilized. The Wallowa Union Railroad operates peddle railcars that tourist and visitors rent and peddle along portions of the line.

Airports

Wallowa County has two small state or municipally run airports in Enterprise and Joseph. The State of Oregon maintains a State Airport west of the City of Joseph, Oregon, capable of handling small aircraft under 12,500 pounds. The City of Enterprise also maintains an airport facility within the eastern side of the city limits. The runway length is 2,850' and is fully lighted. Several operators are listed on the airport's website with services including hangar space and tie down kits as well as scenic flights. Both sites are uncontrolled airports, and aviation fuel is available at both.

The Critical Facilities Lists shown in Table 7 and Figure 14 two other smaller airports that were identified as critical by the NHMP Steering Committee. The US Forest Service maintains Memaloose Airport

located 10 miles southeast of Minam and Red’s Wallowa Horse Ranch in the Eagle Cap Wilderness. Another private air field that is important to the area is located at the Bar B Ranch NW of Wallowa.

Flights face the potential for closure from several natural hazards that are common in the Wallowa County, including windstorms and winter storms. Airports have strict guidelines regarding when conditions are safe for flight.

Roads and Bridges

There are two major highways that run through the Northeast Region. I-84 is a major transportation corridor that connects Portland with eastern Oregon and beyond. State Highway 82 connects Wallowa County with I-84.

Highways are also heavily utilized by local traffic. According to the 2009 American Community Survey, 71% of workers in the Wallowa County commute by driving alone. The average commute for workers in the Northeast Region is just over sixteen minutes each way, but more than 40% of commuters travel 10 minutes or less each way to work in Wallowa County. ⁷² In 2019, only 3.7% of employees living in Wallowa County worked outside of the county. A severe winter storm has the potential to disrupt the daily driving routine of thousands of people.

The 2014 NHMP noted a slight decrease of automobiles on the roads in general. The COVID-19 pandemic has influenced driving patterns as more employees have become able to work from home.

A large increase of automobiles can place stress on roads, bridges, and infrastructure within the cities, and also in rural areas where there are fewer transit roads. Natural hazards can disrupt automobile traffic and shut down local transit systems across the area or region and make evacuations difficult.

Wallowa County is particularly vulnerable as there is limited roadway access to the county.

The City of Enterprise is located 62 miles east of La Grande, Oregon, on State Highway 82. Oregon State Highway 3 links the County to the Clarkston, Washington–Lewiston, Idaho area. A third seasonal route consists of 10 miles of county road (Wallowa Mountain Loop Road) and Forest Service Road, NF 39 that links the County to Halfway, Oregon and State Highway 86. The road is not maintained year-round requires high clearance to travel.

State Highway 82 is a highway of statewide significance that connects Enterprise with the City of Joseph to the southeast, and with the cities of Lostine and Wallowa to the northwest. Highway 82 extends east-west then north-south through the center of Enterprise along River Street and North Street. River and North Streets are two-lane roadways and are part of the City of Enterprise’s grid system. Outside of the urbanized area, Highway 82 is a two-lane roadway with a speed limit of 55. West of Wallowa County, Highway 82 connects with Interstate 84 in the City of La Grande.

State Highway 3 known as the Enterprise-Lewiston Highway is a highway of district significance, connecting Enterprise with the Wallowa-Whitman National Forest. From there, it continues north to the Washington state line, where it becomes Washington State Highway 129 and connects to the Lewiston, Idaho area. State Highway 3 originates in the City of Enterprise as NW 1st Street. It is a two-lane

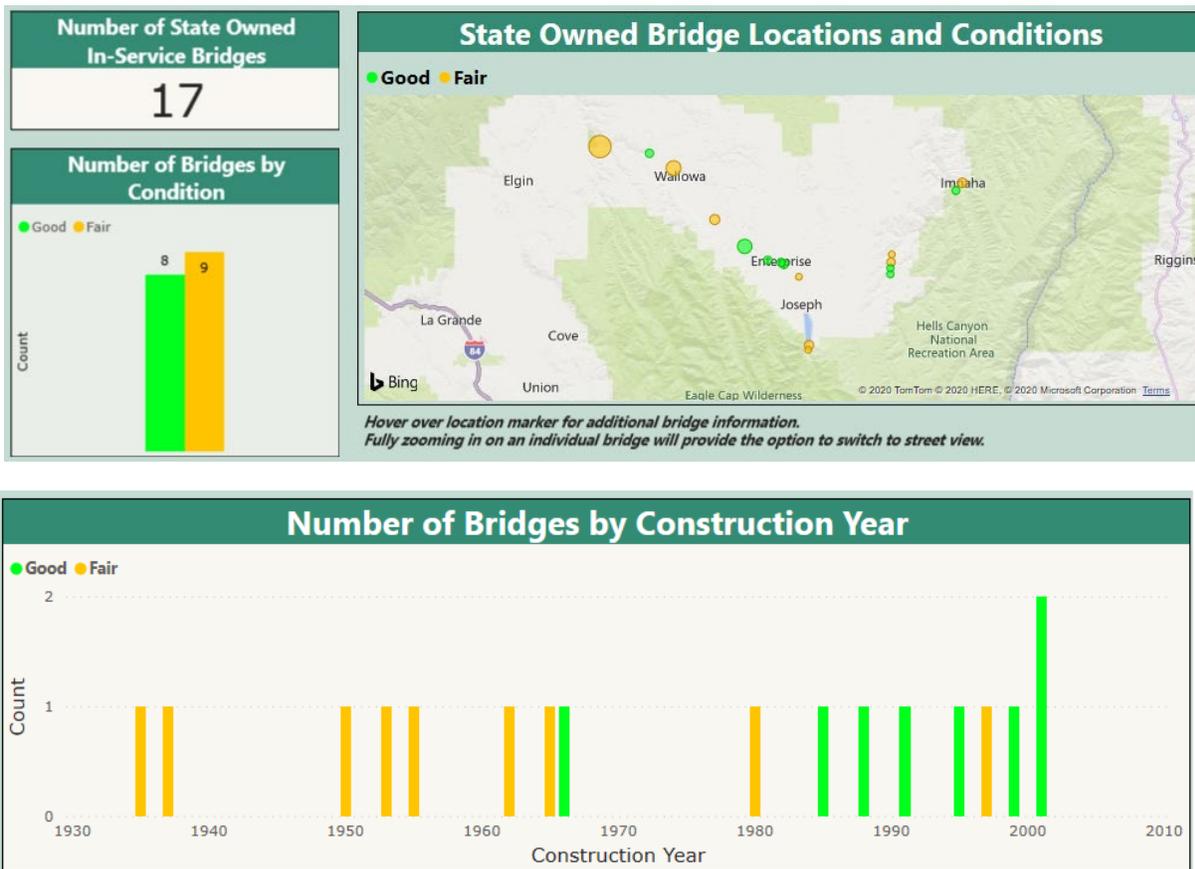
⁷² U.S. Census, American Community Survey, Table S0801, 2019

roadway with on street parking south of North Street and it is part of the city’s grid system. North of the urbanized area, Highway 3 is a two-lane roadway with a speed limit of 55 mph.

The existing condition of bridges in the region is also a factor that affects risk from natural hazards. Bridge failure can have immediate and long-term implications in the response and recovery of a community. Incapacitated bridges can disrupt traffic and exacerbate economic losses due to the inability to transport products and services in and out of the area.

The Oregon Department of Transportation (ODOT) inventories and assesses the condition of bridges in Oregon. According to the 2019 Interactive Bridge Condition Report provided by ODOT, all bridges are in Good or Fair Condition. No bridges in Wallowa County are in Poor Condition (Figure 14).

Figure 24. Report on Wallowa County bridge conditions from Oregon Department of Transportation



In addition to the state highways, a network of county roads runs throughout the study area. County roads serve many purposes. They provide access to residences in rural areas around the incorporated cities. They also serve other smaller rural communities. County roads often connect to agricultural areas, recreational areas, and national forests.

Access to public lands is a key feature of travel management in Wallowa County. Access to these lands relates to the historical context for fishing and hunting both indigenous rights to these natural resources and current land conservation and development values. The Wallowa County Board of Commissioners included its open road and trail assessment and other road elements into the Wallowa County Land Use

Plan and the Wallowa County/Nez Perce Tribe Salmon Habitat Recovery Plan, the county's natural resource management plan in 2009. Noting that road and trail access within a watershed context is needed to accomplish present and future management activities (recreation, grazing, timber harvest, fire control), as well as the public need for access.⁷³

Public Transportation

Community Connections of Northeast Oregon runs both a Dial-a-Ride program and a fixed route bus route between Joseph and La Grande that connects the communities along State Highway 82 three days a week. Community Connections also runs a summer shuttle from Joseph to the southern end of Wallowa Lake approximately ten times a day during the summer months. The Dial-a-Ride service is available to all and free of charge, however it is a reservation-based system that principally serves the cities of Enterprise, Joseph and Wallowa.

Communications

Cellular, Internet and Phone services

Coverage maps provided by four major cellular service providers show service to some extent in Wallowa County by Verizon Wireless, AT&T, Sprint/T-Mobile and US Cellular.⁷⁴

According to the Wallowa Chamber of Commerce Relocation page, the primary internet providers in Wallowa County are Frontier, EONI (Eastern Oregon Net, Inc.) and Wallowa Valley Networks.⁷⁵ The Chamber of Commerce also reports that Frontier is the primary landline phone service provider in Wallowa County.

Water and Wastewater Systems

City of Enterprise

Wastewater System

The City of Enterprise wastewater system serves a population of 2,033 residents. The wastewater collection and treatment system operates under authority of a National Pollutant Discharge Elimination System (NPDES) Permit issued by the Oregon Department of Environmental Quality (DEQ). The NPDES permit authorizes the City of Enterprise to construct, modify, and operate the facilities and discharge of treated effluent year-round into the Wallowa River. In 2011 the City of Enterprise completed major

⁷³ Wallowa County Board of Commissioners, Travel Management Plan, Final DEIS, August 2009.

⁷⁴ <https://www.wirefly.com/content/phone-plans/oregon/baker-city>

⁷⁵ www.wallowacountychamber.com/relocation-info

improvements to the wastewater system including repairs to the collection system and new treatment plant to bring the system into compliance with water quality and public health standards for DEQ and the NDPDS permit. The project cost was \$5,500,000.^{76 77}

Drinking Water

City of Enterprise 2019 Annual Drinking Water Report: The City of Enterprise's water system draws from two separate aquifers, a confined layered volcanic (basalt) aquifer of the Columbia River Basalts that supplies the Well and from an unconfined alluvial aquifer that supplies the springs. A 2017 microscopic particulate analysis performed on both spring's sources to determine if the groundwater was under the direct influence of surface water. The test showed that both spring sources are at low risk of surface water contamination.⁷⁸

City of Joseph

Wastewater

The Oregon Department of Environmental Quality is in the process of working with the city to reissue the NPDES permit that allows the city to discharge secondary treated municipal wastewater to Prairie Creek. The city collection system consists of approximately 8 miles of gravity mains and lateral lines. The city constructed the system in 1967. In 1989 the Wallowa Lake County Sewer District (WLCSD) completed construction. So doing connected residential and commercial structures along the west and south sides of Wallowa Lake to the city sewer. Concurrently, the city upgraded its wastewater facilities to accommodate the added load. WLCSD (now the Wallowa Lake County Service District after having added electric service for customers) consists of a septic tank effluent pumped (STEP) system with a lift station that discharges into the south end of the city sewer system.⁷⁹

The Oregon Department of Environmental Quality proposed to renew the city's NPDES permit in 2018 and identified a number of revisions that would be needed to address maintenance concerns and complaints that resulted in penalties being assessed.⁸⁰

Drinking Water

The City of Joseph utilizes both a surface water source, Wallowa Lake, and a groundwater source. The diversion from the Wallowa River is treated through slow sand filtration and gaseous chlorination and provided 461 acre feet of drinking water⁸¹ to 574 residential users and 68 other users⁸² in the city.

⁷⁶ Enterprise Wastewater Rate Study, 2012

⁷⁷ Personal Communication, Lacey McQuead, Enterprise City Administrator, September 2021

⁷⁸ City of Enterprise 2019 Annual Drinking Water Report

⁷⁹ [OJOF12KX1BV.PDF \(synergydcs.com\)](#)

⁸⁰ Ibid.

⁸¹ [CITY OF JOSEPH \(state.or.us\)](#)

⁸² [00414_2021.pdf \(oregon.gov\)](#)

City of Wallowa

Wastewater

The City of Wallowa discharges municipal wastewater from its treatment plant to the Wallowa River. Typical permit requirements for biological oxygen demand and total suspended solids are conditions of the permit.⁸³

Drinking Water

The City of Wallowa utilizes groundwater from two wells which combined provided 275 acre feet of drinking water to the city during 2021.⁸⁴ The city has recently completed and received approval from the Oregon Water Resources Department in June 2021 for a Water Management and Conservation Plan.

City of Lostine

Wastewater

The City of Lostine residents utilize individual septic systems for wastewater renovation.

Drinking Water

The City of Lostine utilizes water from springs located west of the city. A portion of the city's water rights were transferred from that surface water right to a point of appropriation in 2012 for a new well constructed within the city and predominantly used during the summer months.^{85 86}

⁸³

⁸⁴ [Permit: G 16912 * \(state.or.us\)](#)

⁸⁵ [Cert:60987 OR * \(state.or.us\)](#)

⁸⁶ [LOSTINE CITY WELL 1 \(state.or.us\)](#)

Appendix B: Planning and Public Process

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Planning and Public Process

Purpose

This Appendix describes the process of updating the plan, how the plan was prepared, who was involved, and specific changes made to the *2014 Northeast Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan (2014 NHMP)*, a plan that included Grant, Baker, Union and Wallowa Counties) during the plan update process to develop the *Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan*.

Background

The Disaster Mitigation Act of 2000 requires communities to update their mitigation plans every five years to remain eligible for pre-disaster Building Resilient Infrastructure and Communities (BRIC) program funding, Flood Mitigation Assistance (FMA) program funding, and Hazard Grant Mitigation Program (HMGP) funding. Wallowa County and the City of Enterprise were participants in the *2014 NHMP* that expired during the update process. In 2019 the Department of Land Conservation and Development was awarded an HMGP grant by FEMA to assist Wallowa County with its NHMP update. Wallowa County partnered with the Oregon Department of Land Conservation and Development (DLCD) staff to update the *NHMP* producing this document, the *Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan*.

DLCD staff worked with Wallowa County's Planning Director, to form the Wallowa County NHMP Steering Committee (the Steering Committee) intended to represent the whole community. The Steering Committee included representatives from the county, the four incorporated cities, three school districts, an irrigation district, a sewer and water district, a private non-profit active in the county and the Oregon Department of Forestry Unit Forester. Although the potentially interested tribal nations¹ were contacted and invited to join the process, none were able to participate directly.

The DLCD Natural Hazards Planner, Katherine Daniel, managed the project and met with members of the Steering Committee ten times and conducted individual phone conversations and email conversation to guide Steering Committee work on the plan update. Unlike the update process for Grant and Baker Counties, FEMA did not concurrently conduct a Risk MAP process in Wallowa County during the update process. A multi-hazard risk analysis was performed by the Oregon Department of Geology and Mineral Industries and an analysis of the potential future climate impacts to natural hazards was performed by the Oregon Climate Change Research Institute. Both of these were included in this NHMP update.

The Steering Committee included regular participation from jurisdictions and special districts that will become plan holders. These include Wallowa County, the cities of Enterprise, Joseph, Wallowa and Lostine, Enterprise School District #21, Joseph School District #6 and Wallowa School District #12,

¹ The Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of Warm Springs were invited to participate in the process. The Water Resources Department Director for the Nez Perce Tribe and Natural Resource Manager for the Confederated Tribes of Warm Springs Tribe responded by email or were reached by phone. Review was requested upon completion of the NHMP update.

Wallowa Lake County Service District, Wallowa Lake Irrigation District and the Wallowa Soil and Water Conservation District.

The Convener and Project Manager reached out to neighboring communities, regional, state and federal agencies and community organizations to join the process as interested parties/stakeholders. The Steering Committee included representatives from the Oregon Department of Forestry and from the private non-profit, Wallowa Resources. A list of the Steering Committee members and other participants is on page B-4.

Public Participation Process

Wallowa County is dedicated to directly involving the public in the review and update of the natural hazard mitigation plan. Although members of the Wallowa County NHMP Steering Committee represent the public to some extent, the residents of Wallowa County were notified about opportunities to provide feedback about the NHMP through personal communication by representatives on the Steering Committee, through information published in newsletters, flyers sent to constituents, through public notices for Steering Committee meetings, and through the webpage dedicated to the NHMP updated located on the Wallowa County Land Use Planning Department webpage. The Steering Committee members and their board members participated in two online surveys that provided short answers to questions about how natural hazards impacts the community.

As described in Volume I: Plan Implementation and Maintenance, the NHMP will undergo formal review once per year in coordination with the requirements of the Emergency Management Program Grant utilized by the county to support its emergency management services.

The Wallowa County Planning Director posted notification of steering committee meetings in the Wallowa County Courthouse, on the department webpage and by publication in the Wallowa County Chieftain. Three flyers were developed by the Project Manager and distributed to all Steering Committee members for use in outreach to their constituents. These flyers were used by the Wallowa Soil and Water Conservation District and the Wallow Lake County Service District to add information to a newsletter and included with bill mailings to about 280 rate payers. Participation by the public and feedback on the NHMP update was solicited by all Steering Committee members when they reported to their commissions and boards about progress on the NHMP update.

During the drafting process the Planning Director, Franz Goebel, made the draft *Wallowa County NHMP* available via their websites prior to final submission to FEMA Region X and Office of Emergency Management reviewers.

Public Involvement Summary

Keeping in mind the importance of representing the whole community, the Wallowa County NHMP Steering Committee was assembled by Franz Goebel, Wallowa County Planning Directors and Katherine Daniel, DLCD Natural Hazards Planner. A broad range of jurisdictions and agencies were solicited for potential participation. Opportunity to participate as a member of the steering committee was extended to representatives of the county planning, natural resource and emergency management

departments, all the incorporated cities in the county, local and regional agencies involved in hazard mitigation and agencies that have the authority to regulate development. Emails soliciting participation were sent to special districts that serve educational institutions, irrigators, sewer and water users, and conservation interests. Invitations to participate were also extended to state and federal agencies, local non-profits, tribal nations and involved citizen leaders.

During the plan drafting process the public was directly involved through a survey and notice of NHMP meetings. The public was involved indirectly during the plan drafting phase through the representation of community based organizations on the steering committee.

The members of the Steering Committee volunteered their time to provided edits and updates to the NHMP during publicly advertised meetings and on an individual basis such comments being vetted in a public forum before inclusion in the document. Opportunities for the public to comment were provided at each meeting and through the Wallowa County Land Use Planning Department webpage.

Wallowa County NHMP Update Steering Committee Members:

These representatives served as Steering Committee members for the Wallowa County Natural Hazards Mitigation Plan update process. Franz Goebel, Wallowa County Planning Director was the convener of the Steering Committee. Some representatives served successively as staff turnover required.

Wallowa County

Franz Goebel	Planning Director and Convener
Paul Karvoski	Emergency Manager
Katy Nesbitt	Natural Resources

Tom Crane	Superintendent
Mandy Decker	School Board Chair
Erica Pinkerton	Superintendent

City of Enterprise

Lacey McQuead	City Administrator
Christie Huston	Planning Assistant

Joseph School District #6

Lance Homan	Superintendent
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City of Joseph

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

Wallowa School District #12

Tamera Jones	Superintendent
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Wallowa Soil and Water Conservation District

Cynthia Warnock	District Manager
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City of Lostine

Toni M. Clary	City Recorder
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Wallowa Irrigation District

Dan Butterfield	President
Joe Dawson	Secretary

City Of Wallowa

Scott McCrae	City Council Member
Christian Niece	City Council Member

Wallowa Lake County Service District

Dave Riley	Assistant Manager
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Enterprise School District #21

Oregon Department of Forestry

Matt Howard Unit Forester, Wallowa

Wallowa Resources

Nils Christoffersen Executive Director

**Oregon Department of Land
Conservation & Development Project
Manager**

Katherine Daniel Natural Hazards Planner

The following pages include copies of meeting agendas and approved minutes from NHMP Steering Committee meetings, website screenshots, flyers, and other information that demonstrate the outreach efforts made during this NHMP update process.

Summary of Meetings and Outreach

Table 1. Wallowa County NHMP Meetings, Outreach Materials and Approval Benchmarks

Date	Description of Event/Activity
October 12, 2020	Steering Committee Meeting #1
November 2020 – February 2021	Survey #1
January 2021	Survey #2
February 22, 2021	Steering Committee Meeting #2
March 29, 2021	Steering Committee Meeting #3
April 26, 2021	Steering Committee Meeting #4
May 5, 2021	Distributed Flyer #1
May 24, 2021	Steering Committee Meeting #5
Spring 2021	Wallowa Soil and Water Conservation District newsletter blurb
June 28, 2021	Steering Committee Meeting #6
July 7, 2021	Distributed Flyer #2
July 29, 2021	Small group meeting with Steering Committee members
August 23, 2021	Distributed Flyer #3, notified Steering Committee about webpage, and posted Volume I, Volume II and the Community Profile for public comment
September 7, 2021	Wallowa Lake County Service District included the Flyer #3 in its periodic billing to approximately 380 customers.
September – October 2021	Survey #3
September 27, 2021	Steering Committee Meeting #7, Special focus on Landslide Hazard Identification
October/November, 2021	Steering Committee Meeting #8, Special Focus on Floodplain Management
November 2021	Posted first draft NHMP for final public comment
January 31, 2022	Steering Committee meeting #8, DOGAMI Multi-Hazard Risk Report review and comment
February 28, 2022	Steering Committee meeting #9, OCCRI report results, recommend submission to OEM/FEMA

Steering Committee Meeting Agendas and Meeting Minutes

Figure 1. October 12, 2020 Steering Committee Meeting Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Understanding the process
and forming the Steering Committee**

October 12, 2020
1:00 pm – 3:00 pm
Thornton Conference Room, Wallowa County Courthouse,
101 South River Street, Enterprise, OR
and by Zoom at:
<https://us02web.zoom.us/j/83338430767?pwd=VIMwT1dkSFkxbjQya0pJTVA1WTdLUT09>



AGENDA

Introduction and Meeting Objectives	1:00 -1:20
<ul style="list-style-type: none"> • Introductions • Meeting Objectives <ul style="list-style-type: none"> · Discuss the purpose and process · Understand the roles of all participants · Discuss public engagement strategy · Identify future plan holders and discuss IGA · Discuss the schedule and expectations 	
NHMP Purpose and Process/Role of DLCD	1:20 – 1:30
<ul style="list-style-type: none"> • Purpose of NHMP updates (good planning, plan integration, access to FEMA funding) • Role of DLCD <ul style="list-style-type: none"> · Manage the process (agendas, minutes, follow-up actions, schedule) · Write the plan update · GIS mapping · Administration of grant funds 	
Roles of participants	1:30 – 2:00
<ul style="list-style-type: none"> • Participation is open to all; zoom link will be on agendas • Steering Committee will include plan holders, stakeholders and community members <ul style="list-style-type: none"> · Participate actively; keep track of time spent on this project · Help develop a public engagement strategy and participate in it · Communicate with stakeholders and community members who may not attend these meetings · Plan holders will shepherd the NHMP update through the adoption process • Draft Schedule • Intergovernmental Agreements for Plan Holders • Questions and Comments 	
Public Engagement	2:00-2:30
<ul style="list-style-type: none"> • Notification of public meetings • Discuss broader community engagement strategy • Discuss means for providing access to drafts for review and other common resources 	
Next meeting schedule discussion and Wrap up	2:30-2:45

Figure 2. October 12, 2020 Steering Committee Meeting Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**



**Understanding the process
and forming the Steering Committee**

October 12, 2020
1:00 pm – 2:10 pm
Thornton Conference Room, Wallowa County Courthouse,
101 South River Street, Enterprise, OR
and by Zoom at:

<https://us02web.zoom.us/j/83338430767?pwd=VlMwT1dkSFkxbjQya0pJTVA1WTdLUT09>

APPROVED MINUTES

Present at the meeting were

Convener: Franz Goebel, Wallowa County Planning Director

DLCD: Katherine Daniel, Natural Hazard Planner

Steering Committee members: Katy Nesbitt, Dave Riley, Jake Thompson, Christian Niece, Tammy Jones, Lance Homan, Erika Pinkerton, Dan Butterfield, Cynthia Warnock

Stakeholders: Matt Howard, ODF; Nils Christoffersen, Wallowa Resources

Introduction and Meeting Objectives

Franz Goebel began the meeting and participants introduced themselves and described the organizations they represent. K. Daniel described the purpose of the meeting that being to discuss the purpose and process of updating the current NHMP to address Wallowa County alone, to develop an understanding of the roles of the participants as future plan holders or jurisdictional parties and the IGAs that will formalize this relationship or as stakeholders in the process. Further, the purpose of the meeting includes discussing how the steering committee comprised of both plan holders and stakeholders will engage the wider public of Wallowa County. Finally, the schedule was presented as a draft document.

NHMP Purpose and Process/Role of DLCD

K. Daniel continued to outline the purpose for updating the 2014 NE Oregon Multi-Jurisdictional Natural Hazard Plan (2014 NHMP) which includes not only returning to eligibility to apply for FEMA funds for recovery or hazard mitigation following a natural hazard event, but also an important exercise to bring the NHMP into alignment with the multiple plans that comprise Wallowa County's natural resource and hazard mitigation planning efforts. K. Daniel's role in the process with involve managing the process (agendas, minutes, follow-up actions, schedule) along with F. Goebel, writing the plan update and providing drafts for review by the steering committee, GIS mapping and administration of the grant funds.

Role of Participants

The County has provided assessor's data to aid in the DOGAMI analysis of hazard exposure that they will perform for this plan update.

Steering Committee members are responsible for participating actively in the process and communicating with stakeholders and community members who may not attend these meetings. They will keep track of time spent on this project and report it quarterly to Katherine or Franz. Those representatives of jurisdictions or special districts that sign IGAs will also be responsible for shepherding the final NHMP update through the local adoption process.

The group examined the draft schedule and Katherine asked everyone to consider whether this plan for three more meetings and review of the draft document is feasible in the proposed time. Feedback on the schedule is requested in order to assure that the maximum participation is possible.

Public Engagement

Katherine presented the framework for a Public Engagement framework and asked for input on the methods to use to gather public response to the developing plan. Matt Howard pointed out that the most effective method for public engagement he has found in long tenure working in Wallowa County is to go to each groups' meeting.

Suggested Public Engagement strategies included the following:

- Presentations at other organizations' meetings (specifically agricultural producers growers meetings, homeowners association meetings and Firewise Community meetings)
- Posting in physical locations (Safeway)
- Posting information on the Planning Department webpage
- Posting on social media sites that point interested people to the Planning Department webpage
- News articles and interviews with steering committee participants

A survey was not thought to be a useful method for public engagement.

The meeting concluded at 2:10.

Figure 3. February 22, 2021 Steering Committee Meeting Agenda



Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting

Hazard Vulnerability Analysis – Part 1

February 22, 2020
9:00 am -11:00 am
Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>

Meeting ID: 875 8861 9791
Passcode: 483038



AGENDA

<p>Introduction, Minutes, and Meeting Objectives</p> <ul style="list-style-type: none"> • Introductions • Meeting minutes from 10/12/20 • Meeting Objectives <ul style="list-style-type: none"> · Updates (IGAs, DOGAMI risk report, schedule, Google Drive access, public engagement) · Review survey results to date · Identify natural hazards to address · Begin Hazard Vulnerability Assessment 	<p>9:00-9:15</p>
<p>Updates</p> <ul style="list-style-type: none"> • IGAs • DOGAMI risk report timing • Schedule: Plan to meet twice or three times between now and June; DOGAMI Risk Report much later in the process • Google Drive for exchanging resources and draft sections of the NHMP update https://drive.google.com/drive/folders/1zw6iluejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing • Public Engagement plan • Trying a new tool: Polleverywhere 	<p>9:15-9:40</p>
<p>Identify Natural Hazards in Wallowa County</p> <ul style="list-style-type: none"> • Hazards covered in the 2014 NE Oregon NHMP and Oregon State NHMP • Survey results • Question: Should we add other hazards to this update? 	<p>9:40 – 10:10</p>
<p>Hazard Vulnerability Analysis</p> <ul style="list-style-type: none"> • What is it? A way to quantify aspects of Risk: Concepts of Probability and Vulnerability as well as History and Maximum Threat • How will we approach it? 	<p>10:10 – 10:25</p>
<p>History of Natural Hazards in Wallowa County</p> <ul style="list-style-type: none"> • Review history of hazard events • Rank History of Hazards in Wallowa County through group discussion and Polleverywhere questions; the objective is to come to consensus on a ranking for each of the hazards to be addressed 	<p>10:20 – 10:30</p>
<p>Public Comment/General Comments from SC members</p> <ul style="list-style-type: none"> • All comments welcome 	<p>10:30-10:45</p>
<p>Next meeting</p> <ul style="list-style-type: none"> • Propose last Monday of the month for March, April and May 9:00-11:00 am 	<p>To close of meeting</p>

Figure 4. February 22, 2021 Steering Committee Meeting Approved Minutes



Wallowa County Natural Hazard Mitigation Plan Update Steering Committee Meeting



Hazard Vulnerability Analysis – Part 1

February 22, 2020

9:00 am -11:00 am

Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>

Meeting ID: 875 8861 9791

Passcode: 483038

APPROVED MINUTES

The meeting was convened at 9:05 am by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:	Joe Dawson, Secretary, Wallowa Lake Irrigation District;
Dan Butterfield, President of Wallowa Lake Irrigation District;	Cynthia Warnock, District Manager, Wallowa County SWCD
Paul Karvoski, Emergency Manager/County Fire Chief;	Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry;
Larry Braden, City Administrator for City of Joseph;	Nils Christoffersen, Executive Director, Wallowa Resources
Katy Nesbitt, Wallowa County Natural Resources Director;	Other attendees: Patrick Wingard, DLCD Regional Representative
Tamera Jones, Superintendent, Wallowa School District;	
Erika Pinkerton, Superintendent, Enterprise School District;	
Lance Homan, Superintendent, Joseph School District;	

Introduction, Minutes, and Meeting Objectives

Franz Goebel began the meeting by asking participants to introduce themselves. K. Daniel described the purpose of the meeting that being to provide some project updates, to engage the group in identifying the natural hazards that will be addressed in the 2021 Wallowa County NHMP update, and to begin to conduct the OEM Methodology Hazard Vulnerability Assessment.

The minutes from the 10/12/20 meeting were approved as submitted by the six members present who attended.

Project Updates

K. Daniel reported that seven entities had signed Intergovernmental Agreements (IGAs) those being Wallowa County, City of Enterprise, Enterprise School District #21, City of Wallowa, Wallowa School District #12, Wallowa

Soil and Water Conservation District, Wallowa Lake County Service District and City of Joseph (received during the meeting).

Further, she reported that the Department of Geology and Mineral Industries will not be able to engage in the exposure analysis as anticipated until the fall. For that reason, Katherine and Franz suggest that the steering committee meet monthly for March, April and May in order to complete the Hazard Vulnerability Assessment next month and to delegate two meetings to Mitigation Strategy review and revision.

The google drive location to find the documents relevant to this project can be accessed through the following link: <https://drive.google.com/drive/folders/1zw6iluuiejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Participants may also upload documents to this folder. A Google account is needed in order to do this.

The Public Engagement Strategy as developed at the first meeting was mentioned stressing that the best sort of public outreach is for steering committee members, particularly those who will be plan holders to bring the topic to their constituencies. Materials to use during these exchanges include the one page description of what an NHMP update is, the survey results summary or the surveys themselves. K. Daniel will update the Public Engagement Strategy document for the next meeting.

The group tested a polling tool (Polleverywhere.com) that K. Daniel wanted to try as a tool for the Hazard Vulnerability Assessment later in the meeting.

Identify Natural Hazards in Wallowa County

K. Daniel reviewed the hazards that were named in the 2014 NHMP and reviewed with the group the portion of the surveys they took that related to what hazards are experienced in Wallowa County. A discussion about identifying the hazards to address in the 2021 Wallowa County NHMP update followed.

Several members agreed that Dam Failure would present a different type of hazard event than Flood and they would like to see them differentiated as the effects of dam failure could be catastrophic, whereas flooding is more common and less devastating than dam failure.

Relative to the category of Extreme Temperatures, one member approved of lumping them because they both relate to the possibility for related power outages. Another member suggested splitting them because the remedies for the impact of each may be different. The members agreed to split them into different hazards for this exercise. K. Daniel noted that revision of this list can occur at a future point in this assessment, should the committee members see a reason to do so.

Weather patterns that produce winter storms, windstorms and summer thunderstorms don't differ much, but the effect of a thunderstorm is different from the effect of a winter storm. They all have in common the damaging effect of high winds. Wind may do the most damage, as compared to damage done by heavy snow or hail. Windstorms were left as a distinct hazard and Summer Storms were combined with Winter Storms as a different hazard because the impact of snow and hail is distinct from the impact of wind.

Poor air quality and the impact of smoke from wildfires, both local and distant due to air flow patterns were identified as a separate hazard. Although initially listed as a part of wildfire Wood burning stoves were called out as another reason for poor air quality as was the possibility of poor air quality due to chemical aerosols.

Insects, disease and invasive species/noxious weeds were discussed from both the agricultural and timber industry perspectives as a separate and distinct hazard to be addressed in the 2021 Wallowa County NHMP Update. One member cited research from a joint assessment by USFS, OSU and UW about the connections between a changing climate and

natural disturbances. He provided this quote in the chat box, "A warmer climate will increase natural disturbances, such as insects, disease, and wildfire. The assessment predicts that with current trends, the annual acreage burned in the Blue Mountain region could be as high as six times the current average by 2050."

Hazard Vulnerability Assessment - History

K. Daniel summarized the historical data found in the 2014 NHMP, the NOAA Storm Event database, the 2020 Oregon State NHMP Update, the ODF Fire List and news reports. The data covered occurrences of Drought, Wildfire, Flood, Winter Storms and Heavy Snow, Windstorms, Thunderstorms, Hail, Funnel Clouds and Tornadoes, Landslides and Debris Flows, Earthquakes, and Volcanic Events. Federal Disaster Declarations have been made for incidents in April 2020 for Severe Storms, Flooding, Landslides and Mudslides, in July/August 2006 for the Foster Gulch Fire Complex, in December 2003/January 2004 for Severe Winter Storms, in July 2002 for the Flagtail Fire, in Dec 1996/Jan 1997 and in February 1996 for Severe Winter Storms and Flooding, in April 1977 for Drought, in January 1974 for Sever Storms, Snow Melt and Flooding, in December 1964 for Heavy Rains and Flooding.

The group then used Polleverywhere to rank the hazards according their historical frequency and then one by one to rank them according to the OEM rubric modified to look back 10 years rather than 100 years as follows:

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

Following the polling exercise, the group discussed each hazard to arrive at a consensus ranking for the historical frequency of each of the named hazards. The question arose about how long the temperature has to be at a certain level to be extreme heat or extreme cold. The threshold of four days with a high above 100 °F or a low below 32 °F would qualify as Extreme Heat event or an Extreme Cold event respectively. The partial results are included in the attached Excel file titled 2021_02_22_HVA_MatrixWallowaCounty.xlsx

The meeting concluded at 10:58 pm.

Figure 5. March 29, 2021 Steering Committee Meeting Agenda



Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting

Hazard Vulnerability Analysis – Part 2

March 29, 2021
9:00 am -11:00 am
Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>

Meeting ID: 875 8861 9791

Passcode: 483038

OR Via Phone at: +1 253 215 8782 US (Tacoma)



AGENDA

Introduction, Minutes, and Meeting Objectives	9:00-9:10
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 02/22/21 • Meeting Objectives <ul style="list-style-type: none"> · Updates · Public Engagement · Critical facilities list · Complete Hazard Vulnerability Assessment 	
Updates	9:10-9:15
<ul style="list-style-type: none"> • IGAs • Documents: Updated schedule; Updated Contact List (Patrick, Joe's email) Google Drive: https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing	
Public Engagement Strategy	9:15 – 9:20
<ul style="list-style-type: none"> • How to document your outreach • Remember to note the time you spend 	
Hazard Vulnerability Analysis – Part 2	9:20 – 9:35
<ul style="list-style-type: none"> • Hazards to address – final list • History rankings reviewed • Probability rankings for all hazards 	
Critical Facilities List	9:35 – 9:45
<ul style="list-style-type: none"> • Raw List from 2020 State NHMP • Revise the list to consider what facilities are critical to response and recovery? As we consider each of the ten hazards, how would we add to that list of critical facilities? 	
Hazard Vulnerability Analysis – Part 2 Vulnerability	9:45 – 10:00
<ul style="list-style-type: none"> • What is vulnerability? • Who or what is vulnerable to natural hazards in Wallowa County? • Vulnerability rankings for all hazards 	
Hazard Vulnerability Analysis – Part 2 Maximum Threat	10:00 – 10:15
<ul style="list-style-type: none"> • What's the worst that could happen? • Maximum Threat ranking for all hazards 	
Final HVA Ranking	10:15 – 10:30
<ul style="list-style-type: none"> • Factors and weights • High, Medium and Low categories 	
Public Comment/General Comments from SC members	10:30-10:45
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	To close of meeting
<ul style="list-style-type: none"> • April 26, 2021 9:00 to 11:00 am • What date in May? 	

Figure 6. March 29, 2021 Steering Committee Meeting Approved Minutes



Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting

Hazard Vulnerability Analysis – Part 2

March 29, 2021
9:00 am -11:00 am
Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>
Meeting ID: 875 8861 9791
Passcode: 483038
OR Via Phone at: +1 253 215 8782 US (Tacoma)



OREGON
Department of
Land Conservation
& Development

Approved Minutes

The meeting was convened at 9:05 am by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Dan Butterfield, President of Wallowa Lake Irrigation District;
Katy Nesbitt, Wallowa County Natural Resources Director;
Cynthia Warnock, District Manager, Wallowa County SWCD
Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry;
Other attendees: Patrick Wingard, DLCD Regional Representative

Introduction, Minutes, and Meeting Objectives

The purpose of this meeting is to complete the Hazard Vulnerability Assessment, a group exercise developed by FEMA and OEM to develop a “big picture” assessment of natural hazards. Participants expressed concern that some representatives had not attended any NHMP update meetings, however, these jurisdictions and special districts experience the effects of natural hazards. (The City of Lostine is subject to flooding hazard and the Joseph City schools are subject to high wind events.) There was concern that the HVA would not reflect the views of the whole group if completed with a subset of the Steering Committee.

It was agreed that this meeting would be postponed until the next scheduled meeting time, April 26, 2021 at 9:00 am. Recent weather related damage and downed trees along with the recent completion of spring break for Wallowa County schools may have kept attendance down at today’s meeting.

Meeting adjourned at 9:30 am. Next meeting scheduled for April 26, 2021 at 9:00 am.

Figure 7. April 26, 2021 Steering Committee Meeting Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Hazard Vulnerability Analysis – Part 2

April 26, 2021 9:00 am -11:00 am

Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>

Meeting ID: 875 8861 9791

Passcode: 483038

OR Via Phone at: +1 253 215 8782 US (Tacoma)



AGENDA

Introduction, Minutes, and Meeting Objectives	9:00-9:10
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 02/22/21 and 3/29/21 • Meeting Objectives <ul style="list-style-type: none"> · Updates · Public Engagement · Critical facilities list · Complete Hazard Vulnerability Assessment 	
Updates	9:10-9:15
Public Engagement Strategy	9:15 – 9:20
<ul style="list-style-type: none"> • How to document your outreach • Remember to note the time you spend 	
Hazard Vulnerability Analysis – Part 2	9:20 – 9:35
<ul style="list-style-type: none"> • Hazards to address – final list • History rankings reviewed • Probability rankings for all hazards 	
Critical Facilities List	9:35 – 9:45
<ul style="list-style-type: none"> • Raw List from 2020 State NHMP • Revise the list to consider what facilities are critical to response and recovery? As we consider each of the ten hazards, how would we add to that list of critical facilities? 	
Hazard Vulnerability Analysis – Part 2 Vulnerability	9:45 – 10:00
<ul style="list-style-type: none"> • What is vulnerability? • Who or what is vulnerable to natural hazards in Wallowa County? • Vulnerability rankings for all hazards 	
Hazard Vulnerability Analysis – Part 2 Maximum Threat	10:00 – 10:15
<ul style="list-style-type: none"> • What’s the worst that could happen? • Maximum Threat ranking for all hazards 	
Final Hazard Vulnerability Assessment Ranking	10:15 – 10:30
<ul style="list-style-type: none"> • Factors and weights • High, Medium and Low categories 	
Public Comment/General Comments from SC members	10:30-10:45
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	To close of meeting
<ul style="list-style-type: none"> • What date in May? 	

Project documents can be found at this Google Drive link. The link is open to anyone to view.

Google Drive:

<https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Figure 8. April 26, 2021 Steering Committee Meeting Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Hazard Vulnerability Analysis – Part 2 cont'd

April 26, 2021 9:00 am -11:00 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>
Meeting ID: 875 8861 9791
Passcode: 483038
OR Via Phone at: +1 253 215 8782 US (Tacoma)



Approved Minutes

The meeting was convened at 9:05 am by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Katy Nesbitt, Wallowa County Natural Resources Director;
Paul Karvoski, Emergency Manager/County Fire Chief;
Belinda Buswell, Mayor, City of Joseph;
Scott McCrae, City Council member, City of Wallowa;
Dan Butterfield, President, Wallowa Lake Irrigation District;
Joe Dawson, Secretary, Wallowa Lake Irrigation District;
Cynthia Warnock, District Manager, Wallowa County SWCD
Erika Pinkerton, Superintendent, Enterprise School District;
Tammy Jones, Superintendent, Wallowa School District
Lance Homan, Superintendent, Joseph School District

Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry;
Nils Christoffersen, Executive Director, Wallowa Resources

Introduction, Minutes, and Meeting Objectives

Franz began the meeting by introducing himself and asking others in turn to do the same. New members of the Steering Committee include City Council Member Scott McCrae who has volunteered to represent the City of Wallowa replacing Christian Niece who has stepped down. Mayor Belinda Buswell attended in replacement for Larry Braden who has also stepped down.

The purpose of this meeting is to provide updates to the participants, review the Public Engagement Strategy and consider next steps, to complete the Hazard Vulnerability Assessment and to introduce the Critical Facilities and State owned and leased buildings list.

Attached to these minutes are an updated contact list and an updated draft schedule which will be discussed at the next meeting. Other documents relevant to this project are available in the Google Drive set up for this project. Note: Participants who have google accounts (or are willing to create one) can also upload documents to the Google Drive.

<https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing>

The group reviewed the Public Engagement Plan including strategies suggested during the October 2020 meeting and accomplished by participants including posting on websites, posting in physical locations such as the Wallowa County Courthouse, speaking with councils, boards and citizens, and providing information in mailed notices as the Wallowa County Service District did. Katherine asked the participants to consider how they would bring the Hazard Vulnerability Assessment (HVA) to their constituencies and the general public. Katy and Franz will work together to put a press release together. Katherine will provide the HVA table and some language for use in this effort.

Katherine explained how documenting the participation of people in this NHMP update process (Cost Share documentation) assists the state with the 25% share of the project required by the FEMA grant (Pre-Disaster Management 2019) that funds her work for the county. She will email plan holders when it is time to return their Cost Share reporting quarterly.

The group then turned to the completion of the Hazard Vulnerability Assessment by addressing each of the twelve hazards named by the group during the February Steering Committee meeting and assessing the Severity Level of each with respect to the four factors History, Probability, Vulnerability and Maximum Threat. The ranking of the History factor had been accomplished at the February meeting. These results were reviewed along with other pertinent survey results. During the consideration of the Vulnerability factor maps showing features of flooding, landslide and earthquake faults along with critical local facilities and state-owned and leased facilities.

The natural hazards considered by the group included: Drought, Earthquake, Flood, Dam Failure, Insect, Disease and Invasive/Noxious Weeds, Landslide, Extreme Cold, Extreme Heat, Windstorm, Winter Storm, Smoke and Poor Air Quality, Volcanic Events, Wildfire

The results of the Steering Committee's consideration of its natural hazards within the framework of the OEM Methodology are below.

HAZARD	HISTORY			PROBABILITY			VULNERABILITY			MAX THREAT		RISK SCORE	
	WF = 2		Subtotal	WF = 7		Subtotal	WF = 5		Subtotal	WF = 10	Subtotal		
Floods	2 x	8	16	7 x	7	49	5 x	6	30	10 x	5	50	145
Extreme Heat	2 x	1	2	7 x	8	56	5 x	6	30	10 x	6	60	148
Dam Failure	2 x	1	2	7 x	2	14	5 x	10	50	10 x	10	100	166
Earthquakes	2 x	1	2	7 x	3	21	5 x	10	50	10 x	10	100	173
Drought	2 x	10	20	7 x	7	49	5 x	9	45	10 x	6	60	174
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
Landslides/Debris Flows	2 x	8	16	7 x	6	42	5 x	7	35	10 x	10	100	193
Insects, disease and invasive species/ noxious weeds	2 x	10	20	7 x	10	70	5 x	9	45	10 x	6	60	195
Extreme Cold	2 x	4	8	7 x	9	63	5 x	5	25	10 x	10	100	196
Windstorms	2 x	9	18	7 x	10	70	5 x	7	35	10 x	10	100	223
Smoke and Poor Air Quality	2 x	10	20	7 x	9	63	5 x	10	50	10 x	10	100	233
Wildfire	2 x	10	20	7 x	10	70	5 x	10	50	10 x	10	100	240

This OEM methodology ranking is a tool representing the perspectives and experience of the group. Katherine noted that the rankings can be revised or footnoted with respect to particular locations or conditions. These may include whether tourists are present and the nature of specific locations within the county.

Participants noted the interconnections among several of the hazards and the potential for multiple cascading effects of a worst case scenario. In contrast participants also noted that multiple hazards might be mitigated by a single mitigation action. Mitigation will be the next topic for the group to address.

The next meeting was set for May 24, 2021 at 9 am via Zoom.

Figure 9. May 24, 2021 Steering Committee Meeting Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Mitigation Actions – Part 1

May 24, 2021 9:00 am -11:00 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQTQ9>

Meeting ID: 875 8861 9791
Passcode: 483038

OR Via Phone at: +1 253 215 8782 US (Tacoma)



AGENDA

Introduction, Minutes, and Meeting Objectives	9:00-9:10
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 4/26/2021 • Meeting Objectives <ul style="list-style-type: none"> • Updates • Public Engagement • Critical facilities list review; discuss Capacity • Review Mission and Goals from 2014 NE OR NHMP • Review Mitigation Actions from 2014 NE OR NHMP • Consider Mitigation Actions for “new” hazards 	
Updates	9:10-9:15
Public Engagement Strategy	9:15 – 9:20
<ul style="list-style-type: none"> • Please document your outreach; some examples • Remember to note the time you spend 	
Critical Facilities List and Capacity for Resilience	9:20 – 9:35
<ul style="list-style-type: none"> • Compilation of all responses for final list; KD mapping them relative to hazard areas • Discussion of Capacity 	
Mission and Goals	9:35 – 9:45
<ul style="list-style-type: none"> • Review of prior plan Mission and Goals 	
Mitigation Actions	9:45 – 10:30
<ul style="list-style-type: none"> • Review prior plan Mitigation Actions • Address hazards added (Extreme Heat, Extreme Cold, Poor Air Quality*, Insects, Disease, Invasive Species/Noxious Weeds, and Dam Failure) 	
Public Comment/General Comments from SC members	10:30-10:45
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	To close of meeting
<ul style="list-style-type: none"> • What date in June? Then a break... 	

*Suggestion to rename this hazard removing the words “Smoke and”
Project documents can be found at this Google Drive link. The link is open to anyone to view.
Google Drive:<https://drive.google.com/drive/folders/1zw6iluejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing>

Figure 10. May 24, 2021 Steering Committee Meeting Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Mitigation Actions – Part 1

May 24, 2021 9:00 am -11:00 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>

Meeting ID: 875 8861 9791
Passcode: 483038
OR Via Phone at: +1 253 215 8782 US (Tacoma)



OREGON
Department of
Land Conservation
& Development

Approved Minutes

The meeting was convened at 9:05 am by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Scott McCrae, Wallowa City Council member;
Dan Butterfield, President, Wallowa Lake Irrigation District;
Toni Clary, City Recorder; City of Lostine;
Paul Karvoski, Emergency Manager/County Fire Chief;
Katy Nesbitt, Natural Resource and Economic Development Director
Cynthia Warnock, District Manager, Wallowa County SWCD;
Erika Pinkerton, Superintendent, Enterprise School District;
Tammy Jones, Superintendent, Wallowa School District

Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry;
Nils Christoffersen, Executive Director, Wallowa Resources

Introduction, Minutes, and Meeting Objectives

Franz opened the meeting and Katherine facilitated introductions to begin the meeting at 9:05. The minutes from the 4/26/21 meeting were approved by those in attendance. The purpose of this meeting is to begin the evaluation of the Mission and Goals of the plan and the Mitigation Actions from the previous plan.

Updates and Public Engagement Strategy

A flyer was prepared and provided to the Steering Committee members for use in informing the public about the NHMP update.

The group agreed to revise the titles of two of the new named hazards resulting in the following: Poor Air Quality and Insect Pests, Noxious Weeds and Invasive Species.

Mission and Goals

The Mission statement and the four Goals from the 2014 NE OR NHMP were considered by the Steering Committee and subsequently approved by the Wallowa NHMP update Steering Committee for inclusion without change to the 2021 Wallowa NHMP update.

Critical Facilities List and Capacity for Resilience

The Steering Committee provided input on the list of Critical Local and State-owned facilities and facilities leased by the State of Oregon.

Several facilities were added to the list including the USFS and ODF facilities in Joseph and Enterprise. The regional USFS office in Enterprise includes a warehouse facility as well as shower and kitchen facilities. The inclusion of local businesses in the critical facilities list was suggested, specifically the primary grocery store in Enterprise (Safeway). The two senior centers in Enterprise and Wallowa were added to the Critical Facilities list. In Joseph

Community gathering places were also added to the list including M. Crow in Lostine and the Imnaha Tavern.

Katherine discussed facilities, organizations and infrastructure that support a resilient response to a natural hazard event.

Mitigation Actions

Katherine excerpted all the mitigation actions from the 2014 NE OR NHMP that apply to Wallowa County. This is the list that the Steering Committee considered. The group began to address each of the mitigation actions from the excerpt of the 2014 NE OR NHMP to update the status of each of the relevant entries.

The group discussed multi-hazard mitigation actions that involve public information, economic resilience, emergency egress and other actions that address more than one hazard. Discussion about public information actions yielded acknowledgement that city staff and community members are key point people for disseminating information. Working to involve them in the NHMP mitigation actions is important. Discussion of economic resilience brought up the importance of certain essential businesses and economic stability. This topic could be further fleshed out and specific actions identified. There was consideration of the general objective of enhancing economic resilience. The group focused on revising actions to identify specific actions rather than language that expresses a general objective.

Drought mitigation actions were considered. Water use efficiency programs are in place for agricultural users, but programs for water use efficiency for municipal users are still needed to be developed. The single Landslide Hazard mitigation action was also considered during this meeting.

Public Comment

Opportunity for public comment was provided.

Next meeting and Adjournment

The next meeting was set for June 28th at 9:30 via Zoom.

The meeting was adjourned at 11:05 pm.

Figure 11. June 28, 2021 Steering Committee Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Mitigation Actions – Part 2

June 28, 2021 9:30 am -11:30 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUhBOQT09>
 Meeting ID: 875 8861 9791
 Passcode: 483038
 OR Via Phone at: +1 253 215 8782 US (Tacoma)



AGENDA

Introduction, Minutes, and Meeting Objectives	9:30 - 9:40
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 5/24/2021 • Meeting Objectives <ul style="list-style-type: none"> · Complete Review of Mitigation Actions from 2014 NE OR NHMP · Consider Mitigation Actions for “new” hazards • Schedule Review 	
Mitigation Actions	9:40 – 11:10
<ul style="list-style-type: none"> • Complete review prior plan Mitigation Actions • Address hazards added (Extreme Heat, Extreme Cold, Poor Air Quality, Insects, Disease, Invasive Species/Noxious Weeds, and Dam Failure) 	
Public Comment/General Comments from SC members	11:10-11:15
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	To close of meeting
<ul style="list-style-type: none"> • Consider additional optional meetings for focused discussions; possible topics include Intersection of NHMP with Economic Opportunities; Landslide Hazard focus; Floodplain and Natural Resource Management Plan intersection 	

Project documents can be found at this Google Drive link. The link is open to anyone to view.
 Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Figure 12. June 28, 2021 Steering Committee Approved Minutes

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**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Mitigation Actions – Part 2

June 28, 2021 9:30 am -11:30 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>
BOQT09

Meeting ID: 875 8861 9791
Passcode: 483038

OR Via Phone at: +1 253 215 8782 US (Tacoma)



Approved Minutes

The meeting was convened at 9:35 am by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Toni Clary, City Recorder; City of Lostine;
Paul Karvoski, Emergency Manager/County Fire Chief;
Katy Nesbitt, Natural Resource and Economic Development Director
Cynthia Warnock, District Manager, Wallowa County SWCD;

Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry;

Introduction, Minutes, and Meeting Objectives

Franz opened the meeting and Katherine facilitated introductions to begin the meeting at 9:35. The minutes from the 5/24/21 meeting were approved by those in attendance. The purpose of this meeting was to complete the review of the Mitigation Actions from the previous plan and to add new actions, as necessary.

Katherine reviewed the schedule for completing the project with those present. Following this meeting, the next scheduled meeting in October or November will be focused on reviewing the completed NHMP prior to submission to the Oregon Office of Emergency Management and FEMA for preliminary approval. There may be corrections or additions to make to the plan following OEM and FEMA's reviews. After addressing any comments or questions posed by OEM and FEMA, the plan holders will each be asked to adopt the NHMP. Following adoption by the plan holders, FEMA will issue a final approval letter.

Mitigation Actions

The Steering Committee considered each of the mitigation actions from the 2014 NE Oregon Multi-Jurisdictional Natural Hazard Mitigation Plan. They determined that six actions were no longer relevant and should be removed. Five actions had been completed since the prior plan and eleven new actions were added to make further advances on some mitigation actions or to clarify the mitigation action.

Among the new actions added was MH 7 which focuses on maintaining facilities that can serve as refuges for several of the named natural hazards in Wallowa County. Among the hazards that can be mitigated by providing refuge for people are Extreme Heat, Extreme Cold, and Poor Air Quality. Paul Karvoski, Wallowa County Emergency Manager noted that MOUs have been established for the use of several facilities in Enterprise and arrangements have also been made to provide transportation to these facilities for those who need it.

The group decided to not to meet in July and August, but will tentatively plan to meet on the last Monday of September. Between now and then Katherine will be completing the writing plan update and will be sending draft sections to each of the plan holders for review and comment.

Katherine surveyed the group to determine whether there was interest in hosting subject matter experts on Economic Development or on Landslide Hazard mitigation. Both topics were of interest to some members of the group, so Katherine will invite these specialists to attend and participate in the next meeting on September 27, 2021.

Public Comment/General Comments from SC members

Opportunity for public comment was provided. None were made.

The meeting adjourned at 11:36 am.

Project documents can be found at this Google Drive link. The link is open to anyone to view.
Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing>

Figure 13. September 27, 2021 Steering Committee Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Focus on Landslides and Debris Flow
and
Capacity Analysis for Mitigation Actions**

September 27, 2021 9:30 am -11:30 am



Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUhBOQT09>
 Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)

AGENDA, revised 9/24/21

Introduction, Minutes, and Meeting Objectives	9:30 - 9:40
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 6/28/2021, attached to email • Meeting with Lacey McQuead and Dave Riley on 7/29/21; their HVA • Meeting Objectives <ul style="list-style-type: none"> · Evaluate Capacity to Implement Mitigation Actions, Select for Mitigation Action Worksheets · Focus on Landslide Hazard 	
Updates and Announcements	9:40 – 9:45
<ul style="list-style-type: none"> • Draft is ready for review and comment via email; Posted on Wallowa County Land Use Planning Website with link for emailing comment • Outreach updates; WLCSD sent flyer, others? <i>Please take screen shots of posts on social media or websites or copies of newsletters and email them to me.</i> • Requests of plan holders (Survey responses and Cost Share request soon) • Schedule review, attached to email 	
Remaining Sections of Plan to Complete	9:45 – 9:55
<ul style="list-style-type: none"> • Volume III Appendices • Appendix C: Mitigation Action Worksheets – Purpose and Scope 	
Focus on Landslides	9:55 – 10:45
Capacity for Mitigation Actions	10:45 – 11:15
Public Comment/General Comments from SC members	11:15 – close
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	
<ul style="list-style-type: none"> • October 25, 2021: Floodplain Management Focus 	

Project documents can be found at this Google Drive link. The link is open to anyone to view.
 Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing>

Figure 14. September 27, 2021 Steering Committee Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Focus on Landslides and Debris Flow
and
Capacity Analysis for Mitigation Actions**

September 27, 2021 9:30 am -11:30 am



OREGON
Department of
Land Conservation
& Development

Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>
Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)

Approved Minutes

The meeting was convened at 9:35 by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Paul Karvoski, Emergency Manager/County Fire Chief
Katy Nesbitt, Natural Resource and Economic Development Director
Cynthia Warnock, District Manager, Wallowa County SWCD

Stakeholders: Matt Howard, Unit Forester, Oregon Department of Forestry

Others: Patrick Wingard, DLCD Regional Representative; Tricia Sears, DLCD Natural Hazards Planner

Introduction, Minutes, and Meeting Objectives

Franz opened the meeting and facilitated introductions to begin the meeting at 9:35. The minutes from the 6/28/21 meeting and were approved by those in attendance. The purpose of this meeting was to evaluate capacity to implement the mitigation actions and to prioritize them in order to determine which actions for which Katherine should prepare Mitigation Action Worksheets. The second purpose of the meeting was to provide a focus on landslide hazard identification and mitigation. Tricia Sears was present at the meeting in order to provide this special focus.

Updates and Announcements

Katherine reviewed the results of a “catch-up” meeting held on July 29, 2021 via zoom with Franz Goebel, Lacey McQuead and Dave Riley. This small group performed a modified Hazard Vulnerability Assessment exercise with Katherine and Franz. The results of this assessment resulted in the following relative risk levels for the hazards considered. The principal difference with the group HVA is the position of Flooding relative to the other hazards. Both the City of Enterprise and the community at the head of Wallowa Lake served by the Wallowa Lake County

Service District (WLCS D) are both at higher risk of flood damage than the other communities participating in this NHMP update. The Risk Assessment will be revised to reflect this both these assessments.

Drafts of Volume I: Basic Plan, Volume II: Hazard Annexes and Volume III: Appendix A – Community Profile are all posted on the [Wallowa County Land Use Planning Website](#) with a link for emailing comments to Franz or Katherine. The WLCS D sent out the August 2021 flyer with its September billing and this resulted in public comment on the draft plan. Katherine is keeping track of comments and responses in a table that will be posted with the final draft upon completion.

Katherine discussed the importance of public outreach and requested screen shots of postings made by other participants or copies of newsletters participants have used to inform their constituencies of the NHMP update. Katy Nesbitt agreed to work on preparing a news article for the Wallowa County Chieftain nearer to the October meeting date.

Katherine reviewed the schedule and informed the group that the Department of Geology and Mineral Industries (DOGAMI) Risk Report and the Oregon Climate Change Research Institute (OCCRI) report on future conditions will not be completed until probably December. The schedule now reflects completion of a final draft in January with Steering Committee review and anticipated agreement to submit the plan to the Oregon Office of Emergency Management and subsequently to FEMA when those reports have been incorporated into the plan.

Remaining Sections of Plan to Complete

The remaining appendixes are either completed or require minor effort to prepare and will be posted on the Wallowa County Land Use Department webpage once complete.

After completing these updates, the subject turned to the development of Appendix C: Mitigation Action Worksheets. These worksheets are intended to be springboards for plan holders to use in securing needed resources to implement the Mitigation Actions. Katherine described how they originate with the Mitigation Actions and prioritization of those through the lens of capacity. As a segue and initial example the Landslide Hazard mitigation actions were reviewed (see below). Maps of existing landslides and DOGAMI landslide susceptibility mapping were also reviewed.

Focus on Landslides

The Focus on Landslide presentation by Tricia Sears began with the point that landslides are the most widespread, damaging and chronic natural hazard in Oregon. Risk reduction includes better landslide and mapping, inclusion in comprehensive plans and both zoning and building code. She discussed the concept of risk being the intersection between the area of natural hazard and the assets or vulnerable people within it and how communities are the people who use the information available and decide how to manage that risk. The objective of the NHMP is to further that process. Tricia provided some basic technical background on causes and characteristics of landslides along with some factors to consider in codes. She provided several resources for local governments and special districts to use among these is [Preparing for Landslide Hazards: A Land Use Guide for Oregon Communities](#) and the companion [Quick Reference](#).

Her PowerPoint presentation and the meeting presentation will be available in the google drive.

Capacity for Mitigation Actions

This topic was tabled until the next meeting.

Public Comment/General Comments from SC members

None was received.

Next Meeting is scheduled for October 25, 2021 at 9:30 – 11:30 am and will include a focus on Floodplain Management and Dam Failure.

The meeting adjourned at approximately 10:50 am

Project documents can be found at this Google Drive link. The link is open to anyone to view.

Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxbYRcC-SRz?usp=sharing>

Figure 15. October 25, 2021 Steering Committee Agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Focus on Flooding
and
Capacity Analysis for Mitigation Actions**

October 25, 2021 9:30 am -11:30 am



Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>
 Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)

AGENDA

Introduction, Minutes, and Meeting Objectives	9:30 - 9:35
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 9/27/2021, attached to email • Meeting Objectives <ul style="list-style-type: none"> · Focus on Flooding Hazard · Evaluate Capacity to Implement Mitigation Actions, Select for Mitigation Action Worksheets 	
Updates and Announcements	9:35 – 9:40
<ul style="list-style-type: none"> • Draft is ready for review and comment via email; Posted on Wallowa County Land Use Planning Website with link for emailing comment • Outreach updates (<i>Please take screen shots of posts on social media or websites or copies of newsletters and email them to me</i>) • Request for brief descriptions from plan holders 	
Focus on Flooding	9:40 – 10:40
Capacity for Mitigation Actions	10:40 – 11:25
Public Comment/General Comments from SC members	11:25 – close
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	
TBD; when DOGAMI Risk Report and OCCRI Future Climate Projections Report are complete a meeting will be set; we will try to keep with the last Monday of the month at 9:30 am.	

Project documents can be found at this Google Drive link. The link is open to anyone to view.
 Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Figure 16. October 25, 2021 Steering Committee Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Focus on Flooding
and
Capacity Analysis for Mitigation Actions**

October 25, 2021 9:30 am -11:30 am



OREGON
Department of
Land Conservation
& Development

Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>
Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)

Approve Minutes

The meeting was convened at 9:36 by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:
Katy Nesbitt, Natural Resource and Economic Development Director
Lacey McQuead, City Administrator, City of Enterprise
Dan Butterfield, Wallowa Lake Irrigation District

Others: Celinda Adair, Oregon National Flood Insurance Program (NFIP) Coordinator

Introduction, Minutes, and Meeting Objectives

Franz opened the meeting and facilitated introductions to begin the meeting at 9:36. The minutes from the 9/27/21 meeting and were provisionally approved as those in attendance had not reviewed them. The purpose of this meeting was to provide an opportunity for the communities in Wallowa County affected by flooding to become more familiar with the role of the floodplain administrator and the NFIP. Celinda Adair, the Oregon NFIP Coordinator is present at the meeting to provide this special focus.

The second portion of the meeting was intended to address the evaluation of capacity to implement the mitigation actions and to prioritize them in order to determine which actions for which Katherine should prepare Mitigation Action Worksheets. This was not addressed at this meeting and will be accomplished through small group meetings on specific sets of Mitigation Actions centered around the Lead department or entity.

Updates and Announcements

Drafts of Volume I: Basic Plan, Volume II: Hazard Annexes and Volume III: Appendix A – Community Profile are all posted on the [Wallowa County Land Use Planning Website](#) with a link for emailing comments to Franz or Katherine. The WLCS sent out the August 2021 flyer with its September billing and this resulted in public comment on the draft plan. Katherine is keeping track of comments and

responses in a table that will be posted with the final draft upon completion.

Katherine discussed the importance of public outreach and requested screen shots of postings made by other participants or copies of newsletters participants have used to inform their constituencies of the NHMP update. She requested that participants who have screen shots or copies of public outreach in newsletters or other media please send them to her for inclusion in the plan appendices. She also reviewed the schedule and reminded the group that the Department of Geology and Mineral Industries (DOGAMI) Risk Report and the Oregon Climate Change Research Institute (OCCRI) report on future conditions will not be completed until probably December. The schedule now reflects completion of a final draft in January by the Steering Committee.

Focus on Flooding

To transition to the focus on flooding, Katherine provided a review of the FEMA Special Flood Hazard Area (SFHA) maps for Wallowa County jurisdictions such as Enterprise, Joseph, Troy, and the Wallowa Lake Community. Celinda Adair began from there to present to the group a wide-ranging presentation of information about the legal basis for the NFIP, the purpose and function of it as a mitigation measure against flood damage through the insurance benefits of community participation in a set of construction and development standards.

Celinda provided a copy of her presentation (attached to the email sending this) or available on the project google drive or by request.

Her contact information is: Celinda Adair, celinda.adair@dlcd.oregon.gov Phone: 503-930-9739

Capacity for Mitigation Actions

This topic will be pursued through small group meetings.

Public Comment/General Comments from SC members

None was received.

Next Meeting will be determined based on the completion of the DOGAMI and OCCRI reports.

The meeting adjourned at approximately 11:09 am

Project documents can be found at this Google Drive link. The link is open to anyone to view.

Google Drive: <https://drive.google.com/drive/folders/1zw6iluueiLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Figure 17. January 31, 2022 Steering Committee meeting agenda



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

DOGAMI Multi-Hazard Risk Report

January 31, 2022 9:30 am -10:45 am

Via Zoom at:
<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUmBOQT09>
 Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)



AGENDA

Introduction, Minutes, and Meeting Objectives	9:30 - 9:35
<ul style="list-style-type: none"> • Introductions • Meeting minutes from 10/25/2021, attached to email • Meeting Objectives <ul style="list-style-type: none"> · Review and provide comments on the DOGAMI Multi-Hazard Risk Report 	
Updates and Announcements	9:35 – 9:45
<ul style="list-style-type: none"> • Schedule for completion • Request for outreach updates (<i>Please take screen shots of posts on social media or websites or copies of newsletters and email them to me</i>) • Outstanding request for brief descriptions from plan holders 	
DOGAMI Multi-Hazard Risk Report	9:45 – 10:30
Public Comment/General Comments from SC members	10:30 – close
<ul style="list-style-type: none"> • All comments welcome 	
Next meeting	
February 28, 2022 (last Monday of the month) at 9:30 am.	

Project documents can be found at this Google Drive link. The link is open to anyone to view.
 Google Drive: <https://drive.google.com/drive/folders/1zw6iluueiLmMGIUXB3bQFxbRcC-SRz?usp=sharing>

Figure 18. January 31, 2022 Steering Committee Meeting Approved Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

Multi-Hazard Risk Report presentation

January 31, 2022 9:30 am -11:30 am

Via Zoom at:
<https://us02web.zoom.us/j/83467619389?pwd=U2dEM3hkSnVLaFVIRzdYbkM1U2VOZz09>
Meeting ID: 834 6761 9389; Passcode: 925825 OR Via Phone at: +1 253 215 8782 US (Tacoma)



OREGON
Department of
Land Conservation
& Development

Approved Minutes

The meeting was convened at 9:36 by
Convener: Franz Goebel, Wallowa County Planning Director
DLCD: Katherine Daniel, Natural Hazards Planner

Steering Committee members present included:

Jean Jancaitis, Planning Specialist, Wallowa County
Katy Nesbitt, Natural Resource and Economic Development Director
Dan Butterfield, Wallowa Lake Irrigation District

Others: Matt Williams, Oregon Department of Geology and Mineral Industries
Patrick Wingard, Oregon Department of Land Conservation and Development
Joseph Goebel, Interim Unit Forester, Oregon Department of Forestry

Introduction, Minutes, and Meeting Objectives

Katherine opened the meeting and began with introductions at 9:36 am. Franz moved and Katy seconded a motion to approve the minutes from the 10/27/21 meeting. Katherine indicated she would post the approved minutes on the project google drive.

Updates and Announcements

Katherine provided several updates on the anticipated schedule for completing and submitting the NHMP to OEM and FEMA for approval.

Revisions to Volume I: Basic Plan to incorporate the DOGAMI Multi-Hazard Risk Report were made and a revised draft will be posted for internal review on the project google drive for Steering Committee member review prior to release for additional public comment.

The Oregon Climate Change Research Institute (OCCRI) will be providing a complete report on the impacts of future climate conditions on natural hazards by the end of March. When that report is complete, Katherine will incorporate that information into the NHMP and provide the revised documents to the Steering Committee prior to the next steering committee meeting.

Following the OCCRI report completion, the Steering Committee will schedule a final meeting. At that final meeting, the Steering Committee will be asked to authorize the submission of the plan to OEM.

Katherine discussed the importance of public outreach and requested screen shots of postings made by other participants or copies of newsletters participants have used to inform their constituencies of the NHMP update. She requested that participants who have screen shots or copies of public outreach in newsletters or other media please send them to her for inclusion in the plan appendices.

Katherine noted that the requested descriptions of the planholder jurisdictions and special districts have not been completed by many of the planholders. (Wallowa County and the WLID have provided this information.) She indicated that she would take a different approach to elicit this information from the entity's representatives by preparing a sort of template to be completed. She will send this next week.

DOGAMI Multi-Hazard Risk Report

The principal topic of this meeting is a presentation by Matt Williams of DOGAMI to describe the process of analysis and the results of the risk analysis Matt has completed for Wallowa County. The report addressed earthquake, landslide, flood and wildfire hazards. Matt responded to questions from attendees and took notes on several revisions or clarifications requested by the group.

Public Comment/General Comments from SC members

None at this time.

Next Meeting will be determined based on the completion of the OCCRI reports. Please hold the last Monday in March (3/28/22) for that meeting.

The meeting adjourned at approximately 10:45 am

Project documents can be found at this Google Drive link. The link is open to anyone to view.

Google Drive: <https://drive.google.com/drive/folders/1zw6iluuiejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Figure 19. May 23, 2022 Steering Committee meeting agenda



**Wallowa County Natural Hazard Mitigation Plan Update
 Steering Committee Meeting**

**Future Climate Projections Report
 and final review of plan prior to submission**

May 23, 2022 9:30 am -11:00 am



Via Zoom at:

<https://us02web.zoom.us/j/87588619791?pwd=aWZmRjNsWHJlZWwzTmN3eUtPUnBOQT09>

Meeting ID: 875 8861 9791; Passcode: 483038 OR Via Phone at: +1 253 215 8782 US (Tacoma)

AGENDA

<p>Introduction, Minutes, and Meeting Objectives</p> <ul style="list-style-type: none"> • Introductions • Meeting Objectives <ul style="list-style-type: none"> · Results of Oregon Climate Change Research Institute Future Climate Projections Report for Wallowa County · Review final draft of Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan and authorize submission to the Oregon Office of Emergency Management 	<p>9:30 - 9:40</p>
<p>OCCRI Future Climate Projection Report for Wallowa County OCCRI Future Climate Projection Report – Wallowa County</p>	<p>9:40– 10:10</p>
<p>Review of final draft of Wallowa County MJ NHMP Volume I Volume II Volume III</p>	<p>10:10 – 10:45</p>
<p>Public Comment/General Comments from SC members</p> <ul style="list-style-type: none"> • All comments welcome 	<p>10:45 – close</p>

Project documents can be found at this Google Drive link. The link is open to anyone to view.
 Google Drive: <https://drive.google.com/drive/folders/1zw6iluaeilMmGIUXBX3bQFxbvRcC-SRz?usp=sharing>

Figure 20. May 23, 2022 Draft Meeting Minutes



**Wallowa County Natural Hazard Mitigation Plan Update
Steering Committee Meeting**

**Future Climate Projections Report
and final review of plan prior to submission**

May 23, 2022 9:30 am -11:30 am

Draft Minutes



<p>Convener: Franz Goebel, Wallowa County Planning Director</p> <p>DLCD: Katherine Daniel, Natural Hazards Planner</p> <p>Steering Committee members present included:</p> <p>Katy Nesbitt, Natural Resource and Economic Development Director;</p> <p>Paul Karvoski, Emergency Manager/County Fire Chief;</p> <p>Dan Butterfield, Wallowa Lake Irrigation District;</p> <p>Lacey McQuead, Enterprise City Administrator;</p> <p>Toni M. Clary, Lostine City Recorder;</p> <p>Scott McCrae, Wallowa City Council member;</p>	<p>Cynthia Warnock, District Manager Wallowa Co. Soil and Water Conservation District</p> <p>Others:</p> <p>Meghan Dalton, Senior Faculty Research Assistant, Oregon Climate Change Research Institute (OCCRI);</p> <p>Dominique Bachelet, Associate Professor and Senior Researcher, OCCRI</p> <p>Dawn Hert, Eastern Oregon Regional Representative, Oregon Department of Land Conservation and Development</p> <p>Tracy Brostrom, Unit Forester, Oregon Department of Forestry</p>
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Introduction, Minutes, and Meeting Objectives

The meeting was convened at 9:33 by Franz who asked that Katherine facilitate introductions. And review the objectives of the meeting. The meeting began with the presentation by Meghan Dalton and Dominique Bachelet of the Oregon Climate Change Research Institute of the Future Climate Projections Report for Wallowa County. The final objective of the meeting is to review the draft plan and request consensus for submission of the Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan to the Office of Emergency Management within the Oregon Military Department.

OCCRI Future Climate Projection Report for Wallowa County

During the presentation of the report (available in Appendix F of the Wallowa County NHMP update) participants asked questions, made comments and discussed the following topics.

Nils asked about the use of a shorter historical baseline data (a recent past 30-year period) rather than observed temperature change dating back to 1895 that shows a warming trend that for most of eastern Oregon shows warming between 1.5 to 2.0 degree C (2.7 to 3.6 degrees F). Meghan responded that the observed change in temperature averaged for Oregon over that time period it is slightly more than 2.0 degrees Celsius [3.6 degrees F]. She explained that the

reason for using an historical baseline from the recent past using a 30-year time span is to put modeled projected future temperatures in 30-year time spans into context with recent observed temperature changes to compare like time spans.

Katy commented that fire suppression is necessary to mitigate smoke impact on Wallowa residents even though wildfire used to clean up fuels is a benefit to forest health. Dominique agreed and discussed the constraints and benefits surrounding prescribed fire.

Another question related to what was meant by “confidence level” of the projections. Meghan responded that “confidence” is related to the agreement between models. When most models agree there is very high confidence and when a majority of models agree, the researchers have high confidence in the projections of the models. Confidence also relates to the amount of literature on the projection and how well it agrees with these projections. There is higher confidence in temperature change projects rather than in precipitation projections partly due to the natural variability in precipitation. This affects the ability to detect the change in the data.

Scott commented that one impact on people is that due to the numerous wildfire occurrences it is becoming difficult to get insurance on projected wildfire areas. Dominique agreed and noted the provision in European insurance policies of a Climate Change clause, and she agreed with Scott’s further comment about the impact on agriculture and businesses and the need for protection against the risk of damage.

Review of final draft of Wallowa County MJ NHMP

Katherine reviewed Volume I: Basic Plan covering the principle sections of Risk Assessment, Mitigation Strategy, Plan Integration and Implementation. She asked for participants to provide any final corrections or additions.

Scott requested the addition of the Pacific Power and Light substation located in Wallowa along with the city’s two wells.

Katherine asked the Steering Committee members if they agree that the plan can be submitted for review by OEM. All participants agreed.

Katherine reviewed the sequence of events that will lead to a plan Approvable Pending Adoption letter from FEMA and the subsequent adoption by each jurisdiction by simple resolution. This will then result in FEMA’s issuance of and Approval letter.

The meeting adjourned at approximately 11:35 am.

Project documents can be found at this Google Drive link. The link is open to anyone to view.
Google Drive: <https://drive.google.com/drive/folders/1zw6iluuejLmMGIUXBX3bQFxyRcC-SRz?usp=sharing>

Wallowa County Outreach Materials and Media

A public engagement strategy was developed early in the process using the generalized framework illustrated in the graphic below in Figure 12. The details of this strategy were fleshed out during Steering Committee meetings held October 12, 2020, February 22 2021 and April 26, 2021 and executed during the remainder of the process.

Three short surveys were created and distributed by the Steering Committee members to their constituencies. The first survey received 22 responses and the second survey received 17

responses. The third survey was directed to Steering Committee members to collect information on the capacity of jurisdictions and districts to implement mitigation actions.

Three flyers and an informational sheet were prepared and utilized by Steering Committee members to inform constituents during the course of the process. These flyers were posted on the Wallowa County Land Use Planning Department webpage and used by Steering Committee members in their own outreach efforts. In the final months of the process, Wallowa County Land Use Planning Department posted the draft NHMP on its website and solicited comments. A matrix of these comments and the responses to them was compiled and provided to the Steering Committee when the revised draft was presented to the Steering Committee.

All Steering Committee meetings were held via video conference. The links to these videos and all other NHMP update documents (agendas, minutes, drafts, analyses, lists) were available to the Steering Committee members and anyone else they shared the link with through a shared Google Drive managed by the Convener and the Project Manager.

Figure 21. Public Engagement Framework



Figure 3.1: Outreach strategy framework

Figure 22. NHMP Information Sheet



Natural Hazards Mitigation Planning

Natural hazards happen.

Disasters occur when they impact people, property, and the environment.

Statewide Planning Goal 7

Oregon’s Statewide Planning Goal 7, *Areas Subject to Natural Hazards*, directs local governments to adopt comprehensive plans to reduce risk to people and property from natural hazards.

State and Local Hazards Mitigation Planning

DLCD implements Goal 7 in part by maintaining and updating *Oregon’s Natural Hazards Mitigation Plan (NHMP)*.

DLCD also assists cities, counties, tribes, and special districts with drafting, maintaining, and updating their own NHMPs. Through collaboration with state and federal agencies, DLCD can provide access to data, information, and other resources.

What does a Natural Hazards Mitigation Plan do?

A natural hazard mitigation plan describes the hazards a community is most likely to face, identifies their potential impacts on people and property, and establishes a strategy to reduce those impacts.

Integrating information from NHMPs into other plans, programs, policies, and regulations is an important next step for reducing risk before a hazard event.

Is funding available for mitigation planning?

The Federal Emergency Management Agency (FEMA) provides grants for drafting and updating NHMPs. Among other criteria, communities whose NHMPs will expire soon receive priority for assistance from DLCD.

For contacts and more information visit DLCD’s Natural Hazards Mitigation Planning Program web page:

<https://www.oregon.gov/lcd/NH/Pages/Mitigation-Planning.aspx>

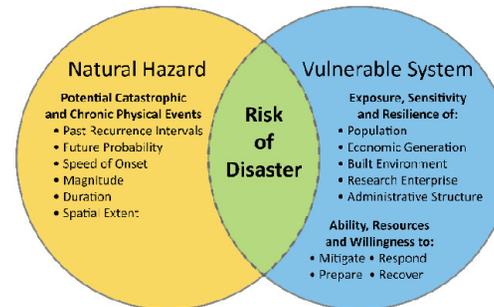
The 2020 Oregon Natural Hazards Mitigation Plan identifies eleven natural hazards in Oregon:

- Coastal Erosion
- Tsunamis
- Droughts
- Earthquakes
- Wildfires
- Floods
- Landslides
- Volcanic Eruptions
- Windstorms
- Winter Storms
- Extreme Heat

Your community may face some or all of these, or other natural hazards. Over time, climate change may influence the frequency and severity of some of these natural hazards. It may also cause your community to experience a natural hazard that has not occurred there before.



Understanding Risk



Modified from USGS Fact Sheet, Understanding Risk and Resilience to Natural Hazards

Disasters occur as an interaction between natural systems, the built environment, and social systems.

We can’t predict when natural hazards will occur or the extent to which they will affect communities. However, with careful planning and collaboration it is possible to reduce the losses that can occur from natural hazards.

Using NHMPs in Comprehensive Planning

With hazard inventory information and risk analysis, goal setting, identification and prioritization of mitigation actions, NHMPs provide information for a city’s or county’s comprehensive plan.

Integrating NHMPs with comprehensive plans, emergency operations plans, stormwater management manuals, and other governance documents helps ensure that hazard mitigation will be considered in decision-making processes and development projects, making communities safer and more resilient.

Figure 23. May 2021 NHMP Public Engagement flyer (2 pages)



***Drought, Floods, Winter Storms, Wildfires...
What Concerns You?***

Communities are stronger when they recognize the risks from natural hazards and make efforts to prepare for them and to reduce potential damage.

Wallowa County's ***Natural Hazards Mitigation Plan*** (NHMP) was part of a four county plan that expired in 2019. Wallowa County is now collaborating with the Oregon Department of Land Conservation and Development (DLCD) to update the NHMP focusing only on Wallowa County, its incorporated cities and special districts. The updated NHMP will return the County's eligibility for disaster related funding.



For more information and to provide comments:
Franz Goebel, Wallowa County Planning Director
Phone: 541-426-7768
Website: <https://co.wallowa.or.us/community-development/land-use-planning/>
Email: plandir@co.wallowa.or.us



The Steering Committee members number a dozen or more, chaired by the County Planning Director, DLCD staff is working with the group to update the NHMP. The NHMP is targeted for completion by November 2021.

Photo credits to Upper left: OregonLive https://www.oregonlive.com/news/2010/06/popular_wallowa_loop_road_clos.html Upper right: Photo in an article by John Marshall, entitled Granite Gulch Fire: A first hand account published in the Wallowa Chieftain August 28, 2019; Lower left Sam Beebe, August 2012 [Wallowa County fire and smoke | Sam Beebe | Flickr](#), and Lower Right: *Leon Werdinger, Northeast Oregon Now* <http://morainecampain.com/index.php>

Wallowa County’s Natural Hazards

- Drought
- Extreme Heat
- Insects, Disease, and Invasive Species/Noxious Weeds
- Floods
- Dam Failure
- Wildfires
- Smoke and Poor Air Quality
- Severe Storms (both winter and summer storms)
- Extreme Cold
- Wind Storms
- Landslides/Debris Flows
- Earthquakes

Wallowa County Natural Hazard Vulnerability Assessment	
Based on the OEM methodology combining factors of History, Probability, Vulnerability and Maximum Threat to assess risk. Further information upon request.	
HAZARD	RISK SCORE
Wildfire	240
Poor Air Quality	233
Windstorms	223
Extreme Cold	196
Insects, disease and invasive species/ noxious weeds	195
Landslides/Debris Flows	193
Severe Storms (Winter snow and summer thunderstorms with hail)	185
Drought	174
Earthquakes	173
Dam Failure	166
Extreme Heat	148
Floods	145

Completed by the Wallowa County NHMP update Steering Committee during steering committee meetings held on February 22, 2021 and April 26, 2021.

Participation

This is a multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) involving representatives from Wallowa County (Planning, Emergency Services and Natural Resources), the City of Joseph, Joseph School District, the City of Enterprise, Enterprise School District, the City of Wallowa, Wallowa School District, the City of Lostine, Wallowa Lake Irrigation District, Wallowa Soil and Water Conservation District, Wallowa County Service District. Representatives from these jurisdictions and other organizations are actively participating in this NHMP update process. Your representative wants to hear from you.

Wallowa County flyer - May 2021 v.2

Figure 24. July 2021 NHMP Public Engagement flyer



Wallowa County Natural Hazards Mitigation Plan Update



July 2021

*Community representatives are working together to update the
Natural Hazard Mitigation Plan for the county*

Wallowa County's Natural Hazards

- Wildfires
- Poor Air Quality
- Severe Storms (both winter and summer storms)
- Windstorms
- Extreme Cold
- Extreme Heat
- Drought
- Insect Pests, Noxious Weeds and Invasive Species
- Floods
- Dam Failure
- Landslides/Debris Flows
- Earthquakes

Participation

This is a multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) involving representatives from Wallowa County (Planning, Emergency Services and Natural Resources), the City of Joseph, Joseph School District, the City of Enterprise, Enterprise School District, the City of Wallowa, Wallowa School District, the City of Lostine, Wallowa Lake Irrigation District, Wallowa Soil and Water Conservation District, Wallowa County Lake Service District. Representatives from these jurisdictions and other organizations are actively participating in this NHMP update process.

Our next meeting will be held September 27th at 9:30 am. See Wallowa County Planning Dept. website for details.

Our work is ready for your review.

Please visit the Wallowa County Planning Website :

<https://co.wallowa.or.us/community-development/land-use-planning/>

To provide comments email:

Franz Goebel, Wallowa County Planning Director

Email: plandir@co.wallowa.or.us or

Katherine Daniel, DLCD Natural Hazards Planner

Email: Katherine.daniel@dlcd.oregon.gov

Figure 25. August 2021 NHMP Public Engagement flyer (2 pages)



Wallowa County Natural Hazards Mitigation Plan Update



August 2021

*Community representatives are working together to update the
Natural Hazard Mitigation Plan for the county*

How do natural hazards affect you? We want to know.

Wallowa County's Natural Hazards

- Wildfires
- Poor Air Quality
- Severe Storms (both winter and summer storms)
- Windstorms
- Extreme Cold
- Extreme Heat
- Drought
- Insect Pests, Noxious Weeds and Invasive Species
- Floods
- Dam Failure
- Landslides/Debris Flows
- Earthquakes



Joseph Canyon fire. Photo by Andy Hayes, Wallowa-Whitman National Forest and published in the Wallowa Chieftain June 7, 2021

Our work is ready for your review.

Please visit the Wallowa County Land Use Planning Website:

[Natural Hazards Mitigation Plan - Wallowa County](#)

To provide comments email:

Franz Goebel, Wallowa County Planning Director

Email: plandir@co.wallowa.or.us or

Katherine Daniel, DLCD Natural Hazards Planner

Email: Katherine.daniel@dlcd.oregon.gov

Participation

How can members of the community participate?

Please visit the Wallowa County Land Use Planning Department website. Here's the link: [Natural Hazards Mitigation Plan - Wallowa County](#)

There you can read and comment on the plan. Right now, we have posted the Community Profile and detailed descriptions of the hazards Wallowa County residents face called the Hazard Annexes. The Basic Plan will be posted in a few weeks.

Who is representing me on the Steering Committee?

This is a multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) involving representatives from Wallowa County (Planning, Emergency Services and Natural Resources), the City of Joseph, Joseph School District, the City of Enterprise, Enterprise School District, the City of Wallowa, Wallowa School District, the City of Lostine, Wallowa Lake Irrigation District, Wallowa Soil and Water Conservation District, Wallowa Lake County Service District. Representatives from these jurisdictions and other organizations are actively participating in this NHMP update process.

Our next meeting will be held September 27th at 9:30 am. See Wallowa County Land Use Planning Dept. website for details if you wish to attend.

Figure 26. Results from Surveys

Wallowa County Natural Hazard Mitigation Plan update

Survey results as of February 18, 2021

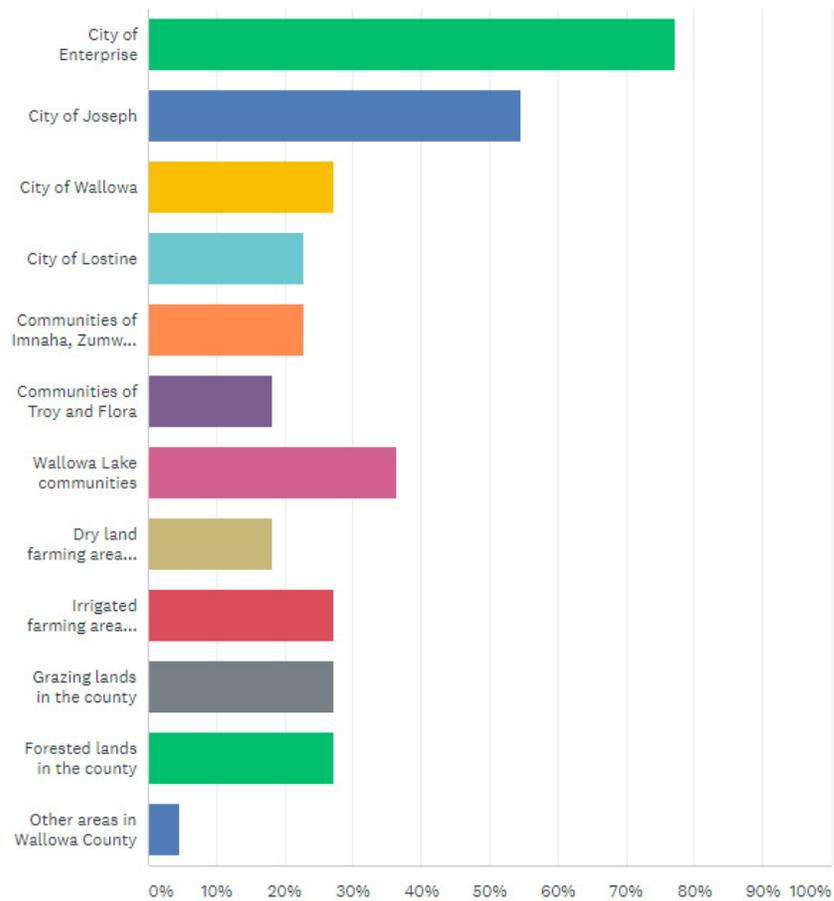
Survey #1

Respondents: 22

Q1:

What places in Wallowa County are you most familiar with?

Answered: 22 Skipped: 0

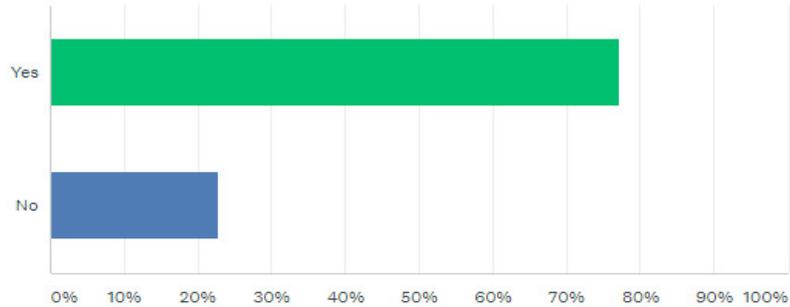


Other area is property abutting Prairie Creek

Q2:

Have you ever been affected by a natural hazard event?

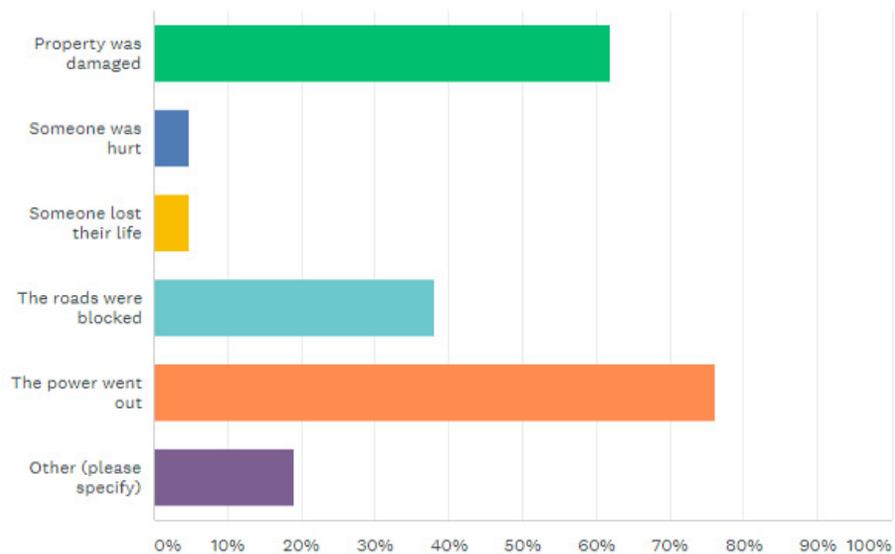
Answered: 22 Skipped: 0



Q3: How were you affected by the natural hazard event?

How were you affected by the natural hazard event?

Answered: 21 Skipped: 1



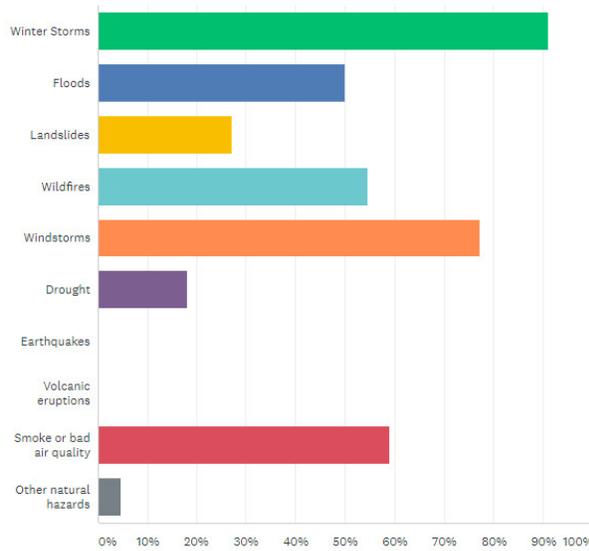
Other:

1. Strong winds removed part of our roof
2. In town: severe T-storms that overwhelm the under engineered storm water drains. Crop/property damage due to severe hail, wind, rain. (I.E. \$100,000 irrigation circle tumbled by fr winter winds) Forestry: fire and drought producing disease, bug, fire loss
3. Alaska Earthquake, 1973?
4. None

Q4: What natural hazards occur frequently in the parts of Wallowa County you are most familiar with?

What natural hazards occurs frequently in the parts of Wallowa County you are most familiar with?

Answered: 22 Skipped: 0



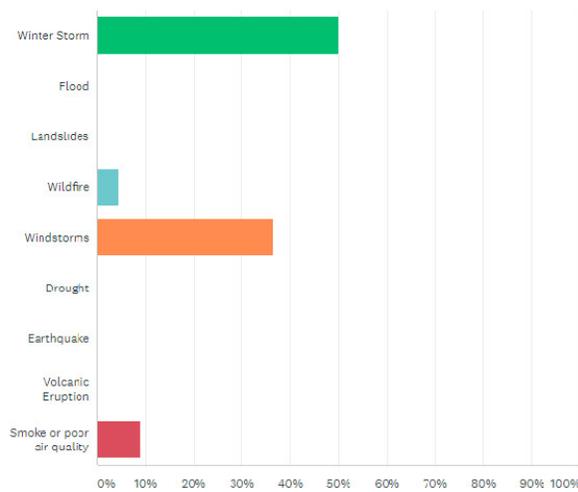
Other:

1. Hail & severe down pours from T-storms

Q5:

Of these natural hazards, which one occurs the most frequently in Wallowa County?

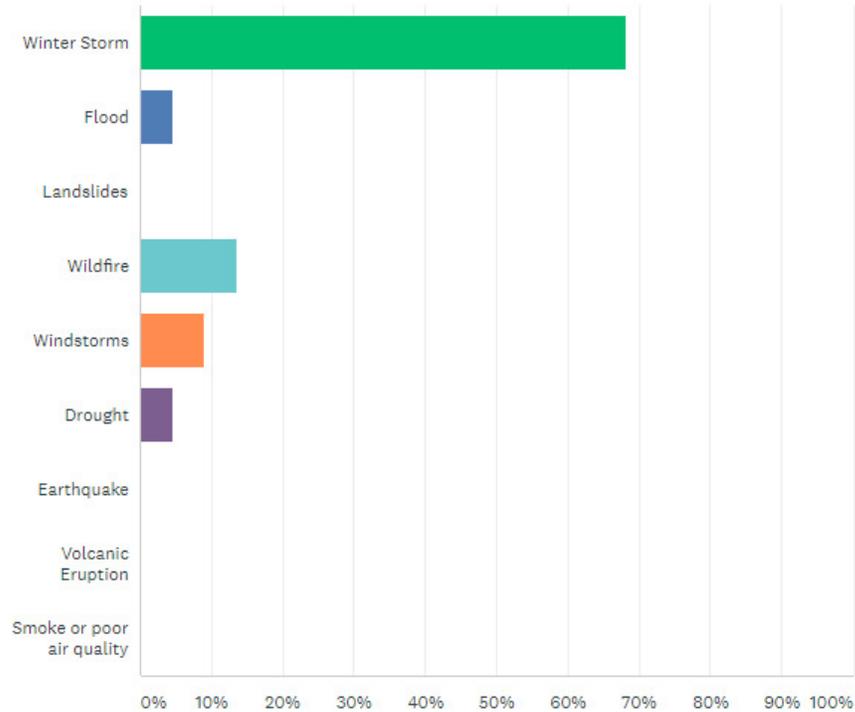
Answered: 22 Skipped: 0



Q6:

Of these hazards, which ones are you most prepared for?

Answered: 22 Skipped: 0



Q7: Can you describe the worst natural hazard event that you remember in Wallowa County?

WILDFIRE

- Grizzly complex wildfires x2
- Troy fire with a Hurricane drainage fire (two fires?)

WINDSTORM

- Various Wind storms over the years especially in Joseph
- Windstorm
- Windstorm thanksgiving 97 or 98
- Wind storm that toppled multiple building and ripped off numerous roofs.
- Wind storms occasionally blow down trees and interupt the power grid.

WINTER STORM

- Heavy snow loads several years back that collapsed many buildings, including a 100 year old barn on my property.
- Severe winter storms
- Winter storms create delays in delivery to the valley
- 2017 Winter
- Snowstorm - roads were closed and power was out.

FLOOD

- Prairie Creek flooding & the flooding of the river entering Wallowa Lake that took out the Boy Scout Camp building
- Flooding down in the Imnaha canyon
- Enterprise flooding 1964,
- Flooding in January 1985,
- Imnaha flooding 1998-1999.
- The flood of 1997

DROUGHT

- Drought, lake level low early August 2006.

BAD AIR QUALITY

- Every summer we get socked in with smoke from around the West

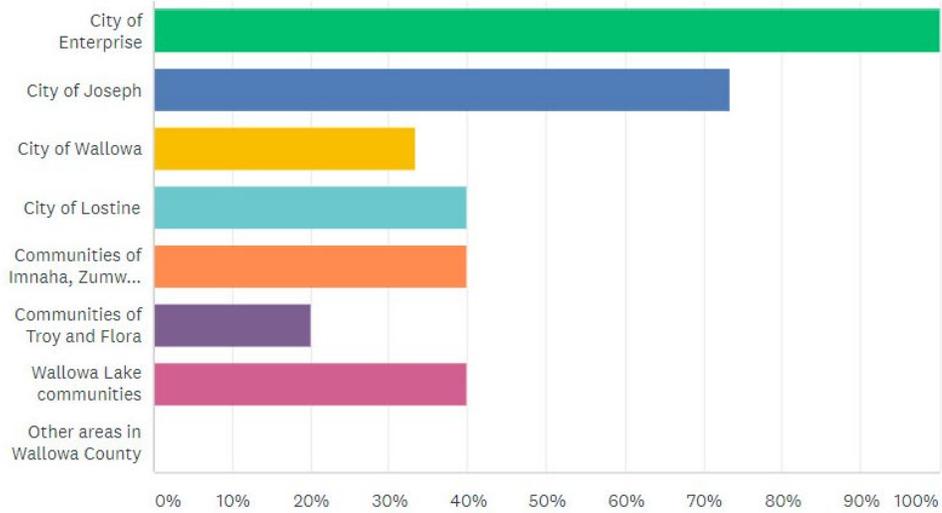
Survey #2

Respondents: 17

Q1:

What communities in Wallowa County are you most familiar with? ...

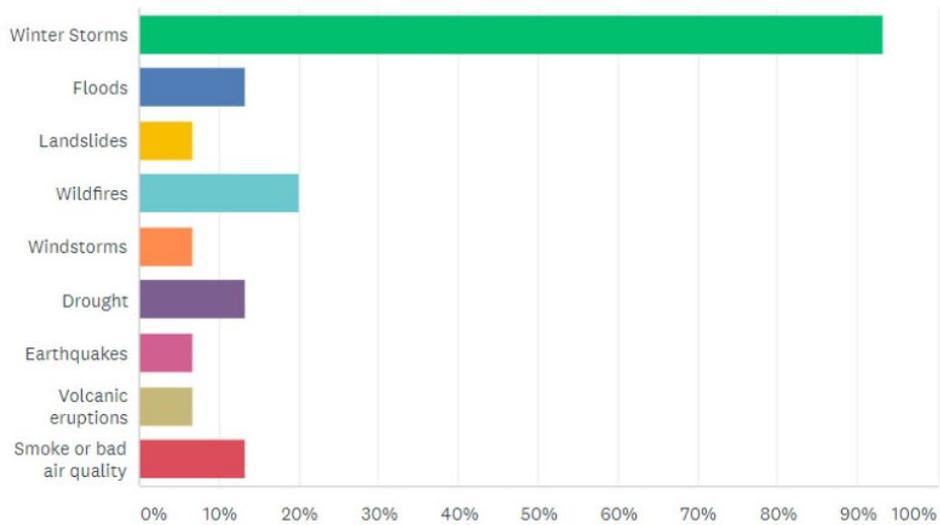
Answered: 15 Skipped: 0



Q2:

Which natural hazards are people most prepared for in the parts of W... ...

Answered: 15 Skipped: 0



Q3: Of those people who are not prepared for the hazard you selected in the question above, what makes them less prepared or more vulnerable to that natural hazard?

Thinking...it can't happen to me.

Lack of knowledge & urgency to have a plan/ be prepared

Lack of knowledge and/or new to community without a support group

A lot of new people that have moved into the County that are not prepared for the types of winters we can have in the County.

Lack of resources x2

Poverty, Poor Health, Advanced Age

Reliance on electricity for heat, and have no secondary heat source

Lack of emergency heat and food

Limited heating and food stores

No back up heat or money to get prepared

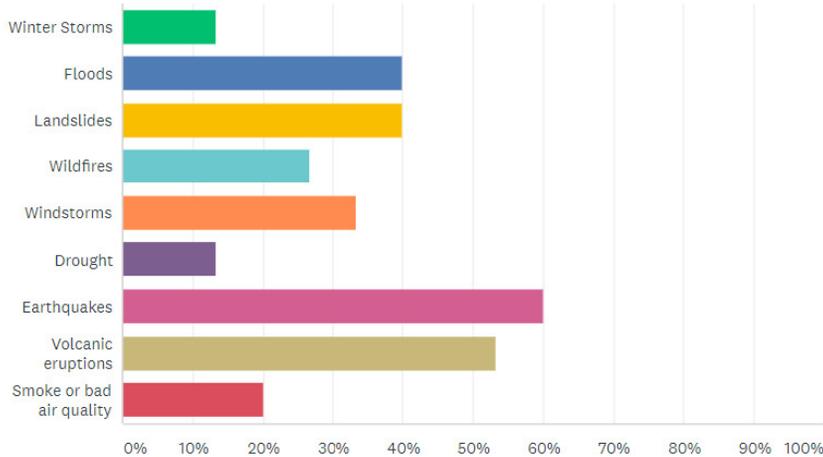
Infrastructure, lack of storage

Wallowa Lake communities are isolated; internet service is spotty. Also, the South part of the Wallowa Lake community is heavily forested and prone to wind blow down. There is only one road into the Southern and Western parts of the Wallowa Lake communities which presents challenges should wildfires threaten the communities.

Q4: Which natural hazards are people least prepared for in the parts of Wallowa County you are familiar with?

Which natural hazards are people least prepared for in the parts of W...

Answered: 15 Skipped: 0



Q5: What makes Wallowa County residents most vulnerable to this natural hazard?

New residents from out of the area. Low risk but extremely high consequences...complacency

They don't happen very often

Lack of occurrences, not a high probability of occurring.

Rare event

Very unlikely

It is not. Very unlikely that is why they are not prepared

Not being prepared and/or not realizing it could happen.

Just lack of experience and preparation

Hard to predict, lack of experience

Lack of USFS management (large government land base & wilderness areas), absentee landowners, neighbors not from a rural/ W.C. aware background

Older population with preexisting conditions

Lack of experience, poverty, poor health, elderly

Lack of resources

The County basically has two ways out.

Q6: Which features of the built environment of Wallowa County may be most vulnerable to natural hazard events? This involves things like buildings, roads, bridges, schools, emergency responder facilities, water systems, dams, energy facilities, cultural, religious and historic places may be vulnerable to natural hazards.

The Wallowa mountains/eagle cap wilderness, the "lake" community, city of Joseph

Wallowa Lake Dam, County/Forest Service Roads

Roads

Roads and workers able to respond

Accessibility based on road conditions

Dam and roads including bridges.

I believe Wallowa Lake Dam is an issue

Wallowa Lake Dam, Power to the community and the Cities water systems.

Age of infrastructure

Buildings, bridges, schools, water systems, dams,

Our schools are ancient and have terrible seismic ratings, along with many buildings in our towns. The dam at Wallowa Lake is in need of repair. There is literally only 2 ways in or out of the County, so the bridges and roads are very vulnerable.

They all could be vulnerable depending on the natural hazard event, what materials the building is made of and location.

Q7: Of the economic drivers of Wallowa County, which are the most affected by natural hazard events? This relates to natural resource based industries like forest products, ranching, farming and tourism, as well as employers like hospitals and health care facilities, small businesses and services.

Fire: forest products, tourism.

Drought: farming/ranching, landslides (i.e. Hwy. 3) infrastructure for forest products, livestock, grain, tourism

Ranching and Farming x5

Forest Products (Wildfire), Beef/Ag (Drought, Windstorm, Flooding etc.),

The southern Wallowa Lake community can be affected by reduced tourism Tourism

Tourism, small businesses

Grocery stores, gas stations

Agriculture, infrastructure related to agriculture

Q8: Which of Wallowa County's natural resources are most vulnerable to natural hazard events and why? The range of natural resources in Wallowa County includes forested land, mineral resources, rangelands, prairies, irrigated and dryland farmland, critical habitat, streams, rivers, and wetlands.

All listed above except, minerals & irrigated farmland. Fire is most devastating to those. Severe storms, drought as well.

Irrigated Farm Land as majority is irrigated by Wallowa Lake Dam

Farmlands

Rangeland, prairies, irrigated and dry land farmland and forested land. Seems like our most common natural hazard is drought or fire.

Forested Land -wildfires, Farmland - flooding, drought, windstorm and

Forest land will take years to recover if ever for production. Habitat for all Wallowa County wildlife.

Fire could impact all of the above

Timber, rangeland, dryland farming for events related to droughts and fires. Irrigated cropland for flooding events.

The forest

forested land, rangeland, streams

Forest Land, Rangelands and waterways

2020 Plan Update Changes

The entire *2014 Northeast Oregon Multi-Jurisdictional NHMP* has been revised and updated. While the basic format of the existing NHMP was retained, substantial changes have been made. Generally, the *Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan* provides updated statistics and attempts to make the document more readable by removing repetition and focusing on the most salient aspects of hazard identification, risk assessment and mitigation actions. The document style has been revised to match other NHMPs prepared by DLCDC beginning with the Tillamook County NHMP so as to make this work recognizable as such.

Cover and Front Pages

The cover and the front pages orient the reader of the NHMP to what the NHMP contains.

- A new NHMP cover was created in the style noted above. Photos relevant to the NHMP were added. Photos were also added to the Volume II, and III covers.
- The FEMA Approval Pending Adoption (APA) and final approval letter as well as the County and Cities resolutions of adoption are included in the final document (when available).
- The Acknowledgements have been updated to include the Wallowa County Steering Committee members.

Volume I: Basic Plan

Volume I includes the cover, approval letters, jurisdictional resolutions, and Table of Contents. It provides the overall plan framework for the *Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan*. It also contains the following sections: Introduction, Risk Assessment, Mitigation Strategy; and Plan Implementation and Maintenance.

Introduction

The Introduction presents the concept of natural hazards mitigation planning and answers the question, “Why develop a mitigation plan?” Additionally, this summarizes the plan update process, and provides an overview of how the plan is organized.

The principle change to this section, as with the entire NHMP, is that the focus on Wallowa County alone has allowed the plan to drill down to focus on the incorporated cities in Wallowa County and the special districts that have joined this multi-jurisdictional plan allowing a more granular view of hazard mitigation in the county. Rather than having separate addenda for the cities and special districts, they are included in the main body of the NHMP. Where applicable, the cities and special district plan holders are specifically called out for their unique situations.

Section 2: Risk Assessment

The Risk Assessment section consists of three phases: natural hazard identification, vulnerability assessment, and risk analysis. Hazard identification involves the identification of hazard geographic extent, its intensity, and probability of occurrence. The second phase combines the information from the hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard, then attempts to predict how different types of property and population groups will be affected by the hazard. The third phase involves estimating the damage, injuries, and costs likely to be incurred in a geographic area over a period of time.

Changes to this section include:

- Format changes to the document to match the style referenced above.
- The incorporation of the information from the cities along with the information concerning Wallowa County to create a cohesive Risk Assessment section.
- Two new hazards were identified by the Wallowa County Steering Committee. Insect Pests, Noxious Weeds and Invasive Species were grouped together and identified as a natural hazard that threatens a portion of the economic base of Wallowa County in agricultural and timber resources. Poor Air Quality was identified as a natural hazard that is related to the topography of the county.
- The natural hazard posed by Extreme Temperatures was further split in to hazards of Extreme Heat and of Extreme Cold. The rationale behind this division was that mitigation actions to minimize the impact of these hazards differ and they may therefore be addressed separately in this plan.
- Hazard identification, characteristics, history, probability, vulnerability, and hazard specific mitigation activities were updated. Discussion of the community Hazard Vulnerability Analysis was moved up to Volume I in the Risk Assessment section. More detailed information about each hazard was moved back to Volume II: Hazard Annexes
- NFIP information was updated.
- The Wallowa County NHMP Steering Committee performed a new Hazard Vulnerability Analysis/Assessment (HVA), resulting in new scores for the identified hazards of drought, earthquake, flood, landslide, winter storms, windstorms, volcanic events, and wildfire.

Section 3: Mitigation Strategy

This section provides the basis and justification for the mission, goals, and mitigation actions identified in the NHMP. Changes to Section 3 include the following:

- The NHMP Steering Committee opted to prioritize mitigation actions as described in the section above, using the HVA risk levels. All the multi-hazard mitigation actions were identified as high priority while hazard specific mitigation actions are high, medium, and low.
- The mission statement and the goals were reviewed and re-confirmed by the 2020 Steering Committee without any changes.
- The mitigation actions from the *2014 Northeast Oregon Multi-Jurisdictional NHMP* were reviewed. Actions were deleted, retained as is, or retained in a modified fashion. New mitigation actions were established.

Section 4: Plan Implementation and Maintenance

The Wallowa County NHMP convener is the Emergency Manager; this person will form and facilitate an Implementation Committee for maintaining, updating, and implementing the NHMP. The Implementation Committee will be composed of members of the NHMP Steering Committee and other members of the community. The Implementation Committee plans to meet formally once per year based on the framework set out in Section 4 Plan Implementation and Maintenance to implement the Mitigation Strategy contained in Section 3 of the Basic Plan.

Volume II: Hazard Annexes

All hazard specific annexes were reformatted and updated to include new history, data, maps, vulnerability information, and resources as available. Cross references to other information in the NHMP has been updated. Information about climate change has been integrated into the hazard specific annexes and added as Appendix D: Future Climate Projections Reports.

Volume III: Mitigation Resources

All of the appendices have been revised and updated to focus uniquely on Wallowa County and its incorporated cities. The appendices have been reorganized slightly placing the Community Profile in Appendix A and the Action Items in Appendix C to follow a more logical progression. Data contained in the Community Profile has been updated with the most recent census information. Appendix D now contains the Future Climate Projection Wallowa County report prepared by OCCRI while the Appendix previously titled Economic Analysis of Natural Hazards has been located in Appendix E and covers a method of evaluating mitigation actions based on benefit/cost analysis. The remaining appendix includes resources for hazard mitigation grants and program resources. The appendix containing the Regional Household Preparedness Survey was deleted because it was no longer relevant.

APPENDIX C: ACTION ITEM WORKSHEETS

The following table list the Mitigation Action item numbers, the lead and supporting plan holding jurisdictions or special districts and the page where the Action Worksheet is located. Each Action Item Worksheet provides areas to rank Priority Level, Capacity Level, Timeline and Status as determined by the members of the 2021-2022 Wallowa County NHMP Steering Committee. Those details which were not determined during the 2021-2022 update process should be addressed during the plan maintenance phase.

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 1 – Incorporate the Natural Hazards Mitigation Plan into the Comprehensive Plan (in particular Goal 7)	Goal 4	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Wallowa County Comprehensive Plan, City of Enterprise Comprehensive Plan, City of Joseph Comprehensive Plan, City of Wallowa Comprehensive Plan, City of Lostine Comprehensive Plan			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The vision, goals, and policies of the comprehensive plan are routinely implemented through other local planning instruments such as zoning ordinances, subdivision regulations, and capital improvement programs. Integrating hazard mitigation into the local comprehensive plan establishes resilience as an overarching value of a community and provides the opportunity to continuously manage development in a way that does not lead to increased hazard vulnerability. • The Natural Hazards Mitigation Plan’s current actions have no regulatory or statutory requirements for compliance. Incorporating the NHMP into the Comprehensive Plan would give the NMHP ‘teeth.’ • The Disaster Mitigation Act of 2000 requires that mitigation plans provide a comprehensive range of actions and projects to mitigate against natural hazards [201.6(c)(3)(ii)], such as actions that protect natural resources. Encouraging the implementation of existing action items with the Comprehensive Plan will help to ensure that the actions are implemented. 			
Ideas for Implementation:			
<ul style="list-style-type: none"> • The Wallowa County Natural Hazards Mitigation Plan intends to adopt the Wallowa County Multi-Jurisdictional NHMP 2022 update as an amendment to the Comprehensive Plan Goal 7 element. The intent to incorporate the document by appending it to the Comprehensive Plan is one way to accomplish that. Another method is to incorporate excerpts of the Wallowa County Multi-Jurisdictional NHMP 2022 update into the Goal 7 element of the Comprehensive Plan itself. • The City of Enterprise was awarded \$50,000 in order to update the city’s Comprehensive Plan. The range of elements that will be updated has yet to be defined but will likely encompass incorporation of the Wallowa County Multi-Jurisdictional NHMP 2022 update into that overarching plan for the city’s development. 			

<ul style="list-style-type: none"> Other city administrators and planners will be encouraged to adopt the NHMP as an amendment to the cities' Comprehensive Plans Goal 7 element. The DLCD Technical Assistance Grants which are usually offered every biennium can assist in defraying the additional costs such as staff time and cost of notification that fall to jurisdictions to accomplishing updates to Comprehensive Plans. 		
Coordinating Organization:	Wallowa County Land Use Planning Department; City Councils	
Internal Partners:	External Partners:	
Board of Commissioners, Natural Resources Director and Advisory Committee, City administrators and planners in Enterprise, Joseph, Wallowa and Lostine	Department of Land Conservation and Development, Oregon Office of Emergency Management, Federal Emergency Management Agency	
Potential Funding Sources:	Estimated cost:	Timeline:
Potential DLCD grant for noticing requirements, e.g. TA Grants offered biennially; HMGP 7% funds		Short Term, 1-3 years
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Retained from 2014 NE OR NHMP	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 2 - Post the Continuity of Operations Plan (COOP) on the Emergency Management webpage.		Goal 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County Continuity of Operations Plan				
Background and Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> The Continuity of Operations Plan (COOP) was prepared for the county and the Steering Committee intends to make this document publicly available. Government is a principal employer in Wallowa County and makes up over 16% of the civilian workforce in the county¹. City and County services in Wallowa County are typically concentrated in one central building; should an earthquake or any other natural disaster interrupt the functioning of these buildings, county or municipal operations would cease to function. A Continuity of Operations Plan establishes policy and guidance to ensure the execution of the organization's most essential functions in any event that requires the relocation of selected personnel and functions to an alternate facility.² Research has shown that staff turnover is likely to occur after a disaster, and veteran staff is critical after a disaster. Developing a Continuity of Operations Plan will address staff turnover so that existing personnel do not have to take on extra responsibilities during an already stressful time. In addition, continuity planning can help encourage staff retention by reducing the amount of stress that staff may have to endure during a disaster.³ Wallowa County has created a redundant infrastructure network to maintain services; some historic archives are not included. 				

¹ US Census, 2019 ACS data Table DP03 [Census - Table Results](#)

² Oregon Natural Hazards Workgroup (ONHW). Cannon Beach Case Study Report. July 2006. Community Service Center, University of Oregon. Eugene, OR.

³ Ibid.

<ul style="list-style-type: none"> Enterprise has begun work on a Citycounty Insurance, Agility Recovery Solutions plan which provides recovery planning similar to a COOP. More information can be found at the Citycounty Insurance website: http://www.cisoregon.org/ 		
Ideas for Implementation:		
Posting is possible because the county has contracted with a webmaster who can assist the Emergency Services Department.		
Coordinating Organization:	Wallowa County Emergency Services	
Internal Partners:		External Partners:
Webmaster; Wallowa County Land Use Planning Department; Natural Resources Director and Advisory Committee, Cities and School Districts		Oregon Office of Emergency Management
Potential Funding Sources:	Estimated cost:	Timeline:
		Short term 1-3 yrs
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	New Action	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
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.		Goal 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input checked="" type="checkbox"/> Enterprise School District <input checked="" type="checkbox"/> Joseph School District <input checked="" type="checkbox"/> Wallowa School District	<input checked="" type="checkbox"/> Wallowa Lake County Service District <input checked="" type="checkbox"/> Wallowa Lake Irrigation District <input checked="" type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallow County Multi-Jurisdictional Natural Hazard Mitigation Plan				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> The turnover for public officials in Wallowa County is relatively high; new council members or board members may want to be briefed about community capacity, existing plans and policies, and personnel capabilities. Before a crisis occurs, public officials can prepare communities, risk managers, government spokespersons, public health officials, the news media, physicians, and hospital personnel with appropriate messages that can help build public confidence in public officials and the measures they recommend. The Disaster Mitigation Act of 2000 requires that the Natural Hazard Mitigation plan includes a method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle [201.6(c)(4)(i)]. When public officials are more informed about the mitigation plan, it is more likely that the plan will be implemented and maintained on a regular basis, and that any methods and schedules for monitoring, evaluating, and updating the plan are continued. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Develop public official information kit that can be distributed to elected officials and community decision makers. The kit should include pertinent information regarding the Natural Hazards Mitigation Plan as well as other relevant information. Publicize annual meetings to update the Natural Hazards Mitigation Plan mitigation strategy and send a copy to public officials. Create a brief memo for public officials that lists pertinent information regarding the Natural Hazards Mitigation Plan. Within the memo, create a list of persons involved in developing and/or implementing the plan, prioritized mitigation actions, and funding source descriptions. 				

<ul style="list-style-type: none"> • Bring mitigation awareness training to county planning and public works staff, GIS technicians, and persons responsible for maintaining or implementing the Natural Hazards Mitigation Plan. • Provide a presentation to relevant public officials and the community regarding the specifics of the Natural Hazard Mitigation Plan. This annual outreach to public officials could occur prior to the annual update meeting of the Steering Committee. 		
Coordinating Organization:	Wallowa County Steering Committee Convener (Wallowa County Planning Director)	
Internal Partners:	External Partners:	
Wallowa County Board of Commissioners, Wallowa County Land Use Planning Department; City administrators and city council members	Oregon Department of Land Conservation and Development	
Potential Funding Sources:	Estimated cost:	Timeline:
		Short Term, 1-3 years
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Ongoing	

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 4 – Integrate education and outreach programs into ongoing services to increase awareness of the risk associated with natural hazards. Specifically engage vulnerable people.	Goals 1 & 3	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Goal 1 element of Comprehensive Plans			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Build and capitalize upon the self-sufficiency and individual capacity of Wallowa County residents. • Engage with community organizations that serve elderly or disadvantaged populations who are concerned with the transportation and services available to special-needs groups • Elderly individuals require special consideration due to their sensitivities to heat and cold, their reliance upon transportation for acquiring needed medications, and their comparative difficulty in making home modifications that reduce risk to hazards. • Engage with community organizations that serve young people in Wallowa County. Young people represent a vulnerable segment of the population. At least 15% of the population is within the 0-14 year age range. Special considerations should be given to younger populations and schools, where children spend much of their time, during the natural hazard mitigation process. Children are more vulnerable to heat and cold, have fewer transportation options, and require assistance to access medical facilities. • The Disaster Mitigation Act of 2000 requires that communities continue to involve the public beyond the original planning process [201.6(c)(4)(iii)]. Developing a public education and outreach strategies to raise awareness of the risk natural hazard pose will help to keep the public informed of, and involved in, awareness of natural hazards and potential mitigation activities the public can implement. Targeting vulnerable populations and organizations that help people with special needs will help to reduce the impact of a natural hazard event on these populations. • Public education and outreach can be inexpensive and can provide information that result in safer households, workplaces, and public areas. Some outreach materials include informational brochures about community seismic risks and mitigation techniques, public forums, newspaper articles, training classes and television advertisements. 			

<ul style="list-style-type: none"> Mitigation is a shared responsibility between local, state, and federal government; citizens; businesses; non-profit organizations; and others. Informing the public of their role in a community’s mitigation efforts not only increases the public’s awareness of a community’s hazard risks, but also helps a community reduce its risk to the hazards addressed by the Natural Hazard Mitigation Plan. Targeting vulnerable populations and organizations that help people with special needs will also help to reduce the impact of a natural hazard event on these populations. 		
Ideas for Implementation:		
<ul style="list-style-type: none"> Consider developing a closer connection with the Chamber of Commerce; 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. Develop and distribute Natural Hazard Community Resource Maps and risk reduction tips that include instructions about how to prepare and reduce risks posed by natural hazards. Research ways to create and disseminate a message that will cause people to act to reduce individual risk. Target education and outreach actions to reach marginalized populations. Bring emergency management and response training to community organizations, such as Head Start and Community Connections. Create mailing packet with hazard-specific information on impacts of hazards, mitigation activities and preparedness Determine which media avenue is most effective for local outreach, mailings, posters, flyers, radio, local TV, presentations by local officials, etc. Print relevant hazard-related articles in local newspaper and other local publications with tips on mitigation actions. Have informational brochures and packets available at identified partner’s office locations. Work with FireWise program to provide Fire-wise brochures in the spring to raise awareness about wildfire. 		
Coordinating Organization:	Wallowa County Land Use Planning Department	
Internal Partners:	External Partners:	
Wallowa County Emergency Services; Wallowa County Natural Resource Advisory Committee	Chambers of Commerce, County Extension Office, Community Connections of Northeast Oregon, Wallowa Resources	
Potential Funding Sources:	Estimated cost:	Timeline:
CTP through FEMA		Medium (3-10 years)
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Ongoing	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 5 – Increase the resilience of small businesses to natural hazards		Goals 1, 2, 3 & 4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> To encourage and equip small businesses to rebuild post-disaster. Wallowa County recognizes the importance of local businesses as essential to the community. Several local businesses are named as Essential Facilities in the 2022 Wallowa County MJ NHMP. The Steering Committee recognizes that they need to explore what it means to increase resilience for small business following the county’s experience with the COVID-19 pandemic. The prevalence of small businesses in Wallowa County is an indication of sensitivity to natural hazards because small businesses are more susceptible to financial uncertainty. When a business is financially unstable before a natural disaster occurs, financial losses (resulting from both damages caused and the recovery process) may have a bigger impact than they would for larger and more financially stable businesses. The professional and business services sector is sensitive to a loss of power from a disaster and to disruptions of physical transmission cables (phone lines, etc.). There may also be a disruption of employees’ ability to work as a result of damages/problems at home. If prepared and organized, however, this sector has the potential to have moderate resilience to many disasters. Business continuity plans assist businesses in determining appropriate insurance coverage, review lease stipulations, mitigate against potential risks, and plan for future recovery efforts. (Source: Alesh, Daniel J. et al. 2001. “Organizations at Risk: What Happens When Small Businesses and Not-for-Profits Encounter Natural Disasters,” The Public Entity Risk Institute). The Disaster Mitigation Act of 2000 requires communities to identify a comprehensive range of actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)], such as actions that educate the public and raise awareness. Assisting businesses to be more disaster resilient will help reduce the impact of a natural hazard events on local businesses and will help them to bounce back faster after a natural hazard event. 				

Ideas for Implementation:		
<ul style="list-style-type: none"> • Encourage small businesses to develop business continuity plans. • Develop a program to provide businesses with post-disaster consult and assistance. For example, Union County maintains a 'Contact Committee' composed of Union County Commissioners, the La Grande City Mayor, UCEDC, NEOEDD, Eastern Oregon University (Annette Johnson and Tim Seydel), OTEC, and Oregon State Employment. When new businesses enter the region, they may use the contact committee for assistance, help in finding loans, etc. Each person/group on this committee is in a position to offer help, and members are bound to confidentiality. • Hold community workshops on business hazard preparation and business continuity planning. 		
Coordinating Organization:	Wallowa County Economic Development Director; Northeast Oregon Economic Development District	
Internal Partners:	External Partners:	
Wallowa County Chamber of Commerce	Regional Solutions Team	
Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Retained	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 6 - Inform the public about the countywide alert system.		Goals 1 & 4	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County Emergency Operations Plan				
Rationale for Proposed Action Item:				
<p>In July 2021 the State of Oregon began operating a new emergency alert notification system called OR-Alert through the EverBridge system. The system enables real-time sharing of hazard information and allows emergency managers to access FEMA notification tools that issue messaging to all cell phones in a geographic area. Twenty-six of Oregon’s 36 counties are using this system.</p> <p>Among the challenges to creating a countywide alert system in Wallowa County are the extensive areas with poor or no cell phone coverage.</p>				
Ideas for Implementation:				
<ul style="list-style-type: none"> The County has recently contracted for webmaster services and can facilitate implementation of this action. At this writing the EverBridge system is new to the Emergency Services Department and will be rolled out to the public in the near future. The Emergency Manager will also receive support from staff members within the City of Enterprise as appropriate during the outreach effort. Specific understanding and experience with the EverBridge system will aid in creating an effective notification system for the whole county. Flyers might be created for use in the effort to encourage people to sign up for the EverBridge system. 				
Coordinating Organization:		County Emergency Services Department		
Internal Partners:		External Partners:		

Webmaster, County Land Use Planning Department, Wallowa County Natural Resource Advisory Committee; City Administrators		Oregon Office of Emergency Management	
Potential Funding Sources:		Estimated cost:	Timeline:
			Short, 1-3 years
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	Ongoing New Action		

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 7 – Communicate to the public about area facilities that can serve as refuge for severe weather, extreme heat/cold, or poor air quality hazard events.		Goal 1	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County Emergency Operations Plan				
Rationale for Proposed Action Item:				
<p>Communicating with the public about facilities that are available for refuge during natural hazard events can be connected to the importance of signing up for OR-Alerts through the EverBridge system. The ability to receive information during an emergency could serve to promote signing up for the alerts.</p> <p>Facilities have been identified by Wallowa County Emergency Services and Memorandum of Understanding (MOU) agreements are in place with area organizations and transportation arrangements are in place to provide refuge during natural hazard events. Other jurisdictions may want to discuss how to house vulnerable people during a natural hazard event.</p> <p>Interior renovations and improvements to HVAC systems are currently being implemented in Cloverleaf Hall in Enterprise.</p>				
Ideas for Implementation:				
<p>Each city might consider what buildings could locally serve as places of refuge during natural hazard events. This action may be implemented by creating a flyer with contact information for local places of refuge that can be circulated at the library or the post office.</p> <p>In the City of Wallowa consideration for what buildings should be identified as places of refuge should include consideration of the periodic need to house firefighting crews as well.</p>				
Coordinating Organization:		Wallowa County Emergency Services Office		
Internal Partners:		External Partners:		
Webmaster; Fairgrounds/Cloverleaf Hall; Wallowa County Board of Commissioners		Oregon Office of Emergency Management; Red Cross, Wallowa Memorial Hospital		

Potential Funding Sources:		Estimated cost:	Timeline:
			Short term, 1-3 years
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	Ongoing		

MH 8 - Encourage communication between the Board of Commissioners and the USFS to maintain access along Forest Service Road 39 when it is passable.		<input checked="" type="checkbox"/> High	<input type="checkbox"/> High
		<input type="checkbox"/> Medium	<input type="checkbox"/> Medium
		<input type="checkbox"/> Low	<input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County	<input type="checkbox"/> Enterprise School District	<input type="checkbox"/> Wallowa Lake County Service District	
<input type="checkbox"/> City of Enterprise	<input type="checkbox"/> Joseph School District	<input type="checkbox"/> Wallowa Lake Irrigation District	
<input type="checkbox"/> City of Joseph	<input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa County Soil and Water Conservation District	
<input type="checkbox"/> City of Wallowa			
<input type="checkbox"/> City of Lostine			
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
Improve third route out of the county by encouraging collaboration with the USFS to maintain FS 39. The road is only passable for a portion of the year and this accessibility is dependent on road condition.			
Ideas for Implementation:			
Coordinating Organization:	Board of Commissioners		
Internal Partners:		External Partners:	
Wallowa County Emergency Services Office; Wallowa County Public Works, Road Maintenance		USFS	
Potential Funding Sources:		Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:			

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 9 - Verify funding needs and sources for construction of the emergency access road at the south end (the head) of Wallowa Lake.		<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<p>Wildfire potential is high. There are periodic rock falls along the Joseph-Wallowa Lake Hwy. Public comment on the plan drew reference to the seasonally high density of visitors to the Wallowa Lake community and the need to consider them in this plan.</p> <p>The area attracts a large number of visitors in the spring, summer and fall.</p> <p>Respondents to surveys about natural hazard event impacts expressed concern about visitors driving campers and towing trailers and boats along potentially unfamiliar roads particularly when considering an evacuation plan for the area.</p> <p>There is a single access road from Joseph along the eastern side of Wallowa Lake to the southern end of the lake where the small community has formed around the Wallowa Lake State Park and a number of vacation rentals and businesses. A second road runs along the western side of the lake, but there is no connection between the two for emergency egress.</p> <p>Oregon State Parks and Recreation Department (OPRD) purchased the missing piece of land connecting the two roadways moving this action forward.</p> <p>Local approvals needed?</p> <p>Funds for construction will be needed provided local approvals are granted.</p>			
Ideas for Implementation:			

Coordinating Organizations:	County Board of Commissioners and Oregon Parks and Recreation Dpt.	
Internal Partners:	External Partners:	
County Land Use Planning Department; Planning Commission		
Potential Funding Sources:	Estimated cost:	Timeline:
FEMA BRIC funding		
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	New Action	

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 10 – Evaluate which critical airport services are available in the event of an emergency and identify limitations to service.	Goal 1 & 3	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • The action item is intended to focus on identifying services available at Wallowa County Essential Facility airports and identifying weak points for each. Inventory categories might include types of fuel available, adequacy of fuel supply systems, limitations to access for aircraft, appropriate lighting, functioning weather services, ground-access to the airport, and safe runways/taxiway infrastructure. • Both the Joseph State Airport and the Enterprise Municipal Airports could provide alternative access to the Wallowa Valley should ground transportation be interrupted on the county’s limited evacuation routes. • Air transport is the fastest way to deliver emergency supplies, medical personnel, and law enforcement. • Aircraft are dependent on sufficient landing runways and the availability of fuel. Night landings require adequate lighting and inclement weather requires full time operation of the Automated Weather Observation System (AWOS). Snow removal is essential for safe operations. • What role have the airports in the Critical Facilities list played in providing medical services to critically ill patients? Which serve as bases for wildfire fighting operations? • What are communication services the county airports perform? 			
Ideas for Implementation:			
<p>Work with USFS, the City of Enterprise and the Joseph Airport to catalogue facilities and fuels available at the airports and airstrips within the county. Including small airstrips in the more remote areas of the county not currently identified in the Critical Facilities list.</p> <p>Identify gaps in facilities and materials required for operation during natural hazard events and in emergency rescues.</p>			

Coordinating Organization:	County Emergency Services		
Internal Partners:	External Partners:		
City of Enterprise; Oregon Dept. of Aviation	USFS, FAA, LifeFlight		
Potential Funding Sources:	Estimated cost:	Timeline:	
		Medium 3-10 yrs.	
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	Revised; Action previously focused only on Grant County Airport		

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
MH 11 - 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.		Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
The Steering Committee clarified the previous mitigation action correcting reference to the ODOT bridge on OR-82. There is no flooding at that bridge, but at a bridge along a local road. Residence Street. The road serves as a primary evacuation route.				
Ideas for Implementation:				
Coordinating Organization:		City of Enterprise Public Works		
Internal Partners:		External Partners:		
County Emergency Services				
Potential Funding Sources:		Estimated cost:	Timeline:	
Form Submitted by:		Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:		Revised; Action previously referred to the ODOT bridge in Enterprise along OR-82.		

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
DR 1 – Identify incentive programs to increase water efficiency among agricultural water users		Goal 1 & 4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input checked="" type="checkbox"/> Wallowa Lake Irrigation District <input checked="" type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				

<ul style="list-style-type: none"> • The probability that Wallowa County will experience future droughts is high;1985-1997 was a dry period capped by statewide droughts in 1992 and 1994 (1992 drought emergency declaration). Negative externalities included forest-fires and insect problems. 2001, 2003, 2005, 2007, and dates saw declarations of a local drought emergency declared in Wallowa County. • Wallowa describes the community’s vulnerability to drought as moderate (i.e. 1 to 10% of the population or assets will be affected by a major drought emergency or disaster) • A strong water conservation incentive program helps to raise public consciousness and participation in water saving practices, habits, and lifestyles. • Drought can affect all segments of a jurisdiction’s population, particularly those employed in water-dependent activities such as agriculture, hydroelectric generation, or recreation. Facilities affected by drought conditions include communications facilities, hospitals, and congregate housing facilities that are subject to power failures. Storage systems for potable water, sewage treatment facilities, water storage for firefighting, and hydroelectric generating plants also are vulnerable. • Water-efficiency measures can reduce water and sewer costs by up to 30%. Significant savings in energy, chemical and maintenance expenses are also possible. The typical payback period is three to seven years. Some general benefits of water conservation include energy savings (by using less energy for heating, pumping, and treating water), financial savings, less wastewater, and environmental benefits including increased water availability to local streams, wetlands, and the natural inhabitants of both environments. • The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of a hazard on the community [201.6(c)(3)(ii)], such as actions protecting natural resources. Installing water efficient devices can significantly reduce the impact of drought by conserving the critical water resources in the community. 	
Ideas for Implementation:	
<ul style="list-style-type: none"> • 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 Master working with the ditch companies. • Create a water-conservation committee within interested counties and/or cities to develop incentive programs, educational programs, and voluntary and/or mandatory restrictions on water use. • Distribute conservation literature along with the regular mailing of bills. Local service organizations can be asked to disseminate water conservation promotional information. • Investigate water pricing schemes (i.e., peak pricing and excess use charges) that discourage water use. • Speak to local civic organizations (Boy Scouts, volunteer fire companies, etc.) on water conservation and suggest the sale of water-saving devices as a fund-raising activity. 	
Coordinating Organization:	County Water Master, Wallowa County Soil and Water Conservation District, USDA Natural Resources Conservation Service
Internal Partners:	External Partners:

Wallowa Lake Irrigation District, Relevant utility companies, county public works departments, ditch companies, landowners, Wallowa Resources		Fresh Water Trust U.S. Environmental Protection Agency’s WAVE (Water Alliances for Voluntary Efficiency) program ⁴	
Potential Funding Sources:		Estimated cost:	Timeline:
			Ongoing
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	Ongoing		

⁴ U.S. EPA WAVE program is a non-regulatory water-efficiency partnership that encourages commercial businesses and institutions to reduce water consumption while increasing efficiency, profitability, and competitiveness

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
DR 2 – Ensure that cities in Wallowa County have Water Management Plans or are developing them to increase water use efficiency among municipal water users.		Goal 1 & 4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> • The probability that Wallowa County will experience future droughts is high; 1985-1997 was a dry period capped by statewide droughts in 1992 and 1994 (1992 drought emergency declaration). Negative externalities included forest-fires and insect problems. 2001, 2003, and 2005 saw declarations of a local drought emergency declared in Wallowa County. • Wallowa County NHMP Steering Committee participants described their vulnerability to drought as moderate (i.e. 1 to 10% of the population or assets will be affected by a major drought emergency or disaster) • A strong water conservation incentive program helps to raise public consciousness and participation in water saving practices, habits and lifestyles. • Drought can affect all segments of a jurisdiction’s population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Facilities affected by drought conditions include communications facilities, hospitals, and congregate living facilities that are subject to power failures. Storage systems for potable water, sewage treatment facilities, water storage for firefighting, and hydroelectric generating plants also are vulnerable. • Water-efficiency measures can reduce water and sewer costs by up to 30%. Significant savings in energy, chemical and maintenance expenses are also possible. The typical payback period is three to seven years. Some general benefits of water conservation include energy savings (by using less energy for heating, pumping, and treating water), financial savings, less wastewater, and environmental benefits including increased water availability to local streams, wetlands, and the natural inhabitants of both environments. • The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of a hazard on the community [201.6(c)(3)(ii)], such as actions protecting natural resources. Installing water efficient devices can significantly reduce the impact of drought by conserving the critical water resources in the community. 				

<ul style="list-style-type: none"> The Wallowa Lake community may have water availability concerns 		
Ideas for Implementation:		
<ul style="list-style-type: none"> The original action focused on identifying incentive programs to increase water use efficiency among municipal water users. The Wallowa County Steering Committee revised it to incorporate the on-going water management planning efforts. Create a water-conservation committee within interested counties and/or cities to develop incentive programs, educational programs, and voluntary and/or mandatory restrictions on water use. Distribute conservation literature along with the regular mailing of bills. Local service organizations can be asked to disseminate water conservation promotional information. Investigate water pricing schemes (i.e., peak pricing and excess use charges) that discourage water use. Initiate a water conservation program in high-use facilities such as schools and colleges, hospitals and institutions, involving a retrofit of existing plumbing fixtures with water saving models and the dissemination of water conservation literature. Promote a campaign of household leak detection. Provide leak detection tips on billing cards. Distribute dye tablets to customers to encourage toilet leak checks. Direct meter readers to inform customers with unusually high recorded use to check for household water leaks. Speak to local civic organizations (Boy Scouts, volunteer fire companies, etc.) on water conservation and suggest the sale of water-saving devices as a fund-raising activity. Encourage the wise use and management of water during peak use summer periods by restricting lawn/garden watering to non-daylight hours. The cities should provide technical support; the relevant local electric companies should provide water efficiency apparatus (e.g. OTEC has water efficiency programs such as a water efficient shower head). Encourage Wallowa Lake to improve water conservation during droughts 		
Coordinating Organization:	Participating Cities	
Internal Partners:	External Partners:	
City Public Works Departments (Enterprise, Lostine, Joseph and Wallowa), Wastewater treatment facilities, Wallowa Lake County Service District,	U.S. Environmental Protection Agency's WaterSense (Water Alliances for Voluntary Efficiency) program ⁵	
Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Revised and Ongoing	

⁵ U.S. EPA WaterSense program is a non-regulatory water-efficiency partnership that encourages commercial businesses and institutions to reduce water consumption while increasing efficiency, profitability, and competitiveness

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
DR 3 – Develop community drought emergency plans and policies		Goal 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input checked="" type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input checked="" type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
<p>Rationale for Proposed Action Item:</p> <ul style="list-style-type: none"> The probability that Wallowa County will experience future droughts is high; 1985-1997 was a dry period capped by statewide droughts in 1992 and 1994 (1992 statewide drought emergency declaration). Negative externalities included forest-fires and insect problems. 2001, 2003, and 2005 saw declarations of a local drought emergency declared in Wallowa County. Drought has the potential to effect micro hydro power in Wallowa County Drought can affect all segments of a jurisdiction’s population, particularly those employed in water-dependent activities such as agriculture, hydroelectric generation, and recreation. Facilities affected by drought conditions may include communications facilities, hospitals, and congregate living facilities that are subject to power failures. Storage systems for potable water, sewage treatment facilities, water storage for firefighting, and hydroelectric generating plants also are vulnerable. Wallowa County NHMP Steering Committee members described their vulnerability to drought as moderate (i.e. 1 to 10% of the population or assets will be affected by a major drought emergency or disaster) The Disaster Mitigation Act of 2000 requires communities to identify comprehensive actions and projects that reduce the effects of hazards on the community [201.6(c)(3)(ii)], such as actions addressing emergency services. Developing community drought emergency plans and policies will help the community to prepare for future drought events and reduce any impact of a future drought. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Review existing plans and look for improvement opportunities Identify new and/or build upon existing emergency water supplies Develop emergency water surcharge schedule rules 				

<ul style="list-style-type: none"> • Adopt orders, rules, and regulations for the purpose of implementing and enforcing the provisions of any Executive Orders issued pertaining to a drought emergency. • Impose restrictions upon the non-essential use of water including the use of water conservation devices, as may be necessary. • Encourage cities without a water curtailment plan/and or drought emergency plan to produce one • Inform public of drought conditions via newspaper and/ or local radio advertisement • Develop education strategies regarding conservation for elementary school students 		
Coordinating Organization:	Wallowa County Natural Resource Director and Advisory Committee; Wallowa County Water Master	
Internal Partners:	External Partners:	
Wallowa Resources, County and City Governments, County and City Planning Departments, Public Works Departments, Enterprise, Wallowa Lake County Service District, Natural Resources Conservation Service	Relevant Irrigation Districts, OSU Extension Office, United State Department of Agriculture	
Potential Funding Sources:	Estimated cost:	Timeline:
		Medium; 3-5yrs.
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Retain	

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
EQ 1 – Perform an earthquake risk evaluation in critical buildings not listed in the DOGAMI Rapid Visual Screening reports.	Goal 1 & 2	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Oregon Senate Bill 2 (2005) directed DOGAMI to develop a statewide seismic needs assessment that includes a FEMA 154 Rapid Visual Screening survey of specific critical facilities, including schools. The Steering Committee identified several potentially vulnerable buildings not listed in survey including the Wallowa County Courthouse. • Fuel and oil pipelines, as well as electricity, natural gas, telephone, internet, and cable companies are essential resources to Wallowa County residents. Redundancy in this infrastructural redundancy does not exist. • Buildings, bridges, highways, and utilities that are better able to withstand earthquakes not only save lives but also enable critical activities to continue with less disruption. • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6(c)(3)(ii)]. Implementing structural and non-structural retrofitting programs will reduce the seismic vulnerability of public buildings, historically important structures, and critical facilities and infrastructure, and assist a community in reducing its overall earthquake risk 			
Ideas for Implementation:			

<ul style="list-style-type: none"> • Utilize the DOGAMI Multi-Hazard Risk Report to identify critical facilities that are at risk of damage due to earthquake. • Inventory existing facilities to determine future demands for maintenance, repair, rehabilitation, or replacement; and to determine adequacy of existing facilities to meet future needs. • Identify historic structures that represent a significant cultural resource for the community, focusing especially on un-reinforced masonry buildings, and identify mitigation measures to protect them from natural hazards. • Provide both structural and non-structural retrofits to at-risk buildings as required by the risk evaluations. 		
Coordinating Organization:	Wallowa County Emergency Services Office	
Internal Partners:	External Partners:	
County Public Works Departments, Interested Cities	Relevant utility companies, Business Oregon, DOGAMI	
Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Retain	

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
EQ 2 – Seismically retrofit Wallowa Elementary to reduce the building’s vulnerability to seismic hazards. Consider both structural and non-structural retrofit options	Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input checked="" type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<ul style="list-style-type: none"> • Wallowa Elementary was built in 1922 and has buildings constructed of concrete shear walls and wooden frames • Wallowa Elementary has been identified as a critical facility by the 2013 Wallowa County Steering Committee and confirmed by the 2021-2022 Wallowa County Steer • Oregon Senate Bill 2 (2005) directed DOGAMI to develop a statewide seismic needs assessment that includes a FEMA 154 Rapid Visual Screening survey of specific critical facilities, including schools; this assessment determined that the Wallowa Elementary School has buildings with a very high collapse potential. • Retrofitting of vital infrastructure, such as schools and community buildings, provides important improvements that reduce hazard exposure and the cost and time associated with recovery (Source: American Planning Advisory Service Report Number 483/484) • Wallowa County has low vulnerability for seismic hazards. Retrofitting Wallowa Elementary will significantly reduce the school’s vulnerability to seismic hazards and improve the safety of students, teachers, and community members that use the school • The Disaster Mitigation Act of 2000 requires communities to identify actions and projects that reduce the effects of hazards on the community, particularly to buildings and infrastructure [201.6 (c)(3)(ii)]. Seismically retrofitting the Wallowa Elementary will reduce its vulnerability and ensure the viability of this critical facility. 			

Successes:		
<ul style="list-style-type: none"> The Wallowa SD 12 was awarded a Technical Assistance Program (TAP) grant from the Department of Education in 2019 for the Wallowa Jr./Sr. High School & Gym. The assessment allowed Wallowa School District 12 to select the Cougar Dome, constructed in 1949, over the century-old brick high school for the retrofit program. ⁶ detailed structural evaluation that outlines recommendations for building deficiencies, and provides a cost estimate, incorporate DOGAMI’s seismic assessment data to assist in retrofitting Wallowa Elementary. In 2020 the district was awarded a Seismic Rehabilitation Grant, state bond funds, for the Wallowa School Gymnasium in the amount of \$2,287,425. ⁷ This amount was matched with a local bond expected to include roof, wall and floor/foundation strengthening with construction to begin in the summer of 2021. ⁸ Combining this work with other needed heating-cooling system and access upgrades may provide cost savings for the district. ⁹ 		
Ideas for Implementation:		
<ul style="list-style-type: none"> Apply for grant funding through the Oregon Seismic Rehabilitation Grant Program Apply for FEMA project grant funding Align project with School District Maintenance Plan 		
Coordinating Organization:	Wallowa SD 12	
Internal Partners:	External Partners:	
Emergency Management, County Public Works Department, City of Wallowa	Business Oregon, Department of Geology and Mineral Industries, Federal Emergency Management Agency, Oregon Department of Education, Oregon Office of Emergency Management	
Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Ongoing	

⁶ Wallowa County Chieftain, May 21, 2021 [Wallowa Schools put \\$2.2 million seismic grant to work | Local News | wallowa.com](#)

⁷ <https://www.oregon.gov/ode/schools-and-districts/grants/Documents/Office%20of%20School%20Facilities/TAP/TAP%20Seismic%20Grant%20Success%20Stories%202016-2020%207.21.20.xlsx>

⁸ Wallowa County Chieftain, May 21, 2021

⁹ [Wallowa School District wins \\$2.3 million grant for gym retrofit | Local News | wallowa.com](#), Wallowa County Chieftain, June 1, 2020, updated July 8, 2021

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
EQ 3 - Seismically retrofit Enterprise High School to reduce building's vulnerability to seismic hazards		Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input checked="" type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Background and Rationale for Proposed Action Item:				
A school levy was approved by voters for improvements but did not include seismic upgrades. Preliminary estimates in 2019 put repairs at \$3.6 million for the high school. ¹⁰				
Ideas for Implementation:				
Coordinating Organization:		Enterprise School District		
Internal Partners:		External Partners:		
County Public Works Departments, City of Enterprise		Business Oregon, DOGAMI, OEM, FEMA, ODE		
Potential Funding Sources:		Estimated cost:	Timeline:	
Business Oregon Seismic Rehabilitation Program competitive grant				
Form Submitted by:		Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:		New Action		

¹⁰ [Enterprise School District assessment details costs to repair school. | News | wallowa.com](https://www.wallowa.com/news/enterprise-school-district-assessment-details-costs-to-repair-school)

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
FL 1 – Explore flood mitigation opportunities for homes and critical facilities subject to flooding.		Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> • Flooding is a potential hazard for many of the region’s water treatment facilities. The City of Enterprise is in the process of upgrading its facility, and the city of Lostine is working on building a new water system. The City of Wallowa has its wastewater facility near the Wallowa River and may require flood proofing. • The City of Enterprise has experienced flooding issues with both the Wallowa River and Prairie Creek, and in 2013 some residents were concerned about potential damages to sewer lines. • The Grande Ronde River has caused flooding damage in the unincorporated town of Troy • The Imnaha River has damaged homes (several in 1997) and roads. As a result, some homes have been moved to higher ground. • Personal homes at the head of Wallowa Lake (South end) have been destroyed by the Wallowa River in past floods. • The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Exploring flood mitigation opportunities for homes will reduce the effect of a flood hazard on the community and help to protect existing buildings from natural hazard events. Eliminating or limiting development in hazard prone areas, such as floodplains, can reduce vulnerability to hazards 				
Ideas for Implementation:				
<ul style="list-style-type: none"> • Few Essential Facilities identified in the county are located within the Special Flood Hazard Area. The Troy Elementary School and one bathroom/shower facility at the Wallowa State Park. • Assess flooding hazards within each county to determine where mitigation efforts are most needed. Identify suitable mitigation projects for each scenario. 				

<ul style="list-style-type: none"> • Develop acquisition and management strategies to preserve parks, trails, and open space in the floodplain • Elevate repeat-loss properties at the head of Wallowa Lake • Identify water and wastewater treatment facilities that are in need of flood-proofing (mechanical or structural fixes). Assess each plant’s necessity for retrofit, identifying those that could benefit from immediate help. • Implement mechanical and structural fixes during planned upgrades/expansions. Possibly elevate properties. • Seek qualification for the Flood Mitigation Assistance Program (FMA). Identify the number of buildings and/or structures in the floodplain. • Explore multi-objective stream enhancement projects. • Seek Silver Jackets assistance in completion of mitigation projects • Likely need for contracted services to augment existing staff capacity. 		
Coordinating Organization:	City and County Public Works and Emergency Services Department	
Internal Partners:	External Partners:	
County Land Use Planning Department; City of Enterprise ; NRAC Tech	Relevant water treatment facilities, Federal Emergency Management Agency, Homeowners, Army Corps of Engineers, Oregon Department of Fish and Wildlife, Department of State Lands, Oregon Department of Transportation, Silver Jackets	
Potential Funding Sources:	Estimated cost:	Timeline:
Grant dependent; DEQ, IFA		
Form Submitted by:		
Action Item Status:	On Hold	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
FL 2 – Explore the costs and benefits for participation in the NFIP's Community Rating System.		Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
<p>Rationale for Proposed Action Item:</p> <ul style="list-style-type: none"> The National Flood Insurance Program’s (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, insurance premiums under the NFIP are discounted to reflect the reduced flood risk resulting from the community actions. The Community Rating System rewards communities that undertake floodplain activities beyond the requirements of the National Flood Insurance Program. The CRS is a point system program that reduces flood insurance premiums for the citizens of the participating communities. The current amount insurance in force for each county is a substantial amount of money. Participating in the CRS program could reduce this amount. The insurance in force for each county is as follows with the total in claims paid amounts in parentheses: <ul style="list-style-type: none"> Wallowa County: \$6,112,700 (\$15,788) <ul style="list-style-type: none"> Enterprise: \$6,087,100 (\$0.00) The Disaster Mitigation Act of 2000 requires communities to identify mitigation actions that address existing buildings and infrastructure [201.6(c)(3)(ii)]. Improving the CRS ratings for communities in Northeast Oregon helps decrease vulnerability to floods. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Assess current community activities to determine whether the city or county is already eligible to apply for a CRS classification better than 10. Determine the CRS classification your community would like to obtain and take steps towards reaching that goal. Work towards obtaining higher CRS class ratings (1 being the highest rating obtainable; 10 being a non-participating community). Activities that reduce flood insurance premiums fall under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. 				

Coordinating Organization:	Interested jurisdictions	
Internal Partners:	External Partners:	
County Emergency Services and Public Works Departments	Federal Emergency Management Agency, Department of Land Conservation and Development, Silver Jackets	
Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	On Hold	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
FL 3 – Increase awareness of the NFIP program.		Goals 3 & 4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
<p>Rationale for Proposed Action Item:</p> <ul style="list-style-type: none"> The market penetration of flood insurance is low within each of the counties and cities participating in this NHMP. Shown below are the number of flood insurance policies (pre-FIRM policies) within the mapped special flood hazard area (100-year flood plain) that have flood insurance: <ul style="list-style-type: none"> Wallowa County: 27 (16 Pre-FIRM), <ul style="list-style-type: none"> Enterprise: 44 (30 Pre-FIRM) Joseph: 1 (0 Pre-FIRM) The Disaster Mitigation Act of 2000 requires communities to include a process for continued public involvement in the maintenance of the plan [201.6(c)(4)(iii)]. Increasing public awareness of the National Flood Insurance Program (NFIP) will allow continued public involvement and will inform residents and businesses of the benefits of the NFIP program and how the NFIP can protect their property. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Distribute information to current and future homeowners/renters in flood-prone areas. Increase awareness for current homeowners and prospective buyers of property about floodplain issues on their property and actions they can implement to mitigate the impacts of a flood 				
Coordinating Organization:	County and City Floodplain Administrators			
Internal Partners:		External Partners:		
City Administrators and Planning staff, Building Department, Oregon NFIP Floodplain Coordinator (DLCD), insurers, realtors		FEMA, ACOE		

Potential Funding Sources:	Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Retain	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
FL 4 –Update the County and City FEMA Flood Insurance Rate Maps and digitize the updated maps.		Goals 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> Flood Mitigation Assistance funds require that the plan describe the community’s vulnerability to flood in terms of the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified hazard areas. Currently, communities in Northeast Oregon are only able to identify the number of NFIP claims that have been made since FIRM adoption. Flood Insurance Rate Maps in each of the Northeast Oregon communities are too old to be currently accurate, and counting the numbers of existing buildings, infrastructure, and critical facilities located in flood-prone areas was not possible during the 20013 Natural Hazards Mitigation Planning Process. Like many locations in Eastern Oregon, FEMA has not updated the Flood Insurance Rate Maps (FIRMS). Due to their ages, and technology used to create them, the maps may not accurately represent present flood conditions. Additionally, maps are not digital. Wallowa: 1988. The number of claims within the county that have experienced flood related losses are as follows: Wallowa County: 7 paid claims (\$15,788) City of Wallowa: 9 paid claims (\$1,709) 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Determine the locations of flood-prone areas not identified by the FIRMs. 				
Coordinating Organization:	County and City Floodplain Administrators			
Internal Partners:	External Partners:			
County Emergency Services Department, City Administrators/City Managers, County Land Use Planning Departments, elected officials	FEMA, Army Corps of Engineers, DOGAMI			
Potential Funding Sources:	Estimated cost:	Timeline:		

Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	On Hold	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
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.		Goal 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Floodplain ordinances for the county and the cities				
Rationale for Proposed Action Item:				
The 2021-2022 Wallowa County NHMP Steering Committee, particularly the county and city representatives, identified basic training and support for the floodplain managers as a way to mitigate risk from flooding in the county.				
Ideas for Implementation:				
Hold annual meetings of county and city floodplain managers; develop a list of people to be resources for this group; develop standard operating procedures to prepare for staff turnover. Improve floodplain administrators' ability to perform their jobs by making the digitized Special Flood Hazard Areas map easily available to them.				
Coordinating Organization:	County Land Use Planning Department			
Internal Partners:		External Partners:		
City and county floodplain managers		DLCD, Oregon NFIP Coordinator		
Potential Funding Sources:		Estimated cost:	Timeline:	
			Short (1-3 yrs.)	
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022			
Action Item Status:	New Action			

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
SW 1 - Support projects that increase redundancy and grid resilience		Goal 2	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
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.				
Ideas for Implementation:				
Coordinating Organization:		Board of Commissioners		
Internal Partners:		External Partners:		
County Land Use Planning Department				
Potential Funding Sources:		Estimated cost:	Timeline:	
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022			
Action Item Status:	New Action			

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
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.		Goals 1 & 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> • The 2013 County Steering Committees identified several landslide prone areas where detailed risk assessment could improve safety for residents. These included the Wallowa Lake community where there are reported rockfall areas along the primary access route, in the Troy area where there are frequently slides every year, and along the Imnaha River. • Improved mapping of the landslide hazard county wide would improve knowledge of debris flow (rapid moving) landslide hazard areas. • Current county regulation identifies steep slope areas as areas to be further characterized. Improved LiDAR mapping can aid in locating steep slope areas. • The Disaster Mitigation Act of 2000 requires that communities identify actions and projects the reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying areas vulnerable to landslide can reduce the impacts of landslides on new and existing developments and infrastructure. 				
Ideas for Implementation:				
Work with DOGAMI staff who regularly review needs for projects of this nature to serve as the basis for risk assessment and mitigation strategy development. This agency has a substantial history of securing funding for improved LiDAR data collection and analysis to better mitigate landslide hazard risk in Oregon.				
Coordinating Organization:	County Land Use Planning Department			
Internal Partners:		External Partners:		
Board of Commissioners; City of Enterprise		DOGAMI, OEM, FEMA		
Potential Funding Sources:	Estimated cost:		Timeline:	

CTP funding grant proposal developed with DOGAMI		Medium (3-5 years)
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	Revised and Retained	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
LS 2 – Collect additional LiDAR for landslide hazard risk analysis to complement the existing LiDAR data		Goals 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> The 2013 County Steering Committees identified several landslide prone areas that may need a detailed risk assessment. These included the Wallowa Lake community where there are reported landslide issues, in the Troy area where there are frequently has slides every year, and along the Imnaha River where there are frequently landslides. The Disaster Mitigation Act of 2000 requires that communities identify actions and projects the reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying areas vulnerable to landslide can reduce the impacts of landslides on new and existing developments and infrastructure. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Improve knowledge of debris flow (rapid moving) landslide hazard areas Map steep slope areas. Research existing community ordinances related to steep slope developments 				
Coordinating Organization:		DOGAMI		
Internal Partners:		External Partners:		
County Land Use Planning Dept., Board of Commissioners; City of Enterprise		FEMA		
Potential Funding Sources:		Estimated cost:		Timeline:
CTP funding grant proposal developed with DOGAMI				Long Term
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022			
Action Item Status:	Revised and Retained			

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
LS 3 – Evaluate LiDAR data to develop detailed risk assessments in landslide prone areas.		Goals 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> The 2013 County Steering Committees identified several landslide prone areas that may need a detailed risk assessment. These included the Wallowa Lake community where there are reported landslide issues, in the Troy area where there are frequently has slides every year, and along the Imnaha River where there are frequently landslides. The Disaster Mitigation Act of 2000 requires that communities identify actions and projects the reduce the impact of a natural hazard on the community, particularly to new and existing buildings and infrastructure [201.6(c)(3)(ii)]. Identifying areas vulnerable to landslide can reduce the impacts of landslides on new and existing developments and infrastructure. 				
Ideas for Implementation:				
<ul style="list-style-type: none"> Improve knowledge of debris flow (rapid moving) landslide hazard areas Map steep slope areas. Research existing community ordinances related to steep slope developments 				
Coordinating Organization:		DOGAMI		
Internal Partners:		External Partners:		
County Land Use Planning Dept., Board of Commissioners; City of Enterprise		FEMA		
Potential Funding Sources:		Estimated cost:		Timeline:
CTP funding grant proposal developed with DOGAMI				Long Term
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022			
Action Item Status:	Revised and Retained			

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
LS 4 - Develop mitigation strategies to reduce the likelihood of a potentially hazardous event based on the LiDAR mapping and risk assessment conducted in LS 2 and LS 3.		Goal 1-4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County Article 25 – Flood, Wildfire and Natural Hazards				
Rationale for Proposed Action Item:				
<p>Until updated landslide mapping can be funded, completed, and analyzed, the county does not have a way to clearly and objectively identify the “Natural Hazard area”. The Department of Geology and Mineral Industries (DOGAMI) maintains a publicly available landslide database (SLIDO) that identifies landslide features as represented in the Wallowa County Natural Hazard Mitigation Plan, Volumes I and II, that could be used for this purpose.</p> <p>The Landslide Guide provides a thorough review of landslide hazard identification and mitigation strategies. The strategies provided may be useful in evaluating the sufficiency of the existing ordinances that pertain to landslide hazard areas including in particular the identification of engineering professionals who are adequately trained to evaluate sites for landslide hazards and the sufficiency of Protection Measures for development on sites exposed to landslide hazard.</p>				
Ideas for Implementation:				
Apply for Cooperative Technical Partner (CTP) funding through FEMA in order to engage DLCD in a review of the natural hazard ordinance(s) with respect to landslide hazard area identification and with respect to site evaluation and protection measures required.				
Coordinating Organization:	County Land Use Planning Department, City of Enterprise			
Internal Partners:		External Partners:		
Board of Commissioners; County Emergency Services Department		DLCD, DOGAMI, OEM, FEMA		
Potential Funding Sources:	Estimated cost:	Timeline:		

Cooperative Technical Partnership (CTP) grant through FEMA Region X		
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	New Action	

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
LS 5 - Create an overlay zone to identify current landslide hazard zones where geotechnical considerations for construction apply and amend ordinance articles as applicable.	Goals 1 & 4	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Wallowa County Article 25 – Flood, Wildfire and Natural Hazards			
Rationale for Proposed Action Item:			
<p>The Steering Committee determined that until updated landslide mapping can be funded, completed, and analyzed, the best data available to the county on landslides is what is represented in the publicly available landslide database (SLIDO) that is maintained by DOGAMI. Until new data are available the county would like a way to clearly and objectively identify areas that fall under the term “Natural Hazard area” as used in Article 25 of the county’s development code. Article 25 identifies Slow- or fast-moving Landslides, Rock Fall and Mudslides, Debris Flows and Mud Flows as Natural Hazards. Until better identification of landslide hazards can be accomplished, the county is interested in better identifying areas subject to these landslide-related natural hazards.</p> <p>The Department of Geology and Mineral Industries (DOGAMI) maintains a publicly available landslide database (SLIDO) that includes the best available data and identifies landslide features and susceptibility to landslide. It is currently presented as SLIDO version 4.4. Maps presented in the 2022 Wallowa County Natural Hazard Mitigation Plan update, Volumes I and II, used SLIDO to represent the best available data on landslide features and susceptibility.</p> <p>DLCD’s Landslide Guide provides a thorough review of landslide hazard identification and mitigation strategies. The strategies provided may be useful in evaluating the sufficiency of the existing ordinances that pertain to landslide hazard areas including in particular the identification of engineering professionals who are adequately trained to evaluate sites for landslide hazards and the sufficiency of Protection Measures for development on sites exposed to landslide hazard.</p>			
Ideas for Implementation:			
Apply for Cooperative Technical Partner (CTP) funding through FEMA in order to engage DLCD in a review of the natural hazard ordinance(s) with respect to landslide hazard area identification and with respect to site evaluation and protection measures required.			

Coordinating Organization:	County Land Use Planning Department	
Internal Partners:	External Partners:	
City of Enterprise, Board of Commissioners, County Emergency Services Department	DLCD, DOGAMI, OEM, FEMA	
Potential Funding Sources:	Estimated cost:	Timeline:
Cooperative Technical Partnership (CTP) grant through FEMA Region X		Medium (3-5 years)
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	New Action	

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
WF 1 – Advocate for the implementation of the wildfire mitigation action items as identified in Wallowa County Wildfire Protection Plan.		Goals 1 & 4	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input checked="" type="checkbox"/> Wallowa County <input checked="" type="checkbox"/> City of Enterprise <input checked="" type="checkbox"/> City of Joseph <input checked="" type="checkbox"/> City of Wallowa <input checked="" type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County CWPP 2017				
Rationale for Proposed Action Item:				
<ul style="list-style-type: none"> The Disaster Mitigation Act of 2000 requires that mitigation plans provide a comprehensive range of actions and projects to mitigate against natural hazards [201.6(c)(3)(ii)], such as actions that protect natural resources. Encouraging the implementation of existing action items with the Counties' Community Wildfire Protection Plans will help to ensure that wildfire mitigation remains a cooperative priority in Northeast Oregon Wallowa County CWPP, developed extensive risk assessments and identified mitigation actions. The CWPPs should be considered as a supplement to the Wildfire section of this NHMP as it contains accurate, updated and extensive information about the vulnerability, risk, and mitigation actions than this NHMP. Action items included within the CWPPs should be referred to and coordinated as a component of this NHMP 				
Ideas for Implementation:				
<ul style="list-style-type: none"> ODF is active in promoting and conducting FireWise Community trainings, new communities are enrolling. Currently working with areas along the Lostine River and trying to involve the Head of the Lake area. The CWPP includes consideration of evacuation plans. Include persons who created and/or maintain the CWPP at semi-annual meetings. Incorporate CWPP actions into the project prioritization process. Create a Rural Fire Protection District in the Wallowa Lake Fire District. 				
Coordinating Organization:		Board of Commissioners		
Internal Partners:		External Partners:		

Natural Resource Advisory Committee (NRAC) Subcommittee on the CWPP; County Emergency Services, County Land Use Planning Departments, Local fire departments and Rural Fire Protection Districts		Oregon Department of Forestry, Bureau of Land Management, OSU Extension Services, US Forest Service, Soil and Water Conservation Districts, Oregon Department of Fish and Wildlife; Homeowners in Wildland/Urban Interface zones; Hells Canyon Preservation Council	
Potential Funding Sources:		Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	Ongoing		

Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
WF 2 - Support community education about fire prevention.		Goal 3	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Wallowa County Wildfire Protection Plan, 2017				
Rationale for Proposed Action Item:				
The 2021-2022 Wallowa County 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.				
Ideas for Implementation:				
Coordinating Organization:	County Land Use Planning Department			
Internal Partners:		External Partners:		
Natural Resource Advisory Committee (NRAC), County Emergency Services Department		ODF		
Potential Funding Sources:		Estimated cost:	Timeline:	
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022			
Action Item Status:	New Action			

IP 1 - Support the Weed Board by supporting public education about Noxious Weeds and Invasive Species.	Goal 3	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
Ideas for Implementation:			
Coordinating Organization:	Wallowa County Weed Department		
Internal Partners:		External Partners:	
Weed Board, NRAC, Board of Commissioners			
Potential Funding Sources:		Estimated cost:	Timeline:
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022		
Action Item Status:	New Action		

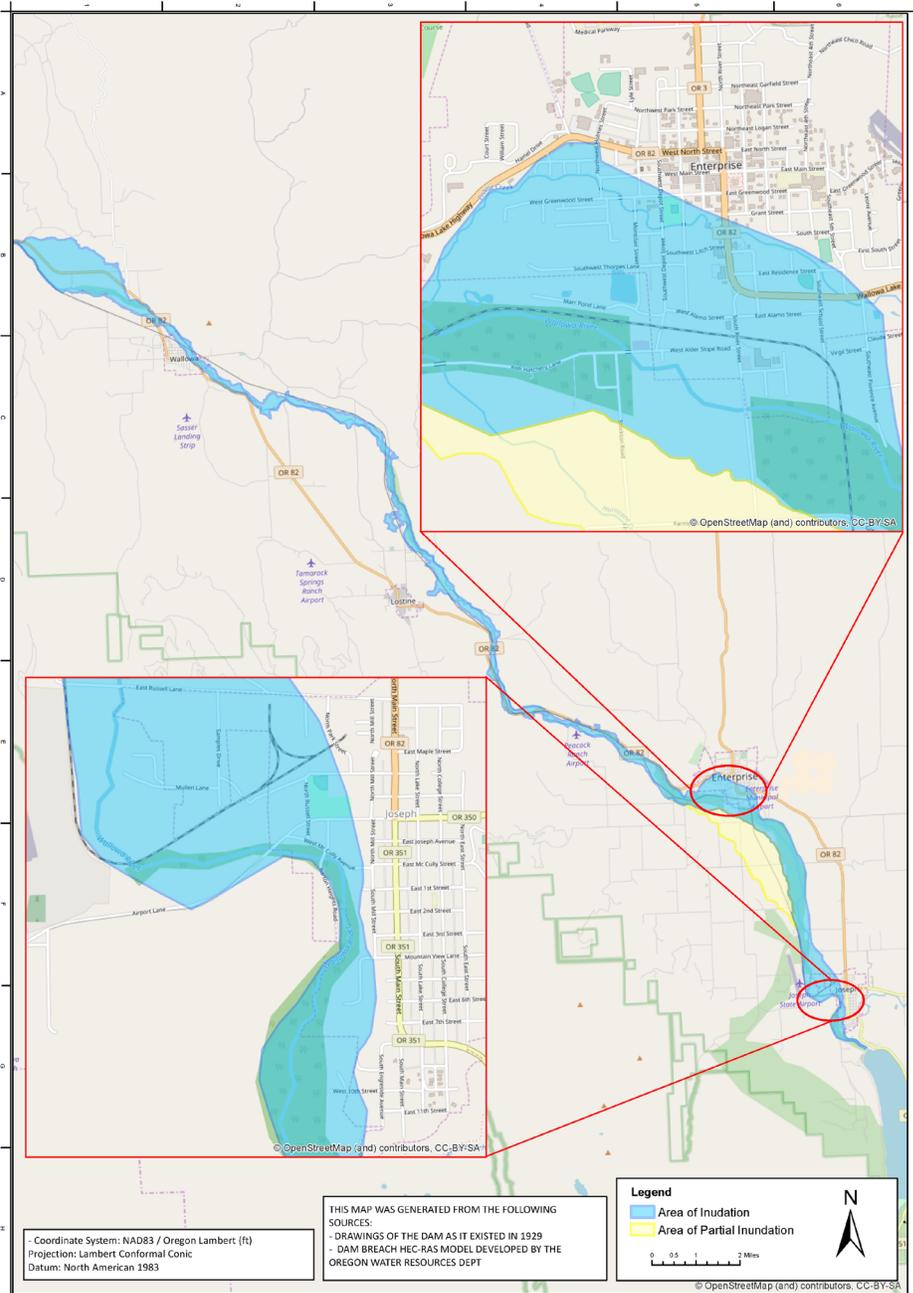
Proposed Action Item:		Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
IP 2 - Support efforts to control insect pests of timber species			<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:				
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District		
Alignment with Existing Plans/Policies:				
Rationale for Proposed Action Item:				
Ideas for Implementation:				
Coordinating Organization:	Oregon Department of Forestry; US Forest Service			
Internal Partners:		External Partners:		
Potential Funding Sources:		Estimated cost:	Timeline:	

Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022
Action Item Status:	New Action

Proposed Action Item:	Alignment with Plan Goals:	Priority of Action Item	Capacity to Implement Action Item
DF 1 - Secure additional funding to complete dam rehabilitation project. State funds of \$14 million have been obligated, but \$2 million and potential increases in costs are not yet secured to reach the 2014 estimate of \$16 million cost of the project.	Goal 1	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low
Jurisdictions and Special Districts Involved:			
<input type="checkbox"/> Wallowa County <input type="checkbox"/> City of Enterprise <input type="checkbox"/> City of Joseph <input type="checkbox"/> City of Wallowa <input type="checkbox"/> City of Lostine	<input type="checkbox"/> Enterprise School District <input type="checkbox"/> Joseph School District <input type="checkbox"/> Wallowa School District	<input type="checkbox"/> Wallowa Lake County Service District <input checked="" type="checkbox"/> Wallowa Lake Irrigation District <input type="checkbox"/> Wallowa County Soil and Water Conservation District	
Alignment with Existing Plans/Policies:			
Rationale for Proposed Action Item:			
<p>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 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, the owner of the dam, to operate the dam at 72% capacity.</p> <p>The Wallowa Lake Dam provides economic value to agricultural producers in the county. At full capacity the dam will be 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.¹¹</p> <p>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. Being able to go to “full pool” would help add approximately 12,000 acre-feet of water, improve spillways, improve passage, and help reduce the risk of failure and flooding to many properties throughout the system.</p>			

¹¹ John Williams, 2015, "The Value of Irrigation Water in the Wallowa Valley, Northeast Oregon"

At risk should there be a breach in the dam are downstream residences, businesses and the Wallowa County Courthouse. The map below prepared by the Oregon Water Resources Department, Dam Safety Division shows the anticipated inundation area.



DRAWING STATUS FINAL	WALLOWA LAKE DAM DAM BREACH INUNDATION MAP	OREGON WATER RESOURCES DEPARTMENT DAM SAFETY	Drawn by: TMJ	Designed by: TMJ					
DRAWING NO: 1		725 SUMMIT ST SUITE A SALEM, OR 97301	Date: 11/28/2017	Checked by:					
			Revision	Date	Description				

<p>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.</p> <p>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. The agreement 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. Fish passage will be required, but the method for this new feature has not yet been finalized.</p> <p>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.</p>		
Ideas for Implementation:		
Seeking grant opportunities with federal, state, and private funds.		
Coordinating Organizations:	Wallowa Lake Irrigation District	
Internal Partners:	External Partners:	
Oregon Department of Fish and Wildlife, Nez Perce Tribe, Oregon Water Resources, Senator Wyden(?)'s field office staff	Dam Safety Division, FEMA/OEM (?)	
Potential Funding Sources:	Estimated cost:	Timeline:
	\$16 million (2014 estimate) Seeking at least \$2 million	1-3 years, Short Term
Form Submitted by:	Wallowa County NHMP Steering Committee, 2021-2022	
Action Item Status:	New Action	

Appendix D: Rapid Visual Screening Reports for Wallowa County, Oregon prepared by the Department of Geology and Mineral Industries in 2006

Contents

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Joseph High School (2 bldgs), 400 E Williams Ave, Joseph, OR	D-44
Joseph Elementary School 201 E 2 nd St, Joseph, OR (now housing the Wallowa Mountain Office, ODF)	D-48



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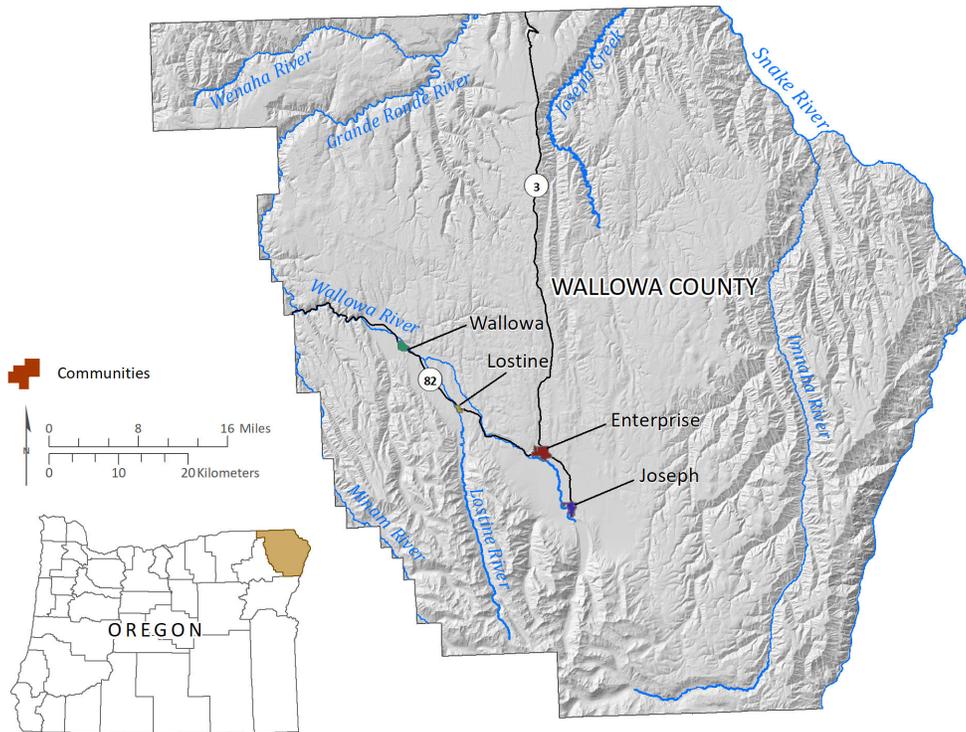
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Appendix E:
Multi-Hazard Risk Report for Wallowa County, Oregon
prepared by the
Department of Geology and Mineral Industries

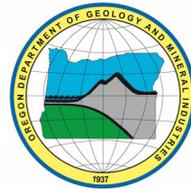
OPEN-FILE REPORT O-22-03

MULTI-HAZARD RISK REPORT FOR WALLOWA COUNTY, OREGON

INCLUDING THE CITIES OF ENTERPRISE, LOSTINE, JOSEPH, AND WALLOWA



by Matt C. Williams¹ and Ian P. Madin²



2022

¹Oregon Department of Geology and Mineral Industries, 800 NE Oregon Street, Suite 965, Portland, OR 97232

²Retired, formerly at Oregon Department of Geology and Mineral Industries, 800 NE Oregon Street, Suite 965, Portland, OR 97232

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Cover image: Study area of the Wallowa County Risk Report. Map depicts Wallowa County, Oregon and incorporated communities included in this report.

WHAT'S IN THIS REPORT?

This report describes the methods and results of natural hazard risk assessments for Wallowa County communities. The risk assessments can help communities better plan for disaster.



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For additional information:
Administrative Offices
800 NE Oregon Street, Suite 965
Portland, OR 97232
Telephone (971) 673-1555
<http://www.oregongeology.org>
<http://oregon.gov/DOGAMI/>

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GEOGRAPHIC INFORMATION SYSTEM (GIS) DATA

See the digital publication folder for files.

Geodatabase is Esri® version 10.7 format. Metadata is embedded in the geodatabase and is also provided as separate .xml format files.

Wallowa_County_Risk_Report_Data.gdb

Feature dataset: Asset_Data

feature classes:

- Building_footprints (polygons)
- Communities (polygons)
- UDF_points (points)

Wallowa_County_Depth_Grids.gdb

Raster data:

- FL_Depth_10yr
- FL_Depth_50yr
- FL_Depth_100yr
- FL_Depth_500yr

Metadata in .xml file format:

Each dataset listed above has an associated, standalone .xml file containing metadata in the Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata format

EXECUTIVE SUMMARY

This report was prepared for the communities of Wallowa County, Oregon, with funding provided by the Oregon Department of Land Conservation and Development (DLCD). It describes the methods and results of natural hazard risk assessments performed in 2021 by the Oregon Department of Geology and Mineral Industries (DOGAMI). The purpose is to provide Wallowa County communities a detailed risk assessment of the natural hazards that affect them to enable them to compare hazards and act to reduce their risk. The risk assessment contained in this project quantifies the impacts of natural hazards to these communities and enhances the decision-making process in planning for disaster.

We arrived at our findings and conclusions by completing three main tasks: compiling an asset database, identifying and using best available hazard data, and performing natural hazard risk assessment.

In the first task, we created a comprehensive asset database for the entire study area 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 we were able to represent accurate spatial location and vulnerability on a building-by-building basis.

The second task was to identify and use the most current and appropriate hazard datasets for the study area. Most of the hazard datasets used in this report were created by DOGAMI; some were produced using high-resolution lidar topographic data. While not all the data sources used in the report are countywide, each hazard dataset was the best available at the time of writing.

In the third task, we performed risk assessments using Esri® ArcGIS Desktop® software. We took two risk assessment approaches: (1) estimated loss (in dollars) to buildings from flood (recurrence intervals) and earthquake scenarios using Federal Emergency Management Agency (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.

The findings and conclusions of this report show the potential impacts of hazards in communities within Wallowa County. An earthquake can cause a moderate amount of damage and losses throughout the county. Hazus-MH earthquake simulations illustrate the potential reduction in earthquake damage through seismic retrofits. Some communities in the study area have significant risk from flooding, and we quantify the number of elevated structures that are less vulnerable to flood hazard. Our analysis shows that new landslide mapping based on improved methods and lidar information will increase the accuracy of mapping. Wildfire risk is high for the majority the unincorporated county, as well as parts of Enterprise and Wallowa. Our findings also indicate that many of the critical facilities in the study area are at high risk from wildfire hazard. We also found that the two biggest causes of population displacement are wildfire hazard. Lastly, we demonstrate that this risk assessment can be a valuable tool to local decision-makers.

Results were broken out for the following geographic areas:

- Unincorporated Wallowa County (rural)
- City of Joseph
- City of Wallowa
- City of Enterprise
- City of Lostine

Selected Countywide Results	
Total buildings: 9,708 Total estimated building value: \$910 million	
<p>2500-year Probabilistic Magnitude 7.0 Earthquake Red-tagged buildings^a: 497 Yellow-tagged buildings^b: 1,515 Loss estimate: \$114 million</p> <p>Landslide (High and Very High-Susceptibility) Number of buildings exposed: 568 Exposed building value: \$67 million</p>	<p>100-year Flood Number of buildings damaged: 295 Loss estimate: \$1.5 million</p> <p>Wildfire (High Risk): Number of buildings exposed: 3,623 Exposed building value: \$286 million</p>
<p>^aRed-tagged buildings are considered uninhabitable due to complete damage ^bYellow-tagged buildings are considered limited habitability due to extensive damage</p>	

1.0 INTRODUCTION

A natural hazard is a naturally occurring phenomenon that can negatively impact humans. A natural hazard risk assessment analyzes impacts on the built environment and population. It also estimates the amount of losses and identifies potential risk. In natural hazard mitigation planning, risk assessments are the basis for developing mitigation strategies and actions. A risk assessment enhances the decision-making process, so that steps can be taken to prepare for a potential hazard event.

Key Terms:

- **Vulnerability:** Characteristics that make people or assets more susceptible to a natural hazard.
- **Risk:** Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of a natural hazard.

Wallowa County is situated in the northeastern corner of Oregon, between the Blue Mountains and the Snake River and is subject to natural hazards, including earthquake, riverine flooding, landslides, and wildfire. The County is sparsely populated, with small communities surrounded by rangeland and forestland in the unincorporated areas. This is the first natural hazard risk assessment analyzing individual buildings and resident population in Wallowa County. It is therefore the most detailed and comprehensive analysis to date of natural hazard risk and provides a comparative perspective never before available. In this report, we describe our assessment results, which quantify the various levels of risk that each hazard presents to Wallowa County communities.

1.1 Purpose

The purpose of this project is to help Wallowa County communities better understand their risk and increase resilience to natural hazards. This is accomplished by providing accurate, detailed, and best available information about these hazards and by measuring the number of people and buildings at risk. The main objectives of this study are to:

- compile and/or create a database of critical facilities, tax assessor data, buildings, and population distribution data,

- incorporate and use existing data from previous geologic, hydrologic, and wildfire hazard studies,
- perform exposure and Hazus-based risk analysis, and
- share this report widely so that all interested parties have access to its information and data.

The body of this report describes the methods and results for these objectives. Two primary methods (Hazus-MH or exposure), depending on the type of hazard, were used to analyze risk. Results for each hazard type are reported on a countywide basis within each hazard section, and community-based results are reported in detail in **Appendix A**. **Appendix B** contains detailed risk assessment tables. **Appendix C** is a more detailed explanation of the Hazus-MH methodology. **Appendix D** lists acronyms and definitions of terms used in this report. **Appendix E** contains tabloid-size county-wide hazard maps.

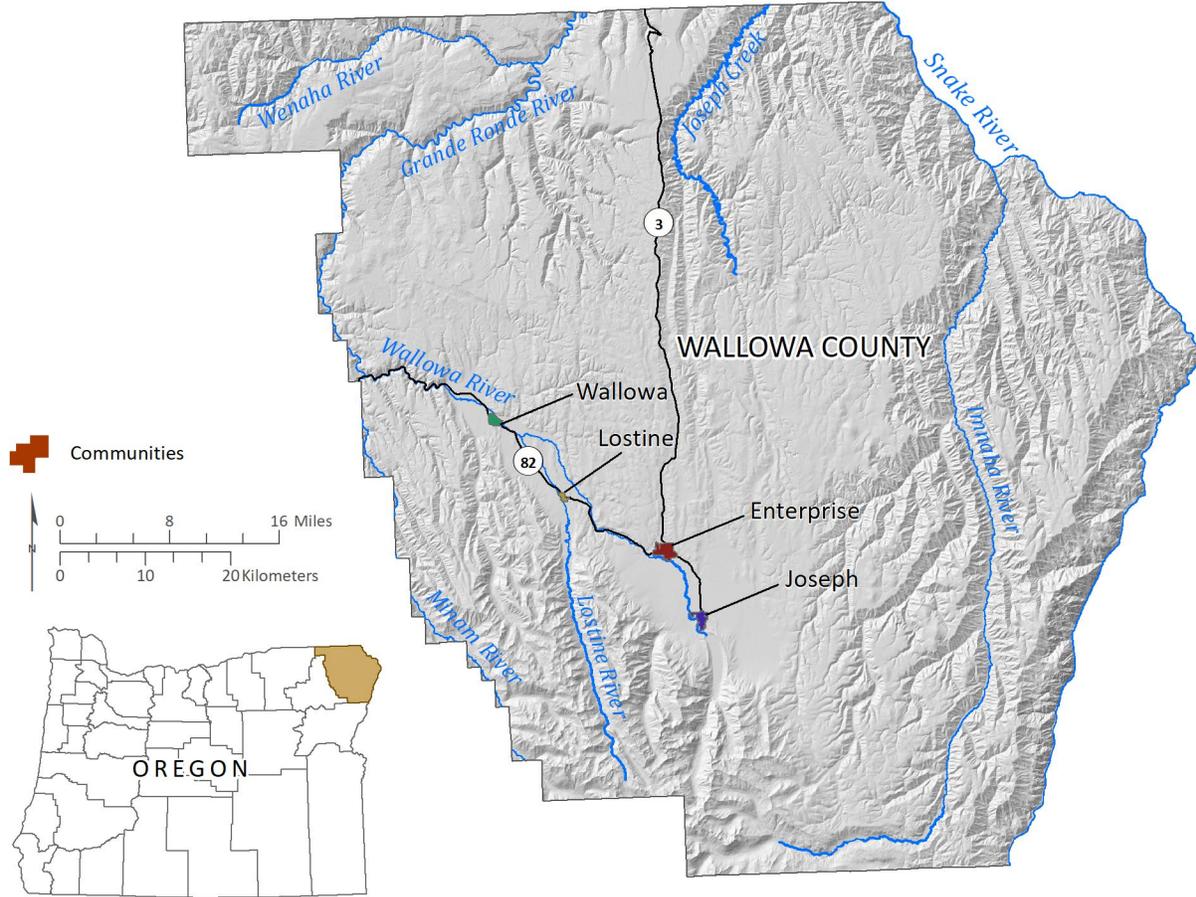
1.2 Study Area

The study area for this project is the entirety of Wallowa County, Oregon (**Figure 1-1**). Wallowa County is located in the northeastern corner of the state and is bordered by Baker County on the south, Union County on the west, Umatilla County on the northwest, the State of Washington on the north and the State of Idaho on the east. The study area covers approximately 3,152 square miles (8,164 square kilometers). The Wallowa-Whitman National Forest accounts for approximately 65% of the land ownership in Wallowa County.

The geography consists of the Columbia Plateau, bounded on the west by the rugged Wallowa Mountains and on the east by Hells Canyon of the Snake River. The Plateau is cut by steep canyons draining into the Snake River. The Plateau areas are a mix of forest and grasslands, and the Wallowa Mountains are forested with glaciated alpine areas at higher elevations. The Imnaha, Lostine, and Wallowa Rivers all originate within the Wallowa Mountains and drain to the Snake River.

The population of the County is 7,008 based on the 2010 U.S. Census Bureau (2010a). The county seat and county's largest community is the City of Enterprise. Most of the residents in the study area reside along the eastern base of the Wallowa Mountains and north of Wallowa Lake. The incorporated communities of the study area are Enterprise, Joseph, Lostine, and Wallowa (**Figure 1-1**). No unincorporated communities were individually examined in this study.

Figure 1-1. Study area: Wallowa County with communities in this study identified.



1.3 Project Scope

For this risk assessment, we applied a quantitative approach to buildings and population. We limited the project scope to buildings and population because of data availability, the strengths and limitations of the risk assessment methodology, and funding availability. We did not analyze impacts to the local economy, land values, or the environment. Depending on the natural hazard, we used one of two methodologies: loss estimation or exposure. Loss estimation was modeled using methodology from Hazus®-MH (FEMA, 2012a, 2012b, 2012c), a tool developed by FEMA for calculating damage to buildings from flood and earthquake. Exposure is a simpler methodology, where buildings are categorized based on their location relative to various hazard zones. To account for impacts on population (permanent residents only), city and county population numbers from the 2010 U.S. Census data (U.S. Census Bureau, 2010a) were distributed among residential buildings.

A critical component of this risk assessment is a countywide building inventory developed from building footprint data and the Wallowa County tax assessor database. The other key component is a suite of datasets that represent the currently best available science for a variety of natural hazards. The geologic hazard scenarios were selected by DOGAMI staff based on their expert knowledge of the datasets; most datasets are DOGAMI publications. In addition to geologic hazards, we included wildfire hazard in this risk assessment. The following is a list of the natural hazards and the risk assessment methodologies that were applied. See **Table 1-1** for data sources.

Earthquake Risk Assessment

- Hazus-MH loss estimation from a 2500-year probabilistic magnitude (Mw) 7.0 scenario

Flood Risk Assessment

- Hazus-MH loss estimation to four recurrence intervals (10%, 2%, 1%, and 0.2% annual chance)
- Exposure to 1% annual chance recurrence interval

Landslide Risk Assessment

- Exposure based on Landslide Susceptibility Index (low to very high)

Wildfire Risk Assessment

- Exposure based on Fire Risk Index (low to high)

Table 1-1. Hazard data sources for Wallowa County.

Hazard	Scenario or Classes	Scale/Level of Detail	Data Source
Earthquake (includes liquefaction and coseismic landslides)	2,500-year probabilistic Mw 7.0	Statewide	DOGAMI OSHD 1.0 (Madin and others, 2021)
Flood	Depth Grids: 10% (10-yr) 2% (50-yr) 1% (100-yr) 0.2% (500-yr)	Countywide	Wallowa County MHRA (2022) – derived from FEMA (1988) data
Landslide*	Susceptibility (Low, Moderate, High, Very High)	Statewide	DOGAMI O-16-02 (Burns and others, 2016)
Wildfire	Risk (Low, Moderate, High)	Regional (Pacific Northwest, US)	ODF (Pyrologix, LCC, 2018)

*Landslide data comprise a composite dataset where the level of detail varies greatly from place to place within the state. Refer to Section 3.4.1 or the report by Burns and others (2016) for more information.

1.4 Previous Studies

One previous risk assessment has been conducted that included Wallowa County by DOGAMI. Wang (1998) used Hazus-MH to estimate the impact from a Mw 8.5 Cascade Subduction Zone (CSZ) earthquake scenario on the state of Oregon. The results of this study were arranged into individual counties. Wallowa County was estimated to experience less than a 1% loss ratio in the Mw 8.5 CSZ scenario, due to the great distance of the County from the offshore CSZ. We did not compare the results of this project with the results of this previous study since very different methodologies were used.

2.0 METHODS

2.1 Hazus-MH Loss Estimation

According to FEMA (FEMA, 2012a, p. 1), “Hazus provides nationally applicable, standardized methodologies for estimating potential wind, flood, and earthquake losses on a regional basis. Hazus can be used to conduct loss estimation for floods and earthquakes [...]. The multi-hazard Hazus is intended for use by local, state, and regional officials and consultants to assist mitigation planning and emergency response and recovery preparedness. For some hazards, Hazus can also be used to prepare real-time estimates of damages during or following a disaster.”

Hazus-MH can be used in different modes depending on the level of detail required. Given the high spatial precision of the building inventory data and quality of the natural hazard data available for this study, we chose the user-defined facility (UDF) mode. This mode makes loss estimates for individual buildings relative to their “cost,” which we then aggregate to the community level to report loss ratios. Cost used in this mode are associated with rebuilding using new materials, also known as replacement cost. Replacement cost is based on a method called RSMeans valuation (Charest, 2017) and is calculated by multiplying the building square footage by a standard cost per square foot. These standard rates per square foot are in tables within the default Hazus-MH database.

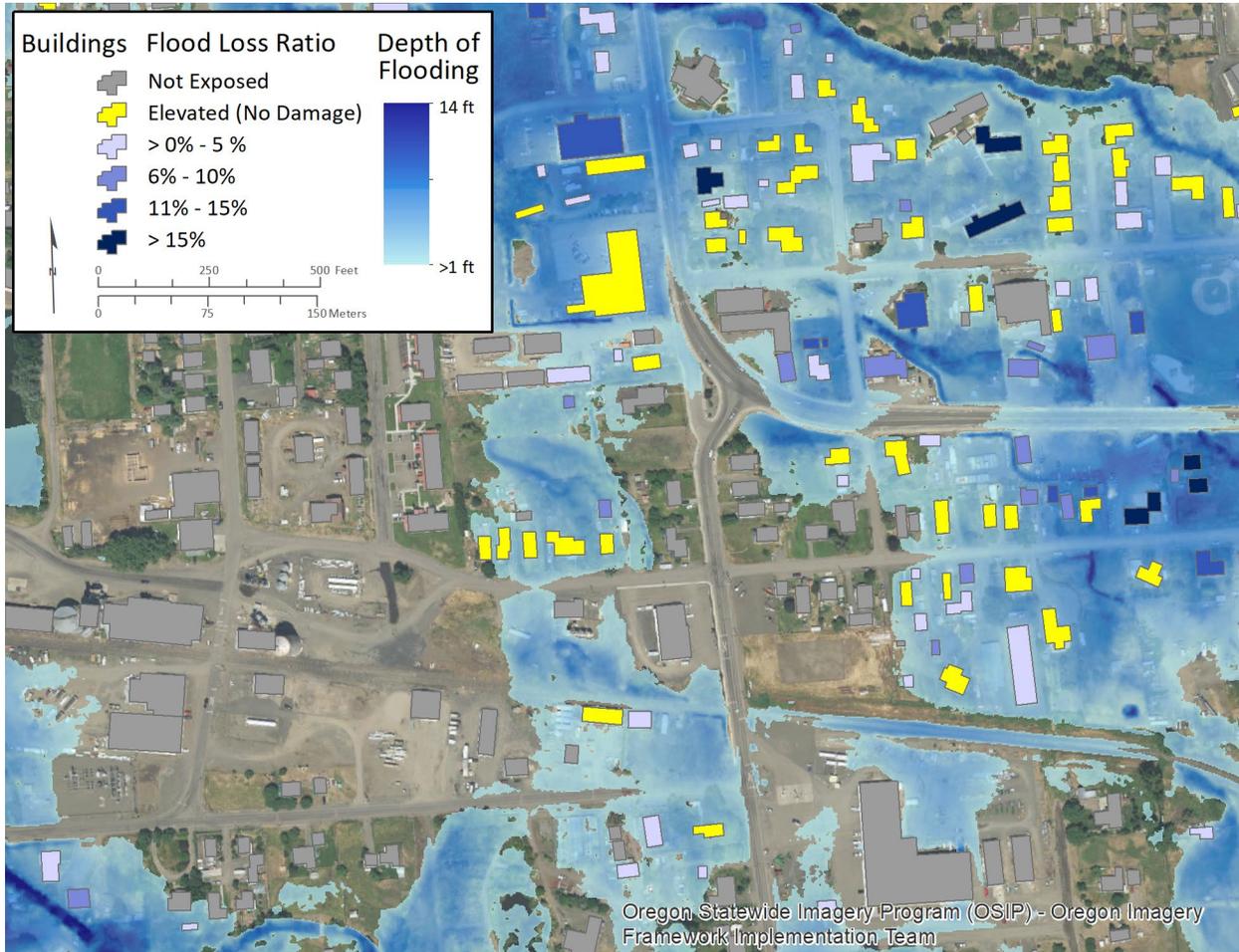
Key Terms:

- *Loss estimation:* Damage that occurs to a building in an earthquake or flood scenario, as modeled with Hazus-MH methodology.
- *Loss ratio:* Percentage of estimated loss relative to the total value.

Damage functions are at the core of Hazus-MH. The damage functions stored within the Hazus-MH data model were developed and calibrated from the observed results of past disasters. 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 2-1** illustrates the range of building loss estimates from Hazus-MH flood analysis.

We used Hazus-MH version 4.2, which was the latest version available when we began this risk assessment.

Figure 2-1. 100-year flood zone and building loss estimates example in City of Enterprise, OR.



2.2 Exposure

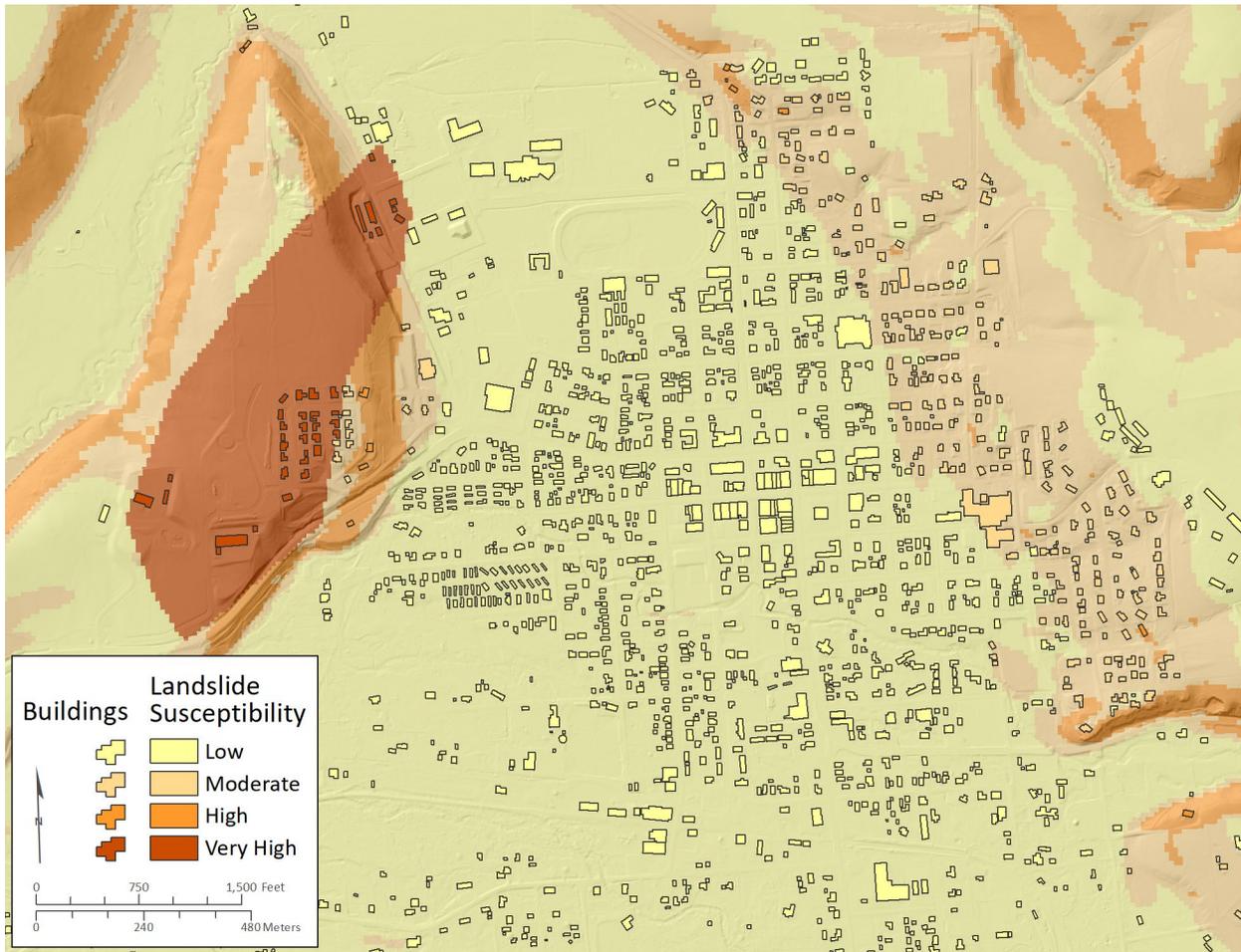
Exposure methodology identifies the buildings and population that are within a particular natural hazard zone. This is an alternative for natural hazards that do not have readily available damage functions to relate damage to the intensity of the hazard. It provides a way to easily quantify what is and what is not threatened. Exposure results are communicated in terms of total building value exposed, rather than a loss estimate because without a damage function a loss ratio cannot be calculated. For example, **Figure 2-2** shows buildings that are exposed to different areas of landslide susceptibility.

Key Terms:

- *Exposure:* Determination of whether a building is within or outside of a hazard zone. No loss estimation is modeled.
- *Building value:* Total monetary value of a building. This term is used in the context of exposure.

Exposure is used for landslides and wildfires. For comparison with loss estimates, exposure is also used for the 1% annual chance flood.

Figure 2-2. Landslide susceptibility areas and building exposure example in the City of Enterprise, OR.



2.3 Building Inventory

A key piece of the risk assessment is the countywide building inventory. This inventory consists of all buildings larger than 200 square feet (19 square meters), as determined from existing building footprints (Williams, 2021). **Figure 2-3** shows an example of building inventory occupancy types used in the Hazus-MH and exposure analyses in Wallowa County. See also **Appendix B** Table B-1, and **Appendix E**, Plate 1 and Plate 2.

To use the building inventory within the Hazus-MH methodology, we converted the building footprints to points and migrated them into a UDF database with standardized field names and attribute domains. The UDF database formatting allows for the correct damage function to be applied to each building. Hazus-MH version 2.1 technical manuals (FEMA, 2012a, 2012b, 2012c) provide references for acceptable field names, field types, and attributes. The fields and attributes used in the UDF database (including building seismic codes) are discussed in more detail in **Appendix C.2.2**.

Figure 2-3. Building occupancy types, City of Enterprise, Oregon.

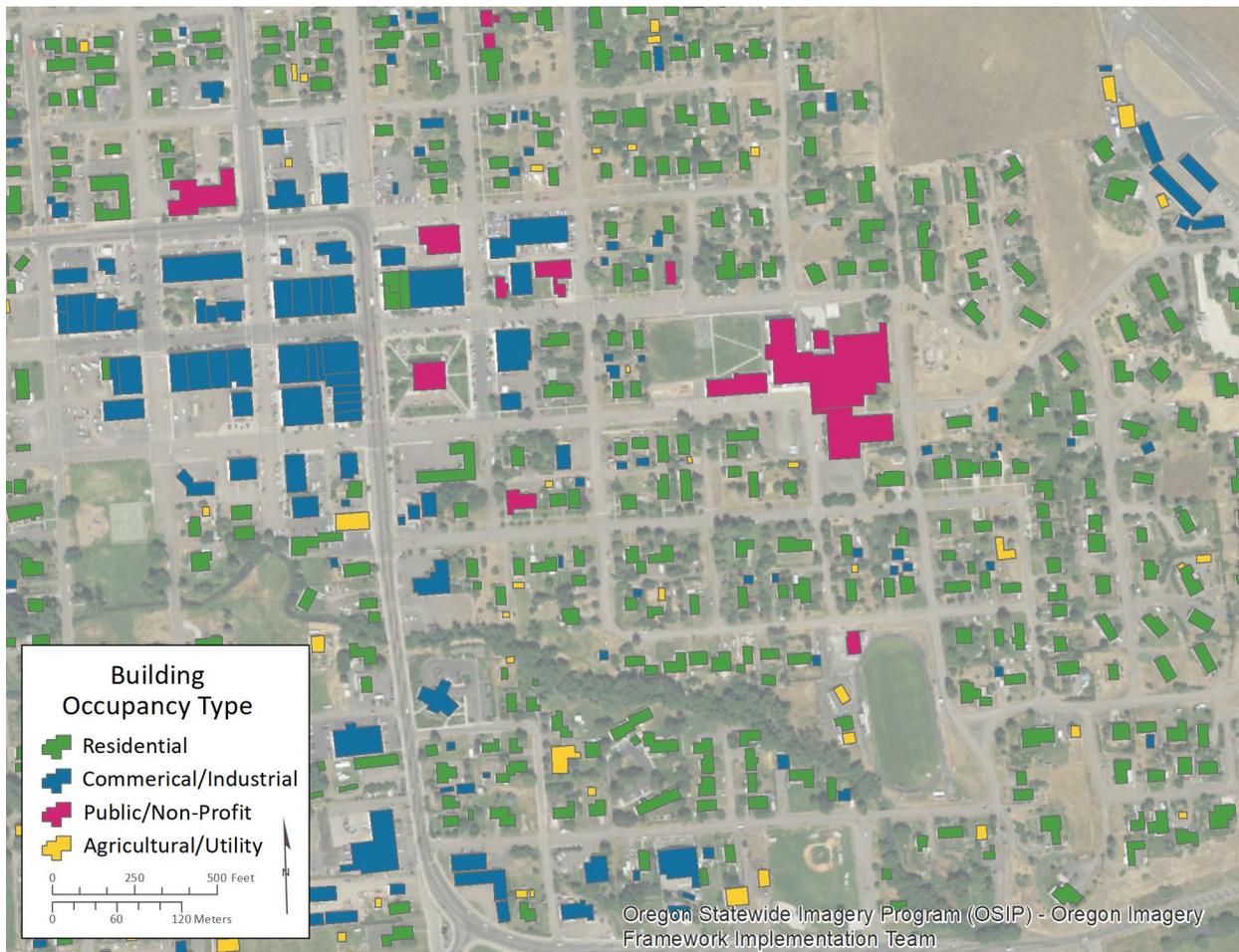


Table 2-1 shows the distribution of building count and value within the UDF database for Wallowa County. A table detailing the occupancy class distribution by community is included in **Appendix B: Detailed Risk Assessment Tables**.

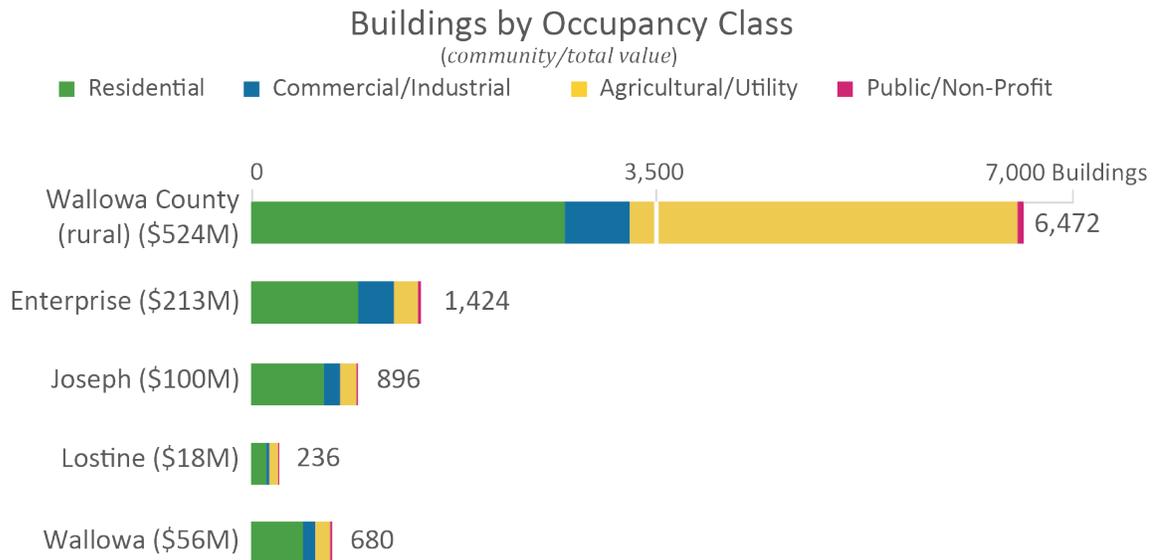
Table 2-1. Wallowa County building inventory.

Community	Total Number of Buildings	Percentage of Total Buildings	Estimated Total Building Value (\$)	Percentage of Total Building Value
Unincorp. Wallowa Co (rural)	6,472	67%	523,679,000	58%
Enterprise	1,424	15%	212,587,000	23%
Joseph	896	9.2%	99,947,000	11%
Lostine	236	2.4%	17,930,000	2.0%
Wallowa	680	7.0%	55,658,000	6.1%
Total Wallowa County	9,708	100%	909,800,000	100.0%

The building inventory was developed from a building footprint dataset developed in 2021 called the Statewide Building Footprints for Oregon, release 1 (SBFO-1) (Williams, 2021), which covers all of Wallowa County. The building footprints provide a location and 2D outline of a structure. The total number of buildings within the study area was 9,703. A small number of buildings were added to this data, particularly, the recently built, 8,600 square foot Sports Complex in Enterprise.

Wallowa County supplied assessor data and it was formatted for use in the risk assessment. The assessor data contains an array of information about each building (i.e., improvement). Tax lot data, which contains property boundaries and other information about the property, was obtained from the county assessor and was used to link the buildings with assessor data. The linkage between the two datasets resulted in a database of UDF points that contain attributes for each building. These points are used in the risk assessments for both loss estimation and exposure analysis. **Figure 2-4** illustrates the building value and occupancy class across the communities of Wallowa County.

Figure 2-4. Community building value in Wallowa County by occupancy class.



We attributed critical facilities in the UDF database so that they could be highlighted in the results. Critical facilities data came from the DOGAMI Statewide Seismic Needs Assessment (SSNA; Lewis, 2007). We updated the SSNA data through consultation with Wallowa County, which provided a list of critical facilities with corresponding addresses. The critical facilities we attributed include hospitals, schools, fire stations, police stations, emergency operations, and military facilities. In addition to these standard building types, we considered other building types based on local input or special considerations that are specific to the study area that would be essential during a natural hazard event, such as public works and water treatment facilities. Critical facilities are important to note because these facilities play a crucial role in emergency response efforts. Communities that have critical facilities that can function during and immediately after a natural disaster are more resilient than those with critical facilities that are inoperable after a disaster. Critical facilities are shown by community in [Table 2-2](#) and are listed for each community in [Appendix A](#).

Table 2-2. Wallowa County critical facilities inventory.

Community	Hospital & Clinic		School		Police/Fire		Emergency Services		Military		Other*		Total	
	Count	Value (\$)	Count	Value (\$)	Count	Value (\$)	Count	Value (\$)	Count	Value (\$)	Count	Value (\$)	Count	Value (\$)
<i>(all dollar amounts in thousands)</i>														
Unincorp. Wallowa Co (rural)	0	0	2	392	2	2,868	0	0	0	0	12	10,489	16	13,749
Enterprise	1	31,878	2	5,571	1	1,765	1	573	0	0	8	8,820	13	48,607
Joseph	0	0	1	8,303	1	120	0	0	0	0	1	355	3	8,778
Lostine	0	0	0	0	1	71	0	0	0	0	3	164	4	235
Wallowa	0	0	1	6,375	1	199	0	0	0	0	2	406	4	6,980
Total Wallowa County	1	31,878	6	20,642	6	5,022	1	573	0	0	26	20,234	40	78,349

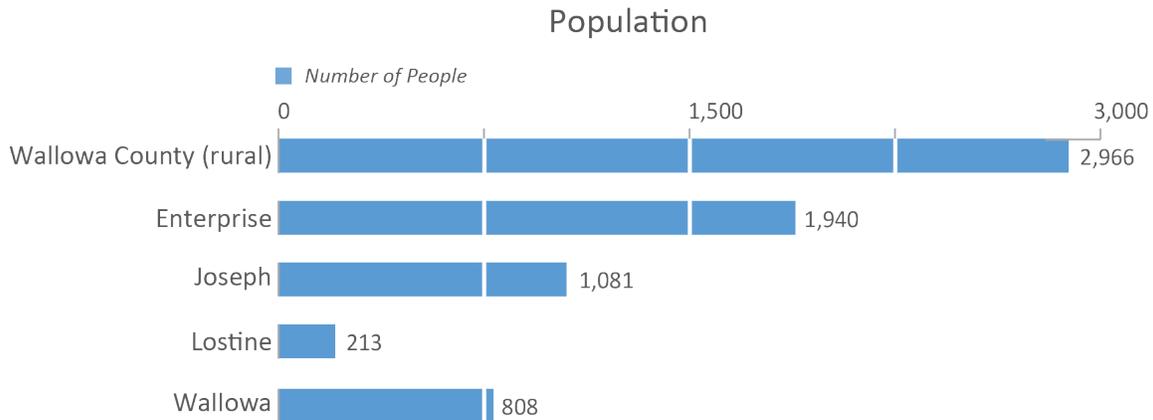
Note: Facilities with multiple buildings were consolidated into one building.

* Category includes buildings that are not traditional (emergency response) critical facilities but considered critical during an emergency based on input from local stakeholders (e.g., water treatment facilities or airports).

2.4 Population

Within the UDF database, the population of permanent residents reported per census block was distributed among residential buildings and pro-rated based on square footage ([Figure 2-5](#)). We did not examine the impacts of natural hazards on non-permanent populations (e.g., tourists), whose total numbers fluctuate seasonally. Due to lack of information within the assessor and census databases, the distribution includes vacation homes, which in many communities make up some of the total residential building stock. From information reported in the 2010 U.S. Census, American FactFinder regarding vacation rentals within the county, it is estimated that approximately 20% of residential buildings are vacant in Wallowa County and a significant portion of these could be vacation rentals (U.S. Census Bureau, 2010b).

From the 2010 census, we analyzed the 7,008 residents within the study area that could be affected by a natural hazard scenario. While current estimates of population are higher overall for the county, the percent of displaced population results would only be slightly affected. For each natural hazard, except for the earthquake scenario, a simple exposure analysis was used to find the number of potentially displaced residents within a hazard zone. For the earthquake scenario the number of potentially displaced residents was based on residents in buildings estimated to be significantly damaged by the earthquake.

Figure 2-5. Population by Wallowa County community.

3.0 ASSESSMENT OVERVIEW AND RESULTS

This risk assessment considers four natural hazards (earthquake, flood, landslide, and wildfire) that pose a risk to Wallowa County. The assessment describes both localized vulnerabilities and the widespread challenges that impact all communities. The loss estimation and exposure results, as well as the rich dataset included with this report, can lead to greater understanding of the potential impact of disasters. Communities can use the results to update plans as part of the work toward becoming more resilient to future disasters.

3.1 Hazards and Countywide Results

In this section, results are presented for Wallowa County. Individual community results are in [Appendix A: Community Risk Profiles](#).

3.2 Earthquake

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

Two earthquake-induced hazards are liquefaction and coseismic landslides. Liquefaction occurs when 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. Coseismic landslides are mass movement of rock, debris, or soil induced by ground shaking. All earthquake loss estimates in this report include damage derived from shaking and from liquefaction and landslide factors.

3.2.1 Data sources

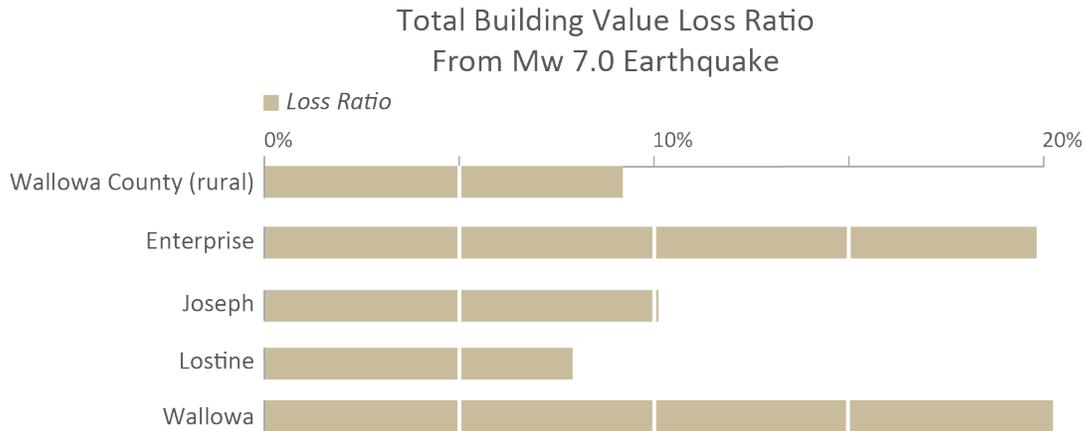
Hazus-MH offers two scenario methods for estimating loss from earthquakes, probabilistic and deterministic (FEMA, 2012b). A probabilistic scenario uses U.S. Geological Survey (USGS) National Seismic Hazard Maps which are derived from seismic hazard curves calculated on a grid of sites across the United States that describe the annual frequency of exceeding a level of ground motion as a result of all possible earthquake sources (USGS, 2017). A deterministic scenario is based on a specific seismic event, such as a Cascadia Subduction Zone magnitude 9.0 event. We used the probabilistic scenario method for this study because the probabilistic approach accounts for the great uncertainty about earthquake sources in the area.

The 2% in 50 years or 2,475-year probabilistic shaking map of Madin and others (2021) was selected as the most appropriate for communicating earthquake risk for Wallowa County. We based this decision on several factors such as previous Hazus-MH earthquake analyses in the region, available seismic data (historical events, fault locations, etc.), and existing building code standards. It is important to note that the probabilistic shaking map is based on the highest level of shaking that could reasonably be expected to occur on average once every 2,475 years. For practical purposes it can be considered a worst-case event for each community, although it does not represent shaking that would impact the entire County in a single earthquake. The probabilistic earthquake results should be used carefully for risk assessment and emergency response planning purposes.

The following hazard layers used for our loss estimation are derived from work conducted by Madin and others (2021): 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. We also used landslide susceptibility data derived from the work of Burns and others (2016). The liquefaction and landslide susceptibility layers together with PGA were used by the Hazus-MH tool to calculate the probability and magnitude of permanent ground deformation caused by these factors. Although the probabilistic shaking map encompasses all possible earthquake sources, Hazus uses a characteristic magnitude value to calculate the impacts of liquefaction and landslides. For this study, we followed the example of Madin and others (2021) and used Mw 7 as the characteristic event.

3.2.2 Countywide results

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 probabilistic shaking hazard (though not necessarily simultaneously). Hazus-MH loss estimates (see [Appendix B](#) Table B-2) 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 (FEMA, 2012b). [Figure 3-1](#) shows the estimated loss ratios by community for Wallowa County from the earthquake scenario described in this report.

Figure 3-1. Earthquake loss ratio by Wallowa County community.

In keeping with earthquake damage reporting conventions, we 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 (FEMA, 2012b).

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 (FEMA, 2012b). 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.

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

The results indicate that Wallowa County could incur a moderate level of losses (13%) due to the earthquakes represented in the probabilistic shaking map. These results are strongly influenced by ground deformation from liquefaction. Moderate to high liquefaction susceptibility exists in the valley along the Wallowa River, which increases the risk from earthquake. Developed areas in the communities of Enterprise, Joseph, Lostine, and Wallowa that are built on highly liquefiable soils have higher estimates of damage from this earthquake scenario than rural parts of the county.

Although damage caused by coseismic landslides was not specifically looked at in this report, it likely contributes a small amount of the estimated damage from the earthquake hazard in Wallowa County. Landslide exposure results show that 7% of buildings in Wallowa County are within a very high or high susceptibility zone. This indicates that a similar percentage of the earthquake loss estimated in this study may be due to coseismic landslide.

Building vulnerabilities such as the age of the building stock and occupancy type are also contributing factors in loss estimates. The first seismic buildings codes were implemented in Oregon in the 1970’s (Judson, 2012) and by the 1990’s modern seismic building codes were being enforced. Nearly 75% of Wallowa County’s buildings were built before the 1990’s. In Hazus-MH, manufactured homes are one occupancy type that performs poorly in earthquake damage modeling. Communities that are composed of an older building stock and more vulnerable occupancy types are expected to experience more damage from earthquake than communities with fewer of these vulnerabilities.

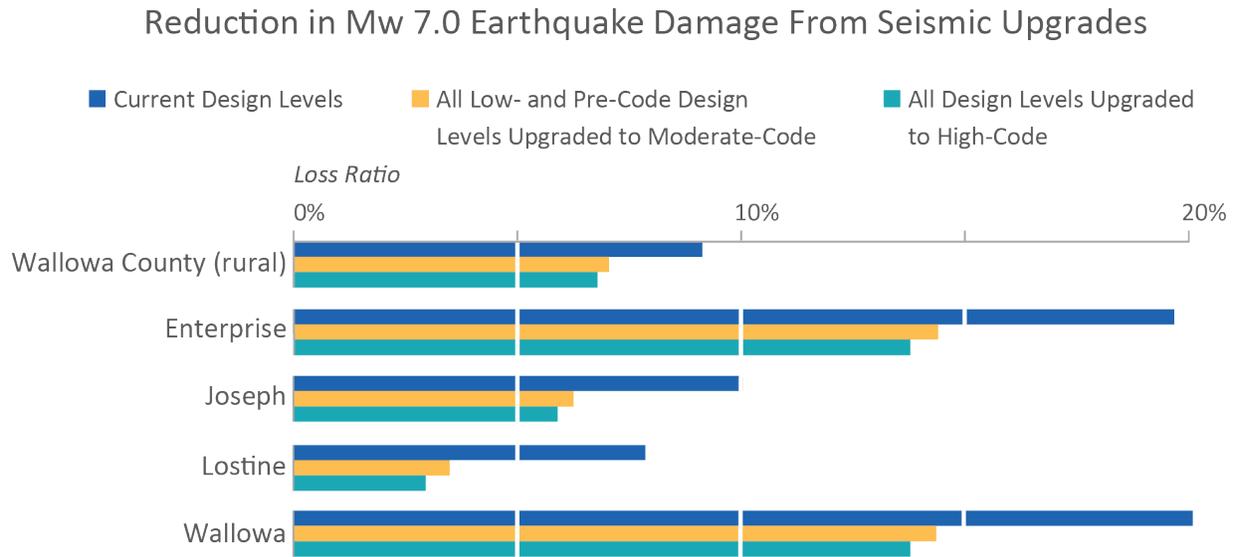
If buildings could be seismically retrofitted to higher code standards, earthquake risk would be greatly reduced. In this study, a simulation in Hazus-MH earthquake analysis shows that loss ratios drop from 13% to 9.2%, when all buildings are upgraded to at least moderate code level. While retrofits can decrease earthquake vulnerability, for areas of high landslide or liquefaction, additional geotechnical mitigation may be necessary to have an effect on losses. **Figure 3-2** illustrates the

Key Terms:

- *Seismic retrofit:* Structural modification to a building that improves its resilience to earthquake.
- *Design level:* Hazus-MH terminology referring to the quality of a building’s seismic building code (i. e. pre, low, moderate, and high). Refer to [Appendix C.2.3](#) for more information.

reduction in loss estimates from the probabilistic Mw 7.0 earthquake through two simulations where all buildings are upgraded to moderate code standards or to high code standards.

Figure 3-2. 2,500-year probabilistic Mw 7.0 earthquake loss ratio in Wallowa County, with simulated seismic building code upgrades.



3.2.3 Areas of significant risk

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

- 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.

3.3 Flooding

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, close and damage major highways, destroy railways, damage structures, and cause major economic disruption. Flood issues like flash flooding, ice jams, post-wildfire floods, and dam safety were not examined in this report.

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 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.

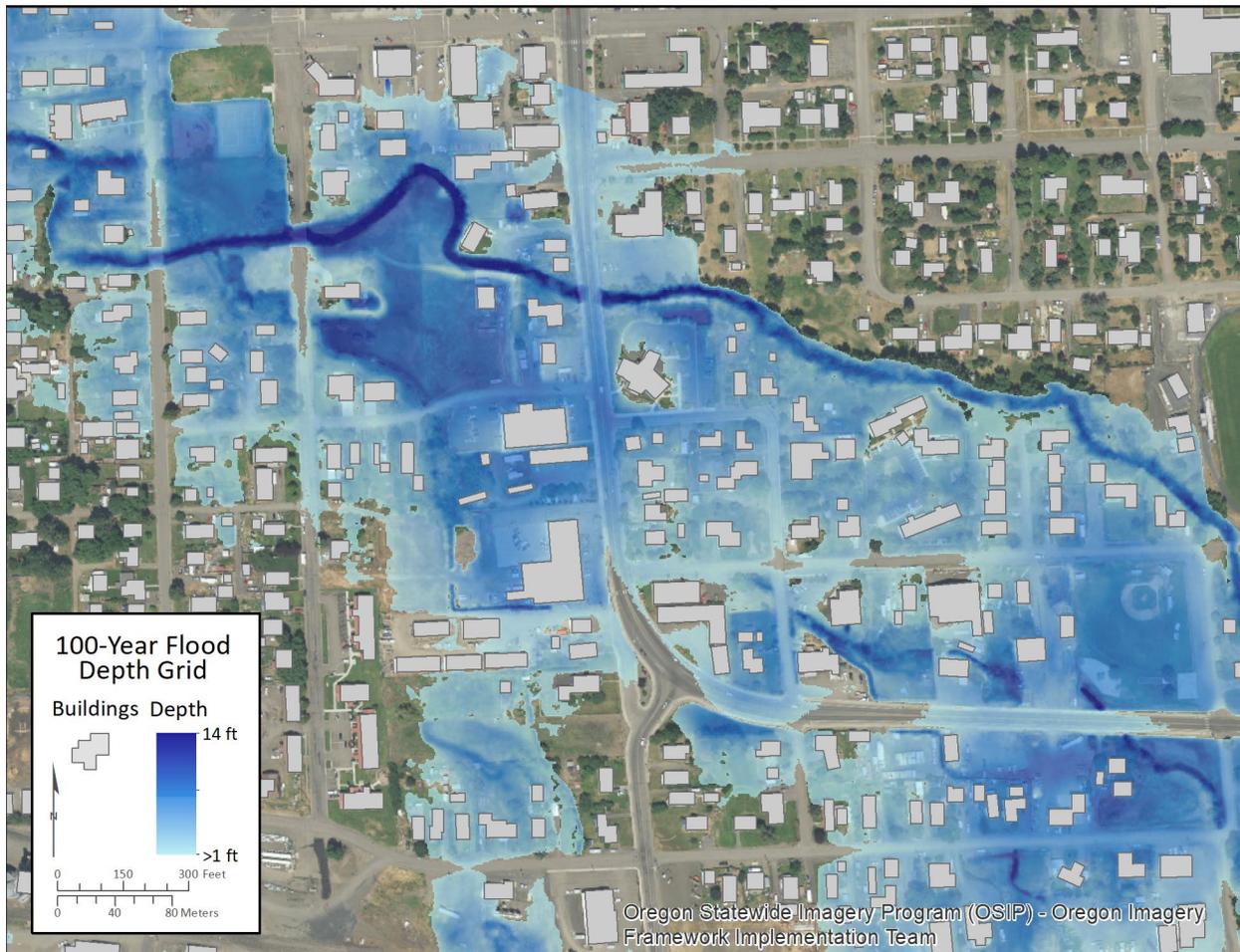
Floods commonly adversely impact human activities within the natural and built environment. Through strategies such as flood hazard mitigation these adverse impacts can be reduced. Examples of common mitigating activities are elevating structures above the expected level of flooding or removing the structure through FEMA's property acquisition ("buyout") program.

3.3.1 Data sources

The Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) for the study area were updated and made effective in 1988 (FEMA, 1988); these were the primary data sources for the flood risk assessment. Further information regarding NFIP related statistics can be found at FEMA's website: <https://nfipservices.floodsmart.gov/reports-flood-insurance-data>. These were the only flood data sources that we used in the analysis, but flooding does occur in areas outside of the detailed mapped areas. Over the 35 years since stream modeling first occurred in Wallowa County, the stream condition may have changed considerably and inaccuracies in the flood maps could be present.

We developed 10-, 50-, 100-, and 500-year flood depth maps from detailed stream model information within the study area. A flood depth map is a raster map of water depth for a specific flood in which each pixel value represents the depth of flooding at that location for a given flood (**Figure 3-3**). The flood depth maps are the result of subtracting the ground surface elevation represented by a detailed lidar DEM from a model of the water surface elevation for each flood. The flood depth maps were used in this risk assessment for loss estimations and, for comparative purposes, exposure analysis to determine the level of impact to people and buildings. The DEM that we used to create the flood depth maps was from high-resolution lidar collected in 2015 (Wallowa 3DEP project, Oregon Lidar Consortium; see <http://www.oregongeology.org/lidar/collectinglidar.htm>).

Figure 3-3. Flood depth grid example in the City of Enterprise, OR.



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

For Wallowa County, occupancy type and basement presence attributes were available from the assessor database for most buildings. Where individual building information was not available from assessor data, we used oblique imagery and street level imagery to estimate these important building

attributes. Only buildings in a flood zone or within 500 feet (152 meters) of a flood zone were examined closely to attribute buildings with more accurate information for first-floor height and basement presence. Because our analysis accounted for building first-floor height, buildings that have been elevated above the flood level were not given a loss estimate—but we did count residents in those structures as displaced. We did not look at the duration that residents would be displaced from their homes due to flooding. For information about structures exposed to flooding but not damaged, see the [Exposure analysis](#) section below.

3.3.2 Countywide results

For this risk assessment, we imported the countywide UDF data and depth grids into Hazus-MH and ran a flood analysis for four flood scenarios (10-, 50-, 100-, and 500-year). We used the 100-year flood scenario as the primary scenario for reporting flood results (also see [Appendix E](#) Plate 4). The 100-year flood has traditionally been used as a reference level for flooding and is the standard probability that FEMA uses for regulatory purposes. See [Appendix B](#) Table B-4 for multi-scenario cumulative results.

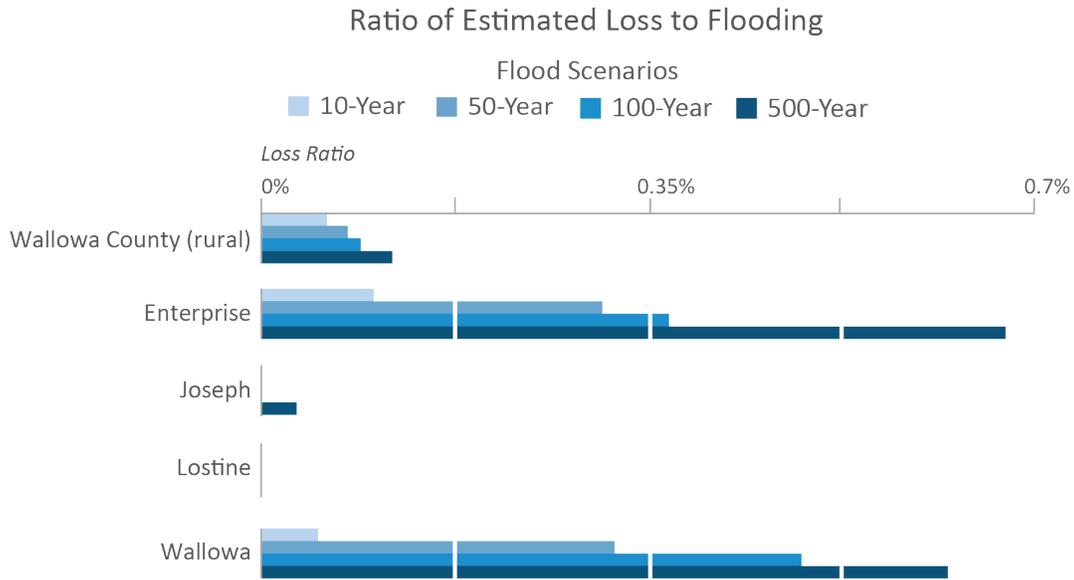
Wallowa Countywide 100-year flood loss:

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

3.3.3 Hazus-MH analysis

The Hazus-MH loss estimate for the 100-year flood scenario for the entire county is over \$1.5 million. While the overall loss ratio for flood damage in Wallowa County is 0.2%, 100-year flooding has a significant impact to Wallowa County where development exists near streams ([Figure 3-4](#)). In communities where most residents are not within flood designated zones, the loss ratio may not be as helpful as the actual replacement cost and number of residents displaced to assess the level of risk from flooding. The Hazus-MH analysis also provides useful flood data on individual communities so that planners can identify problems and consider which mitigating activities will provide the greatest resilience to flooding.

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 3-4](#)). There are few areas of concentrated flood damage in the study area. The small amount of damage that is estimated is scattered across the county at various places along the mapped streams.

Figure 3-4. Ratio of flood loss estimates by Wallowa County community.

3.3.4 Exposure analysis

Separate from the Hazus-MH flood analysis, we did an exposure analysis by overlaying building locations on the 100-year flood extent. We did this 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. See [Appendix B](#) Table B-5 for community-based results of flood exposure.

3.3.5 Areas of significant risk

We 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.

3.4 Landslide Susceptibility

Landslides are mass downhill movements of rock, debris, or soil. There are many different types of landslides in Oregon. In Wallowa County, the most common are debris flows and shallow- and deep-seated landslides. Landslides can occur in many sizes, at different depths, and with varying rates of movement. Generally, they are large, deep, and slow moving or small, shallow, and rapid. Some factors that influence

landslide type are hillside slope, water content, and geology. Many triggers can cause a landslide: intense rainfall, earthquakes, or human-induced factors like excavation along a landslide toe or loading at the top. Landslides can cause severe damage to buildings and infrastructure. Fast-moving landslides may pose life safety risks and can occur throughout Oregon (Burns and others, 2016).

3.4.1 Data sources

The Statewide Landslide Information Layer for Oregon [SLIDO], release 3.2 (Burns and Watzig, 2014) is an inventory of mapped landslides in the state of Oregon. SLIDO is a compilation of past studies; some studies were completed very recently using new technologies, like lidar-derived topography, and some studies were performed more than 50 years ago. Consequently, SLIDO data vary greatly in scale, scope, and focus and thus in accuracy and resolution across the state. Some landslide mapping for Wallowa County was done in 1979 and again in 2006 before lidar was available for high-accuracy mapping.

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

We used the data from the statewide landslide susceptibility map (Burns and others, 2016) in this report to identify the general level of susceptibility of given area to landslide hazards, primarily shallow and deep landslides. We overlaid building and critical facilities data on landslide susceptibility zones to assess the exposure for each community (see [Appendix B](#) Table B-6). We combined high and very high susceptibility zones to provide a general sense of community risk for planning purposes (see [Appendix E](#), Plate 5).

The total dollar value of exposed buildings was summed for the study area and is reported below. We 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.

3.4.2 Countywide results

The landslide exposure results are tabulated below for the high and very high categories and shown for all categories in [Figure 3-5](#). See [Appendix B: Detailed Risk Assessment Tables](#) for multi-scenario analysis results.

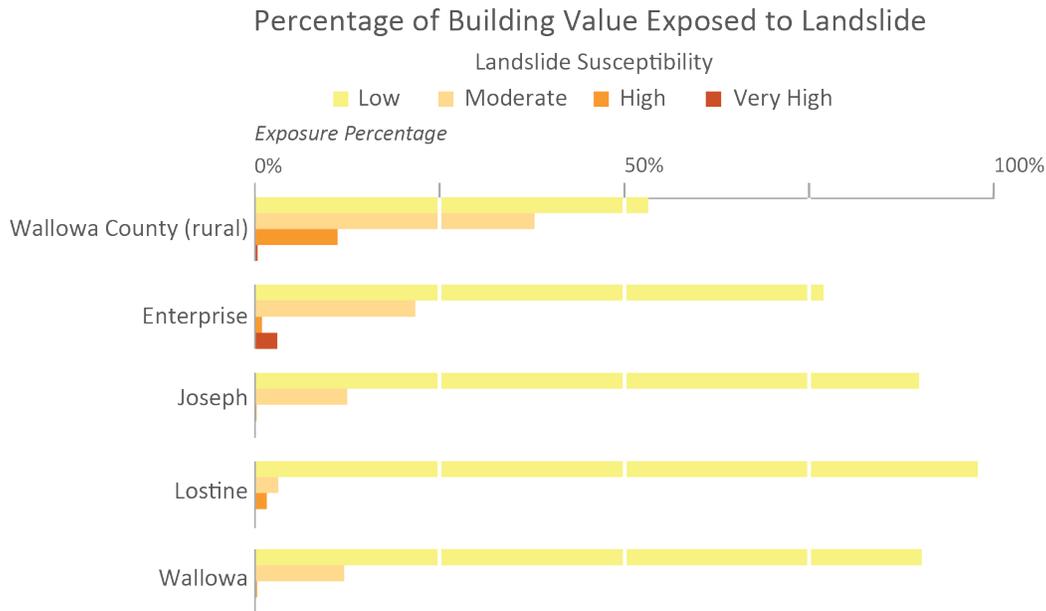
Wallowa Countywide landslide exposure (High and Very High susceptibility):

- 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

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 3-5. Landslide susceptibility exposure by Wallowa County community.



3.4.3 Areas of significant risk

We identified locations within the study area that are comparatively at greater risk to landslide hazard:

- The current mapping show exposure to landslide hazard throughout rural parts of the county and along the base of the Wallowa Mountains.
- Some communities in Wallowa County may be at higher or lower risk than what the data show, due to very incomplete mapping of landslides.

3.5 Wildfire

Wildfires are a natural part of the ecosystem in Oregon. However, wildfires can present a substantial hazard to life and property in many communities. The most common severe wildfire conditions include: hot, dry, and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation). Once a fire has started, its behavior is influenced by numerous conditions, including fuel, topography, weather, drought, and development (Pyrologix LCC, 2018). Post-wildfire geologic hazards can also present risk. These usually include flood, debris flows, and landslides. Post-wildfire geologic hazards were not evaluated in this project.

The Wallowa County Land Development Ordinance (WCLDO), from 1995, recommends that the county develop policies that address fire restriction enforcement, wildland urban interface standards, and building code enforcement related to emergency access (Wallowa County Planning Commission, 1995). Forests cover a significant portion of the county and surround homes in many rural parts. Contact the Wallowa County Planning Department for specific requirements related to the county's land use plan.

3.5.1 Data sources

The Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results (PNRA; Pyrologix LCC, 2018) 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 measure the risk to communities in Wallowa County.

Using guidance from ODF, we categorized the Burn Probability dataset into low, moderate, and high-hazard zones for the wildfire exposure analysis. Probability ranges of the Burn Probability dataset from the PNRA were grouped into 3 categories of wildfire hazard. Burn probability is derived from simulations using many elements, such as, weather, ignition frequency, ignition density, and fire modeling landscape (Pyrologix LCC, 2018).

Burn probabilities (mean annual burn probability) were grouped into 3 hazard categories:

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

We overlaid the buildings layer and critical facilities on each of the wildfire hazard zones to determine exposure. In certain areas no wildfire data is present which indicates areas that have minimal risk to wildfire hazard (see [Appendix B](#), Table B-8). We also estimated the number of people threatened by wildfire. Land value losses due to wildfire were not examined for this project.

3.5.3 Areas of significant risk

We 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.

4.0 CONCLUSIONS

The purpose of this study is to provide a better understanding of potential impacts from multiple natural hazards at the community scale. We accomplished this by using the latest natural hazard mapping and loss estimation tools to quantify expected damage to buildings and potential displacement of permanent residents, or determine which buildings and residents are exposed to a hazard. This comprehensive and detailed approach to the analysis provides new context for the county's risk reduction efforts. We note several important findings based on the results of this study:

- **Moderate overall damage and losses can occur from an earthquake**—Based on the results of a 2,500-year probabilistic Mw 7.0 earthquake, every community in Wallowa County will experience a moderate impact and disruption. Results show that an earthquake can cause building losses of 10% to 20% to all communities in the study area. Some communities like Enterprise and Wallowa can expect a high percentage of losses due to ground deformation related to liquefaction. The high vulnerability of the building inventory (building age and building type) and the number of buildings constructed on liquefiable soils contribute to the estimated levels of losses expected in the study area.
- **Retrofitting buildings to modern seismic building codes can reduce damages and losses from earthquake shaking**—Seismic building codes have a major influence on earthquake shaking damage estimated in this study. We examined potential loss reduction from seismic retrofits (modifications that improve building's seismic resilience) in simulations by using Hazus-MH building code "design level" attributes of pre, low, moderate, and high codes (FEMA, 2012b) in earthquake scenarios. The simulations were accomplished by upgrading every pre (non-existent) and low seismic code building to moderate seismic code levels in one scenario, and then by upgrading all buildings to high (current) code in another scenario. We found that retrofitting to at least moderate code was the most cost-effective mitigation strategy because the additional benefit from retrofitting to high code was minimal. In our simulation of upgrading buildings to at least moderate code, the estimated loss for the entire study area was reduced from 13% to 9.2%. We found only a slight reduction in estimated loss in our simulation to 8.9% by upgrading all buildings to high code. In both cases the gains are small in comparison to the considerable cost of retrofits, and retrofits may only make sense for critical facilities and high-occupancy buildings. Some communities would see greater loss reduction than the county on a whole, due to older building stock constructed at pre or low code seismic building code standards. An example is the City of Enterprise where a significant loss reduction (from 20% to 15%) could occur by retrofitting all buildings to at least moderate code. This stands in contrast to areas with younger building stock, such as the unincorporated county areas around the Cities of Enterprise and Joseph, which would see small reductions in damage estimates. While seismic retrofits are an

effective strategy for reducing earthquake shaking damage, it should be noted that earthquake-induced landslide and liquefaction hazards will also be present in some areas, and these hazards require different geotechnical mitigation strategies. Future risk assessments focused on coseismic landslide and liquefaction hazards would provide a clearer understanding for local decision-makers.

- **Some communities in the county are at significant risk from flooding**—Most of buildings in Wallowa County are built along the Wallowa River and some of its tributaries that are prone to flooding. Flooding can also occur in several other rivers in the county that do not have an available stream model and were not included in this risk assessment. Current flood mapping in use is nearly 35 years old and may be inaccurate in its characterization of the 100-year flood. At first glance, Hazus-MH flood loss estimates may give a false impression of lower risk because they show lower damages for a community relative to other hazards we examined. This is due to the difference between loss estimation and exposure results, as well as the limited area impacted by flooding. Another consideration is that flood is one of the most frequently occurring natural hazards. An average of 3.8% loss was calculated when looking at just the buildings within the 100-year flood zone. The areas that are most vulnerable to flood hazard within the study are some residential buildings in Enterprise and Wallowa along the Wallowa River and some of its tributaries.
- **Elevating structures in the flood zone reduces vulnerability**—Flood exposure analysis was used in addition to Hazus-MH loss estimation to identify buildings that were not damaged but that were within the area expected to experience a 100-year flood. By using both analyses in this way, the number of elevated structures within the flood zone could be quantified. This showed possible mitigation needs in flood loss prevention and the effectiveness of past activities. The flood depth maps show that floods would occur over a wide area but would be relatively shallow, so that, many buildings exposed to flood hazard would be above the flood elevation. The City of Enterprise has a very high number (161) of buildings in the flood hazard area that are higher than the base flood elevation (BFE). Based on the number of buildings exposed to flooding throughout the unincorporated county, many would benefit from elevating above the level of flooding. Updated flood mapping would help to accurately determine the correct elevation required.
- **New landslide mapping would increase the accuracy of estimating landslide risk**—The landslide hazard data used in this risk assessment was created before the advent of modern mapping technology; future risk assessments using lidar-derived landslide hazard data would provide more accurate results.
- **Wildfire risk is very high for the overall study area**—Exposure analysis shows that buildings throughout the unincorporated county are vulnerable to wildfire hazard. The City of Wallowa is at risk to wildfire with 14% of the buildings in the high-risk zone. All communities in Wallowa County have some risk to wildfire with around 20% of buildings being in moderate or high wildfire risk zones.
- **Most of the study area’s critical facilities are at significant risk to earthquake and wildfire hazards**—Critical facilities were identified and were specifically examined for this report. We estimate that 48% (19 of 40) of Wallowa County’s critical facilities will be non-functioning after a 2,500-year probabilistic earthquake. Additionally, 25% (10 of 40) of critical facilities are exposed to high wildfire risk and 10% (4 of 40) to very high or high landslide hazard. We found no exposure of critical facilities to flood.

- **The biggest causes of displacement to population are earthquake and wildfire hazards—** Potential displacement of permanent residents from natural hazards was estimated in this report. We estimate that 21% of the population in the county could be displaced due a wildfire. Earthquake hazard is a potential threat to 8.2% of the population and flood hazard puts 8.9% at risk of displacement. A small percentage of residents are vulnerable to displacement from landslide hazard.
- **The results allow communities the ability to compare across hazards and prioritize their needs—**Each community within the study area was assessed for natural hazard exposure and loss. This allowed for comparison of risk for a specific hazard between communities. It also allows for a comparison between different hazards, though care must be taken to distinguish loss estimates and exposure results. The loss estimates and exposure analyses can assist in developing plans that address the concerns for those individual communities.

5.0 LIMITATIONS

There are several limitations to keep in mind when interpreting the results of this risk assessment.

- **Spatial and temporal variability of natural hazard occurrence** – Flood, earthquake, landslide, and wildfire are extremely unlikely to occur across the fully mapped extent of the hazard zones. For example, areas mapped in the 1% annual chance flood zone will be prone to flooding on occasion in certain watersheds during specific events, but not all at once throughout the entire county or even the entire community. While we report the overall impacts of a given hazard scenario, the losses from a single hazard event probably will not be as severe and widespread.
- **Loss estimation for individual buildings** – Hazus-MH is a model of reality, which is an important factor when considering the loss ratio of an individual building. On-the-ground mitigation, such as elevation of buildings to avoid flood loss, has been only minimally captured. Also, due to a lack of building material information, assumptions were made about the distribution of wood, steel, and un-reinforced masonry buildings. Loss estimation is most insightful when individual building results are aggregated to the community level because it reduces the impact of uncertainty in building characteristics.
- **Loss estimation versus exposure** – We recommend careful interpretation of exposure results. This is due to the spatial and temporal variability of natural hazards (described above) and the inability to perform loss estimations due to the lack of Hazus-MH damage functions. Exposure is reported in terms of total building value, which could imply a total loss of the buildings in a particular hazard zone, but this is not the case. Exposure is simply a calculation of the number of buildings and their value and does not make estimates about the level to which an individual building could be damaged or how many buildings might be impacted in a single event. Even a large wildfire would only cover a small part of the county at any time and most landslides would be unique events.
- **Population variability** – Some of the communities in Wallowa County have a number of vacation homes and rentals, which are typically occupied during the summer. Our estimates of potentially displaced people rely on permanent populations published in the 2010 U.S. Census (United States Census Bureau, 2010b). As a result, we are slightly underestimating the number of people that may be in harm's way on a summer weekend.

- **Data accuracy and completeness** – Some datasets in our risk assessments had incomplete coverage or lacked high-resolution data within the study area. We used lower-resolution data to fill gaps where there was incomplete coverage or where high-resolution data were not available. Assumptions to amend areas of incomplete data coverage were made based on reasonable methods described within this report. However, we are aware that some uncertainty has been introduced from these data amendments at an individual building scale. At community-wide scales the effects of the uncertainties are lower. Data layers in which assumptions were made to fill gaps are building footprints, population, some building specific attributes, and landslide susceptibility. Many of the datasets included known or suspected artifacts, omissions and errors, identifying or repairing these problems was beyond the scope of the project and are areas needing additional research.

6.0 RECOMMENDATIONS

The following areas of implementation are needed to better understand hazards and reduce risk to natural hazard through mitigation planning. These implementation areas, while not comprehensive, touch on all phases of risk management and focus on awareness and preparation, planning, emergency response, mitigation funding opportunities, and hazard-specific risk reduction activities.

6.1 Awareness and Preparation

Awareness is crucial to lowering risk and lessening the impacts of natural hazards. When community members understand their risk and know the role that they play in preparedness, the community in general is a much safer place to live. Awareness and preparation not only reduce the initial impact from natural hazards, but they also reduce the time a community needs to recover from a disaster, commonly referred to as “resilience.”

This report is intended to provide local officials a comprehensive and authoritative profile of natural hazard risk to underpin their public outreach efforts.

Messaging can be tailored to stakeholder groups. For example, outreach to homeowners could focus on actions they can take to reduce risk to their property. The DOGAMI Homeowners Guide to Landslides (https://www.oregongeology.org/Landslide/ger_homeowners_guide_landslides.pdf) provides a variety of risk reduction options for homeowners who live in high landslide susceptibility areas. This guide is one of many existing resources. Agencies partnering with local officials in the development of additional effective resources could help reach a broader community and user groups.

6.2 Planning

The information presented here can help local decision-makers in developing their local plans and help identify geohazards and associated risks to the community. The primary framework for accomplishing this is through the comprehensive planning process. The comprehensive plan sets the long-term trajectory of capital improvements, zoning, and urban growth boundary expansion, all of which are planning tools that can be used to reduce natural hazard risk.

Another framework is the natural hazard mitigation plan (NHMP) process. NHMP plans focus on characterizing natural hazard risk and identifying actions to reduce risk. Additionally, the information

presented here can be a resource when updating the mitigation actions and inform the vulnerability assessment section of the NHMP plan.

While there are many similarities between this report and an NHMP, the hazards or critical facilities in the two reports can vary. Differences between the reports may be due to data availability or limited methodologies for specific hazards. The critical facilities considered in this report may not be identical to those listed in a typical NHMP due to the lack of damage functions in Hazus-MH for non-building structures and to different considerations about emergency response during and after a disaster.

6.3 Emergency Response

Critical facilities will play a major role during and immediately after a natural disaster. This study can help emergency managers identify vulnerable critical facilities and develop contingencies in their response plans. Additionally, detailed mapping of potentially displaced residents can be used to re-evaluate evacuation routes and identify vulnerable populations to target for early warning.

The building database that accompanies this report presents many opportunities for future pre-disaster mitigation, emergency response, and community resilience improvements. Vulnerable areas can be identified and targeted for awareness campaigns. These campaigns can be aimed at pre-disaster mitigation through, for example, improvements of the structural connection of a building's frame to its foundation. Emergency response entities can benefit from the use of the building dataset through identification of potential hazards and populated buildings before and during a disaster. Both reduction of the magnitude of the disaster and a decrease in the response time contribute to a community's overall resilience.

6.4 Mitigation Funding Opportunities

Several funding options are available to communities that are susceptible to natural hazards and have specific mitigation projects they wish to accomplish. State and federal funds are available for projects that demonstrate cost effective natural hazard risk reduction. The Oregon Office of Emergency Management (OEM) State Hazard Mitigation Officer (SHMO) can provide communities assistance in determining eligibility, finding mitigation grants, and navigating the mitigation grant application process.

At the time of writing this report, FEMA has two programs that assist with mitigation funding for natural hazards: Hazard Mitigation Grant Program (HMGP) and Pre-Disaster Mitigation (PDM) Grant Program. FEMA also has a grant program specifically for flooding called Flood Mitigation Assistance (FMA). The SHMO can help with finding further opportunities for earthquake and tsunami assistance and funding.

6.5 Hazard-Specific Risk Reduction Actions

6.5.1 Earthquake

- Evaluate critical facilities for seismic preparedness by identifying structural deficiencies and vulnerabilities to dependent systems (e.g., water, fuel, power).
- Evaluate vulnerabilities of critical facilities. We estimate that 50% of critical facilities ([Appendix A: Community Risk Profiles](#)) will be damaged by an earthquake scenario described in this report, which will have many direct and indirect negative effects on first-response and recovery efforts.

- Identify communities and buildings that would benefit from seismic upgrades.

6.5.2 Flood

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

6.5.3 Landslide

- Create modern landslide inventory and susceptibility maps.
- Monitor ground movement in high susceptibility areas.
- Consider land value losses due to landslide in future risk assessments.

6.5.4 Wildfire-related geologic hazards

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

6.5.5 Channel migration

- Create modern channel migration hazard maps.
- Consider land value losses due to channel migration in future risk assessments.

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APPENDIX A. COMMUNITY RISK PROFILES

A risk analysis summary for each community is provided in this section to encourage ideas for natural hazard risk reduction. Increasing disaster preparedness, public hazards communication, and education, ensuring functionality of emergency services, and ensuring access to evacuation routes are actions that every community can take to reduce their risk. This appendix contains community specific data to provide an overview of the community and the level of risk from each natural hazard analyzed. In addition, for each community a list of critical facilities and assumed impact from individual hazards is provided.

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A.1 Unincorporated Wallowa County (Rural)

Table A-1. Unincorporated Wallowa County (rural) hazard profile.

Community Overview							
Community Name	Population	Number of Buildings	Critical Facilities ¹	Total Building Value (\$)			
Unincorporated Wallowa County (rural)	2,966	6,472	16	523,679,000			
Hazus-MH Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood ²	1% Annual Chance	101	3.4%	115	0	477,000	0.1%
Earthquake	2500-year Probabilistic	148	5.0%	966	5	48,629,035	9.3%
Exposure Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Exposure Ratio
Landslide	High and Very High Susceptibility	185	6.2%	516	4	58,757,000	11.2%
Wildfire	High Hazard	1,315	44.3%	3,491	10	266,117,000	50.8%

¹Facilities with multiple buildings were consolidated into one building complex.

²No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

Table A-2. Unincorporated Wallowa County (rural) critical facilities.

Critical Facilities by Community	Flood 1% Annual Chance	Earthquake Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High Hazard
	Exposed	>50% Prob.	Exposed	Exposed
Communication Structure			X	X
Enterprise Water Treatment				
Howard Butte Lookout				X
Imnaha Christian Fellowship			X	
Imnaha Elementary				X
Imnaha Store and Tavern				X
Joseph State Airport		X		
Joseph Water Treatment			X	
Lazy F Ranch Airport				X
Memaloose Airport				X
ODFW Hatchery		X		X
Oregon State Police		X		
Reds Wallowa Horse Ranch Airstrip			X	X
Troy Elementary				X
Wallowa County Public Works		X		
Wallowa Lake Fire Station		X		X

A.2 City of Enterprise

Table A-3. City of Enterprise hazard profile.

Community Overview							
Community Name		Population	Number of Buildings	Critical Facilities ¹	Total Building Value (\$)		
Enterprise		1,940	1,424	13	212,587,000		
Hazus-MH Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood ²	1% Annual Chance	503	25.9%	163	0	794,000	0.4%
Earthquake	2500-year Probabilistic	282	14.5%	584	6	42,500,674	20.0%
Exposure Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Exposure Ratio
Landslide	High and Very High Susceptibility	56	2.9%	45	0	8,101,000	3.8%
Wildfire	High Hazard	49	2.5%	43	0	10,894,000	5.1%

¹Facilities with multiple buildings were consolidated into one building complex.

²No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

Table A-4. City of Enterprise critical facilities.

Critical Facilities by Community	Flood 1% Annual Chance	Earthquake Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High Hazard
	Exposed	>50% Prob.	Exposed	Exposed
Cloverleaf Hall		X		
Enterprise Community Connections				
Enterprise Fire Department		X		
Enterprise High School		X		
Enterprise Maintenance Station Grounds				
Enterprise Municipal Airport				
Enterprise Safeway		X		
Enterprise SDA School				
Enterprise Sports Complex				
Wallowa County Courthouse		X		
Wallowa County Sheriff and Emergency Services				
Wallowa Memorial Hospital				
Wallowa Resources		X		

A.3 City of Joseph

Table A-5. City of Joseph hazard profile.

Community Overview							
Community Name		Population	Number of Buildings	Critical Facilities ¹	Total Building Value (\$)		
Joseph		1,081	896	3	99,947,000		
Hazus-MH Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood ²	1% Annual Chance	0	0.0%	0	0	0	0.0%
Earthquake	2500-year Probabilistic	55	5.1%	172	1	10,188,975	10.2%
Exposure Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Exposure Ratio
Landslide	High and Very High Susceptibility	1	0.1%	4	0	189,000	0.2%
Wildfire	High Hazard	9	0.8%	8	0	1,395,000	1.4%

¹Facilities with multiple buildings were consolidated into one building complex.

²No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

Table A-6. City of Joseph critical facilities.

Critical Facilities by Community	Flood 1% Annual Chance	Earthquake Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High Hazard
	Exposed	>50% Prob.	Exposed	Exposed
Joseph Fire Department				
Joseph High School				
Wallowa Mountain Office		X		

A.4 City of Lostine

Table A-7. City of Lostine hazard profile.

Community Overview							
Community Name		Population	Number of Buildings	Critical Facilities ¹	Total Building Value (\$)		
Lostine		213	236	4	17,930,000		
Hazus-MH Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood ²	1% Annual Chance	0	0.0%	0	0	0	0.0%
Earthquake	2500-year Probabilistic	3	1.6%	31	4	1,432,368	8.0%
Exposure Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Exposure Ratio
Landslide	High and Very High Susceptibility	2	1.2%	2	0	276,000	1.5%
Wildfire	High Hazard	0	0.0%	0	0	0	0.0%

¹Facilities with multiple buildings were consolidated into one building complex.

²No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

Table A-8. City of Lostine critical facilities.

	Flood 1% Annual Chance	Earthquake Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High Hazard
Critical Facilities by Community	Exposed	>50% Prob.	Exposed	Exposed
Lostine City Hall		X		
Lostine Fire Dept		X		
M Crow General Store		X		
Southfork Grange		X		

A.5 City of Wallowa

Table A-9. City of Wallowa hazard profile.

Community Overview							
Community Name		Population	Number of Buildings	Critical Facilities ¹	Total Building Value (\$)		
Wallowa		808	680	4	55,658,000		
Hazus-MH Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Damaged Buildings	Damaged Critical Facilities	Loss Estimate (\$)	Loss Ratio
Flood ²	1% Annual Chance	19	2.3%	17	0	275,000	0.5%
Earthquake*	2500-year Probabilistic	88	10.9%	258	3	11,360,070	20%
Exposure Analysis Summary							
Hazard	Scenario	Potentially Displaced Residents	% Potentially Displaced Residents	Exposed Buildings	Exposed Critical Facilities	Building Value (\$)	Exposure Ratio
Landslide	High and Very High Susceptibility	4	0.4%	1	0	123,000	0.2%
Wildfire	High Hazard	100	12.4%	81	0	7,542,000	14%

¹Facilities with multiple buildings were consolidated into one building complex.

²No damage is estimated for exposed structures with “First floor height” above the level of flooding (base flood elevation).

Table A-10. City of Wallowa critical facilities.

Critical Facilities by Community	Flood 1% Annual Chance	Earthquake Moderate to Complete Damage	Landslide High and Very High Susceptibility	Wildfire High Hazard
	Exposed	>50% Prob.	Exposed	Exposed
Wallowa Fire Dept.		X		
Wallowa High/Elementary School		X		
Wallowa Senior Center				
Wallowa Water Treatment		X		

APPENDIX B. DETAILED RISK ASSESSMENT TABLES

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Table B-1. Wallowa County building inventory.

(all dollar amounts in thousands)

Community	Residential			Commercial and Industrial			Agricultural			Public and Non-Profit			All Buildings			
	Number of Buildings	Building Value (\$)	Building Value per Community Total	Number of Buildings	Building Value (\$)	Building Value per Community Total	Number of Buildings	Building Value (\$)	Building Value per Community Total	Number of Buildings	Building Value (\$)	Building Value per Community Total	Number of Buildings	Number of Buildings per Watershed Total	Building Value (\$)	Value of Buildings per Watershed Total
Unincorp. Wallowa Co (rural)	2,627	368,343	70%	546	30,627	5.8%	3,250	107,323	20%	49	17,386	3.3%	6,472	66.7%	523,679	57.6%
Enterprise	898	118,457	56%	300	71,409	33.6%	202	5,376	2.5%	24	17,345	8.2%	1,424	14.7%	212,587	23.4%
Joseph	611	74,050	74%	136	13,323	13.3%	138	3,322	3.3%	11	9,252	9.3%	896	9.2%	99,947	11.0%
Lostine	128	14,015	78%	27	2,030	11%	74	1,235	6.9%	7	650	3.6%	236	2.4%	17,930	2.0%
Wallowa	437	40,545	73%	101	4,411	7.9%	126	2,754	4.9%	16	7,947	14.3%	680	7%	55,658	6%
Total Wallowa County	4,701	615,410	68%	1,110	121,801	13.4%	3,790	120,010	13.2%	107	52,580	6%	9,708	100.0%	909,800	100.0%

Table B-2. Earthquake loss estimates.

<i>(all dollar amounts in thousands)</i>										
Total Earthquake Damage										
	Total Number of Buildings	Total Estimated Building Value (\$)	Buildings Damaged				All Buildings Changed to At Least Moderate Code			
			Yellow- Tagged Buildings	Red- Tagged Buildings	Sum of Economic Loss	Loss Ratio	Yellow- Tagged Buildings	Red- Tagged Buildings	Sum of Economic Loss	Loss Ratio
Unincorp. Wallowa Co (rural)	6,472	523,679	739	228	48,629	9.3%	606	136	37,524	7%
Enterprise	1,424	212,587	418	166	42,501	20%	341	73	31,114	15%
Joseph	896	99,947	138	34	10,189	10%	77	14	6,350	6%
Lostine	236	17,930	28	3	1,432	8%	8	1	636	4%
Wallowa	680	55,658	192	66	11,360	20%	151	33	8,123	15%
Total Wallowa County	9,708	909,800	1,515	497	114,111	13%	1,183	256	83,747	9%

Table B-3. Flood loss estimates.

Community	Total Number of Buildings	Total Estimated Building Value (\$)	<i>(all dollar amounts in thousands)</i>											
			10% (10-yr)			2% (50-yr)			1% (100-yr)			0.2% (500-yr)		
			Number of Buildings	Loss Estimate	Loss Ratio	Number of Buildings	Loss Estimate	Loss Ratio	Number of Buildings	Loss Estimate	Loss Ratio	Number of Buildings	Loss Estimate	Loss Ratio
Unincorp. Wallowa Co (rural)	6,472	523,679	76	315	0.06%	109	415	0.1%	115	477	0.1%	142	629	0.1%
Enterprise	1,424	212,587	85	219	0.10%	142	664	0.31%	163	794	0.37%	243	1,450	0.68%
Joseph	896	99,947	0	0	0.0%	0	0	0.0%	0	0	0.0%	1	32	0.0%
Lostine	236	17,930	0	0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%
Wallowa	680	55,658	6	29	0.1%	11	180	0.3%	17	275	0.5%	24	350	0.6%
Total Wallowa County	9,708	909,800	167	562	0.1%	262	1,259	0.1%	295	1,547	0.2%	410	2,461	0.3%

Table B-4. Flood exposure.

Community	Total Number of Buildings	Total Population	1% (100-yr)				
			Potentially Displaced Residents from Flood Exposure	% Potentially Displaced Residents from flood Exposure	Number of Flood Exposed Buildings	% of Flood Exposed Buildings	Number of Flood Exposed Buildings Without Damage
Unincorp. Wallowa Co (rural)	6,472	2,966	101	3.4%	141	2.2%	26
Enterprise	1,424	1,940	503	25.9%	324	22.8%	161
Joseph	896	1,081	0	0.0%	0	0.0%	0
Lostine	236	213	0	0.0%	0	0.0%	0
Wallowa	680	808	19	2.3%	21	3.1%	4
Total Wallowa County	9,708	7,008	622	8.9%	486	5.0%	191

Table B-5. Landslide exposure.

Community	Total Number of Buildings	Total Estimated Building Value (\$)	<i>(all dollar amounts in thousands)</i>								
			Very High Susceptibility			High Susceptibility			Moderate Susceptibility		
			Number of Buildings	Building Value (\$)	Percent of Building Value Exposed	Number of Buildings	Building Value (\$)	Percent of Building Value Exposed	Number of Buildings	Building Value (\$)	Percent of Building Value Exposed
Unincorp. Wallowa Co (rural)	6,472	523,679	20	1,662	0.3%	496	57,095	10.9%	2,365	193,176	37%
Enterprise	1,424	212,587	34	6,237	3%	11	1,863	0.9%	271	44,929	21%
Joseph	896	99,947	0	0	0.0%	4	189	0.2%	109	12,158	12%
Lostine	236	17,930	0	0	0.0%	2	276	1.5%	10	546	3%
Wallowa	680	55,658	0	0	0%	1	123	0.2%	82	6,555	12%
Total Wallowa County	9,708	909,800	54	7,899	0.9%	514	59,546	6.5%	2,837	257,364	28%

Table B-6. Wildfire exposure.

Community	Total Number of Buildings	Total Estimated Building Value (\$)	<i>(all dollar amounts in thousands)</i>					
			High Hazard			Moderate Hazard		
			Number of Buildings	Building Value (\$)	Percent of Building Value Exposed	Number of Buildings	Building Value (\$)	Percent of Building Value Exposed
Unincorp. Wallowa Co (rural)	6,472	523,679	3,491	266,117	51%	1,279	117,991	22.5%
Enterprise	1,424	212,587	43	10,894	5%	145	23,478	11%
Joseph	896	99,947	8	1,395	1%	237	25,150	25%
Lostine	236	17,930	0	0	0.0%	41	3,517	20%
Wallowa	680	55,658	81	7,542	14%	49	3,253	6%
Total Wallowa County	9,708	909,800	3,623	285,948	31.4%	1,751	173,389	19%

APPENDIX C. HAZUS-MH METHODOLOGY

C.1 Software

We performed all loss estimations using Hazus®-MH 4.2 and ArcGIS® Desktop® 10.7

C.2 User-Defined Facilities (UDF) Database

A UDF database was compiled for all buildings in Wallowa County for use in both the flood and earthquake modules of Hazus-MH. The Wallowa County assessor database (acquired in 2021) was used to determine which tax lots had improvements (i.e., buildings) and how many building points should be included in the UDF database.

C.2.1 Locating buildings points

The Oregon Department of Geology and Mineral Industries (DOGAMI) used the SBFO-1 (Williams, 2021) dataset to help precisely locate the centroid of each building. Extra effort was spent to locate building points along the 1% and 0.2% annual chance inundation fringe. When buildings were partially within the inundation zone, the building point was moved to the centroid of the portion of the building within the inundation zone. An iterative approach was used to further refine locations of building points for the flood module by generating results, reviewing the highest value buildings, and moving the building point over a representative elevation on the lidar digital elevation model to ensure an accurate first floor height.

C.2.2 Attributing building points

Populating the required attributes for Hazus-MH was achieved through a variety of approaches. The Wallowa County assessor database was used whenever possible, but in many cases that database did not provide the necessary information. The following is list of attributes and their sources:

- **Longitude and Latitude** – Location information that provides Hazus-MH the x and y-position of the UDF point. This allows for an overlay to occur between the UDF point and the flood or earthquake input data layers. The hazard model uses this spatial overlay to determine the correct hazard risk level that will be applied to the UDF point. The format of the attribute must be in decimal degrees. A simple geometric calculation using GIS software is done on the point to derive this value.
- **Occupancy class** – An alphanumeric attribute that indicates the use of the UDF (e.g., 'RES1' is a single-family dwelling). The alphanumeric code is composed of seven broad occupancy types (RES = residential, COM = commercial, IND = industrial, AGR = agricultural, GOV = public, REL = non-profit/religious, EDU = education) and various suffixes that indicate more specific types. This code determines the damage function to be used for flood analysis. It is also used to attribute the Building Type field, discussed below, for the earthquake analysis. The code was interpreted from "Stat Class" or "Description" data found in the Wallowa County assessor database. When data was not available, the default value of RES1 was applied throughout.
- **Cost** – The replacement cost of an individual UDF. Loss ratio is derived from this value. Replacement cost is based on a method called RSMeans valuation (Charest, 2017) and is calculated by multiplying the building square footage by a standard cost per square foot. These standard rates per square foot are in tables within the default Hazus database.

- **Year built** – The year of construction that is used to attribute the Building Design Level field for the earthquake analysis (see “Building Design” below). The year a UDF was built is obtained from Wallowa County assessor database. When not available, the year of “1900” was applied.
- **Square feet** – The size of the UDF is used to pro-rate the total improvement value for tax lots with multiple UDFs. The value distribution method will ensure that UDFs with the highest square footage will be the most expensive on a given tax lot. This value is also used to pro-rate the **Number of People** field for Residential UDFs within a census block. The value was obtained from DOGAMI’s building footprints; where (RES) footprints were not available, we used the Wallowa County assessor database.
- **Number of stories** – The number of stories for an individual UDF, along with Occupancy Class, determines the applied damage function for flood analysis. The value was obtained from the Wallowa County assessor database when available. For UDFs without assessor information for number of stories that are within the flood zone, closer inspection using Google Street View™ or available oblique imagery was used for attribution.
- **Foundation type** – The UDF foundation type correlates with First Floor Height values in feet (see Table 3.11 in the Hazus-MH Technical Manual for the Flood Model [FEMA, 2012a]). It also functions within the flood model by indicating if a basement exists or not. UDFs with a basement have a different damage function from UDFs that do not have one. The value was obtained from the Wallowa County assessor database when available. For UDFs without assessor information for basements that are within the flood zone, closer inspection using Google Street View™ or available oblique imagery was used to ascertain if one exists or not.
- **First floor height** – The height in feet above grade for the lowest habitable floor. The height is factored during the depth of flooding analysis. The value is used directly by Hazus-MH, where Hazus-MH overlays a UDF location on a depth grid and using the **first floor height** determines the level of flooding occurring to a building. It is derived from the Foundation Type attribute or observation via oblique imagery or Google Street View™ mapping service.
- **Building type** – This attribute determines the construction material and structural integrity of an individual UDF. It is used by Hazus-MH for estimating earthquake losses by determining which damage function will be applied. This information was unavailable from the Wallowa County assessor data, so instead it was derived from a statistical distribution based on **Occupancy class**.
- **Building design level** – This attribute determines the seismic building code for an individual UDF. It is used by Hazus-MH for estimating earthquake losses by determining which damage function will be applied. This information is derived from the **Year Built** attribute (Wallowa County Assessor) and state/regional Seismic Building Code benchmark years.
- **Number of people** – The estimated number of permanent residents living within an individual residential structure. It is used in the post-analysis phase to determine the amount of people affected by a given hazard. This attribute is derived from default Hazus database (United States Census Bureau, 2010a) of population per census block and distributed across residential UDFs and adjusted based on population growth estimates from PSU Population Research Center.
- **Community** – The community that a UDF is within. These areas are used in the post-analysis for reporting results. The communities were based on incorporated area boundaries; unincorporated community areas were based on building density.

C.2.3 Seismic building codes

Oregon initially adopted seismic building codes in the mid-1970s (Judson, 2012). The established benchmark years of code enforcement are used in determining a “design level” for individual buildings. The design level attributes (pre code, low code, moderate code, and high code) are used in the Hazus-MH earthquake model to determine what damage functions are applied to a given building (FEMA, 2012b). The year built or the year of the most recent seismic retrofit are the main considerations for an individual design level attribute. Seismic retrofiting information for structures would be ideal for this analysis but was not available for Wallowa County. Table C-1 outlines the benchmark years that apply to buildings within Wallowa County.

Table C-1. Wallowa County seismic design level benchmark years.

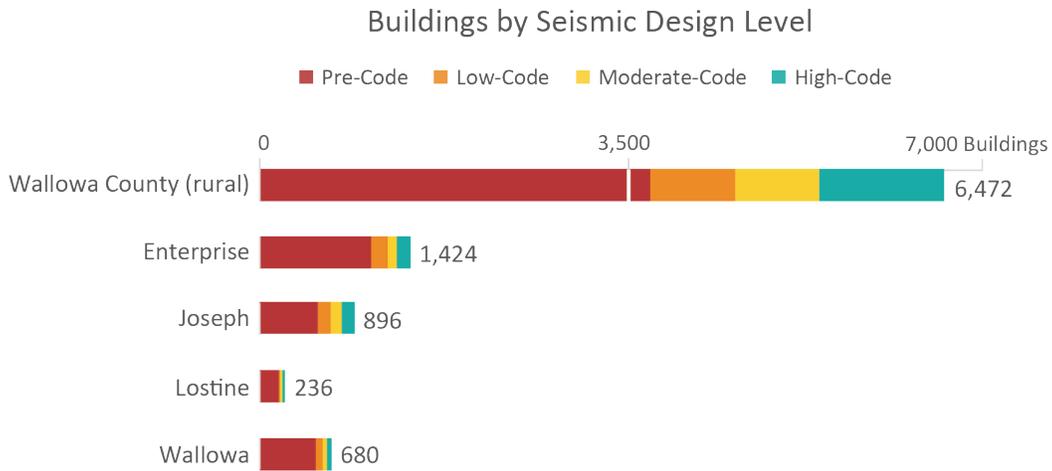
Building Type	Year Built	Design Level	Basis
Single-Family Dwelling (includes Duplexes)	prior to 1976	Pre Code	Interpretation of Judson (Judson, 2012)
	1976–1991	Low Code	
	1992–2003	Moderate Code	
	2004–2016	High Code	
Manufactured Housing	prior to 2003	Pre Code	Interpretation of OR BCD 2002 Manufactured Dwelling Special Codes (Oregon Building Codes Division, 2002)
	2003–2010	Low Code	
	2011–2016	Moderate Code	Interpretation of OR BCD 2010 Manufactured Dwelling Special Codes Update (Oregon Building Codes Division, 2010)
All other buildings	prior to 1976	Pre Code	Business Oregon 2014-0311 Oregon Benefit-Cost Analysis Tool, p. 24 (Business Oregon, 2015)
	1976–1990	Low Code	
	1991–2016	Moderate Code	

Table C-2 and corresponding Figure C-1 illustrate the current state of seismic building codes for the county.

Table C-2. Seismic design level in Wallowa County.

Community	Total Number of Buildings	Pre Code		Low Code		Moderate Code		High Code	
		Number of Buildings	Percentage of Buildings						
Unincorp. Wallowa Co (rural)	6,472	3,692	57%	804	12.4%	797	12.3%	1,179	18.2%
Enterprise	1,424	1,053	74%	155	11%	88	6%	128	9.0%
Joseph	896	550	61%	121	14%	103	11%	122	13.6%
Lostine	236	180	76%	11	4.7%	23	9.7%	22	9.3%
Wallowa	680	529	78%	67	10%	39	6%	45	6.6%
Total Wallowa County	9,708	6,004	62%	1,158	11.9%	1,050	10.8%	1,496	15.4%

Figure C-1. Seismic design level by Wallowa County community.



C.3 Flood Hazard Data

DOGAMI developed flood hazard data in 2021 from the Wallowa County FEMA Flood Insurance Study (FEMA, 1988). The hazard data was based on some previous flood studies and new riverine hydrologic and hydraulic analyses. For riverine areas, the flood elevations for the 100-year event for each stream cross-section were used to develop depth of flooding raster dataset or a “depth grid.”

A countywide, 2-meter, lidar-based depth grid was developed for each of the 10-, 50-, 100-, and 500-year annual chance flood events. The depth grids were imported into Hazus-MH for determining the depth of flooding for areas within the FEMA flood zones.

Once the UDF database was developed into a Hazus-compliant format, the Hazus-MH methodology was applied using a Python (programming language) script developed by DOGAMI. The analysis was then run for a given flood event, and the script cross-referenced a UDF location with the depth grid to find the depth of flooding. The script then applied a specific damage function, based on a UDF’s Occupancy Class [OccCls], which was used to determine the loss ratio for a given amount of flood depth, relative to the UDF’s first-floor height.

C.4 Earthquake Hazard Data

The following hazard layers used for our loss estimation are derived from work conducted by Madin and others (2021): 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. We also used landslide susceptibility data derived from the work of Burns and others (2016). The liquefaction and landslide susceptibility layers together with PGA were used by the Hazu-MH tool to calculate permanent ground deformation and associated probability.

During the Hazu-MH earthquake analysis, each UDF was analyzed given its site-specific parameters (ground motion and ground deformation) and evaluated for loss, expressed as a probability of a damage state. Specific damage functions based on Building type and Building design level were used to calculate the damage states given the site-specific parameters for each UDF. The output provided probabilities of the five damage states (None, Slight, Moderate, Extensive, Complete) from which losses in dollar amounts were derived.

C.5 Post-Analysis Quality Control

Ensuring the quality of the results from Hazu-MH flood and earthquake modules is an essential part of the process. A primary characteristic of the process is that it is iterative. A UDF database without errors is highly unlikely, so this part of the process is intended to limit and reduce the influence these errors have on the final outcome. Before applying the Hazu-MH methodology, closely examining the top 10 largest area UDFs and the top 10 most expensive UDFs is advisable. Special consideration can also be given to critical facilities due to their importance to communities.

Identifying, verifying, and correcting (if needed) the outliers in the results is the most efficient way to improve the UDF database. This can be done by sorting the results based on the loss estimates and closely scrutinizing the top 10 to 15 records. If corrections are made, then subsequent iterations are necessary. We continued checking the “loss leaders” until no more corrections were needed.

Finding anomalies and investigating possible sources of error are crucial in making corrections to the data. A wide range of corrections might be required to produce a better outcome. For example, floating homes may need to have a first-floor height adjustment or a UDF point position might need to be moved due to issues with the depth grid. Incorrect basement or occupancy type attribution could be the cause of a problem. Commonly, inconsistencies between assessor data and tax lot geometry can be the source of an error. These are just a few of the many types of problems addressed in the quality control process.

APPENDIX D. ACRONYMS AND DEFINITIONS

D.1 Acronyms

CRS	Community Rating System
CSZ	Cascadia subduction zone
DLCD	Oregon Department of Land Conservation and Development
DOGAMI	Department of Geology and Mineral Industries (State of Oregon)
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FRI	Fire Risk Index
GIS	Geographic Information System
NFIP	National Flood Insurance Program
NHMP	Natural hazard mitigation plan
NOAA	National Oceanic and Atmospheric Administration
ODF	Oregon Department of Forestry
OEM	Oregon Emergency Management
OFR	Open-File Report
OPDR	Oregon Partnership for Disaster Resilience
PGA	Peak ground acceleration
PGD	Permanent ground deformation
PGV	Peak ground velocity
Risk MAP	Risk Mapping, Assessment, and Planning
SHMO	State Hazard Mitigation Officer
SLIDO	State Landslide Information Layer for Oregon
UDF	User-defined facilities
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WUI	Wildland-urban interface
WWA	West Wide Wildfire Risk Assessment

D.2 Definitions

1% annual chance flood – The flood elevation that has a 1-percent chance of being equaled or exceeded each year. Sometimes referred to as the 100-year flood.

0.2% annual chance flood – The flood elevation that has a 0.2-percent chance of being equaled or exceeded each year. Sometimes referred to as the 500-year flood.

Base flood elevation (BFE) – Elevation of the 1-percent-annual-chance flood. This elevation is the basis of the insurance and floodplain management requirements of the NFIP.

Critical facilities – Facilities that, if damaged, would present an immediate threat to life, public health, and safety. As categorized in HAZUS-MH, critical facilities include hospitals, emergency operations centers, police stations, fire stations and schools.

Exposure – Determination of whether a building is within or outside of a hazard zone. No loss estimation is modeled.

Flood Insurance Rate Map (FIRM) – An official map of a community, on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) – Contains an examination, evaluation, and determination of the flood hazards of a community and, if appropriate, the corresponding water-surface elevations.

Hazus-MH – A GIS-based risk assessment methodology and software application created by FEMA and the National Institute of Building Sciences for analyzing potential losses from floods, hurricane winds, and earthquakes.

Lidar – A remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. Lidar is popularly used as a technology to make high-resolution maps.

Liquefaction – Describes a phenomenon whereby a saturated soil substantially loses strength and stiffness in response to an applied stress, usually an earthquake, causing it to behave like liquid.

Loss Ratio – The expression of loss as a fraction of the value of the local inventory (total value/loss).

Magnitude – A scale used by seismologists to measure the size of earthquakes in terms of energy released.

Risk – Probability multiplied by consequence; the degree of probability that a loss or injury may occur as a result of a natural hazard. Sometimes referred to as vulnerability.

Risk MAP – The vision of this FEMA strategy is to work collaboratively with State, local, and tribal entities to deliver quality flood data that increases public awareness and leads to action that reduces risk to life and property.

Riverine – Of or produced by a river. Riverine floodplains have readily identifiable channels.

Susceptibility – Degree of proneness to natural hazards that is determined based on physical characteristics that are present.

Vulnerability – Characteristics that make people or assets more susceptible to a natural hazard.

APPENDIX E. MAP PLATES

See appendix folder for individual map PDFs.

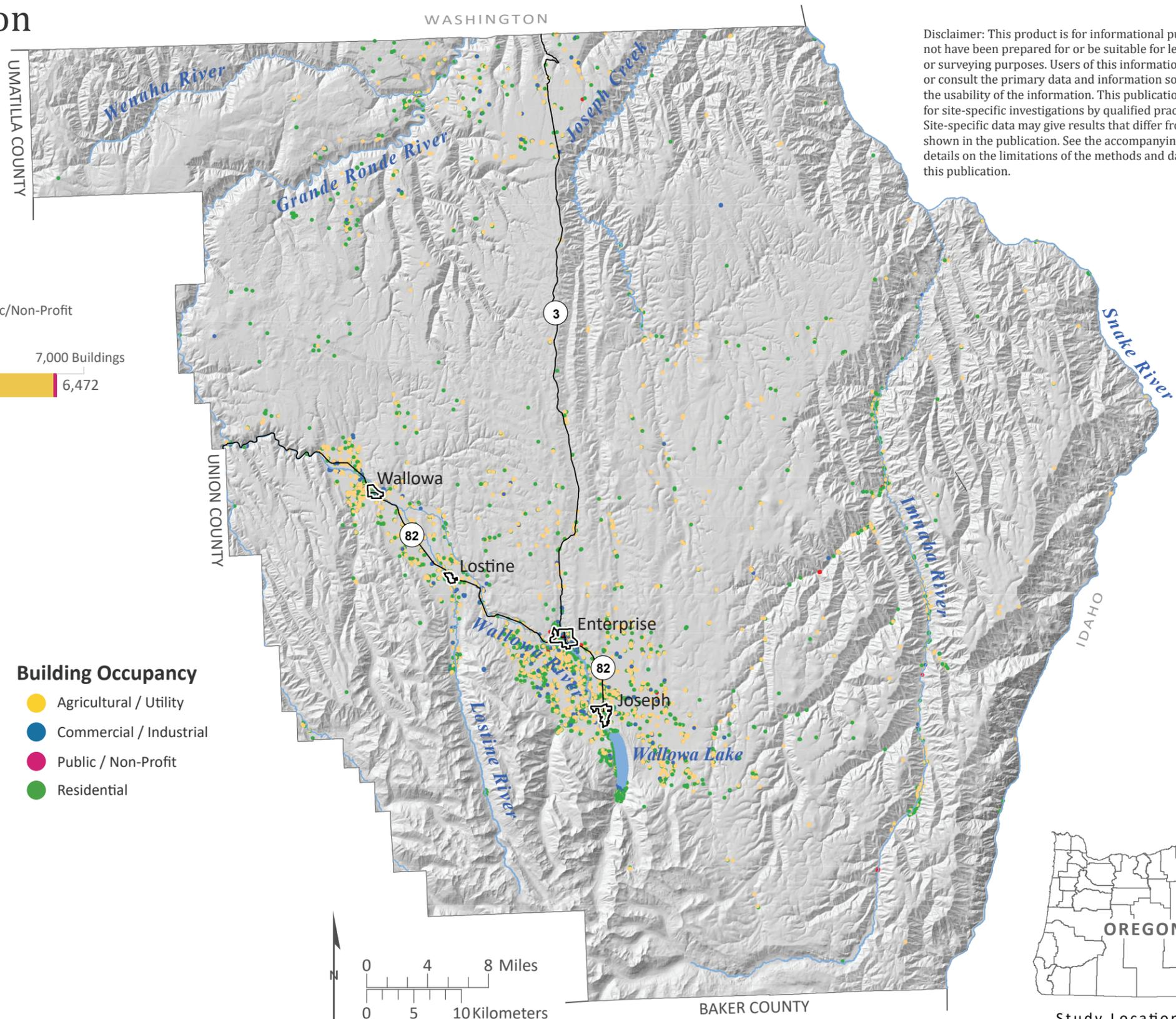
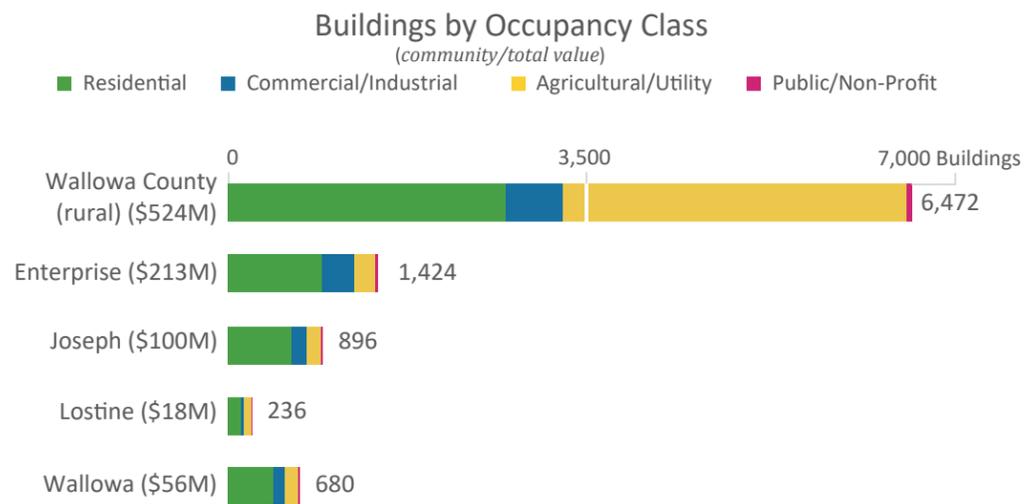
Plate 1.	Building Distribution Map of Wallowa County, Oregon.....	52
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Building Distribution Map of Wallowa County, Oregon

This map is an overview map and not intended to provide details at the community scale. The GIS data that is published with the Wallowa County Natural Hazard Risk Assessment can be used to inform regarding queries at the community scale.

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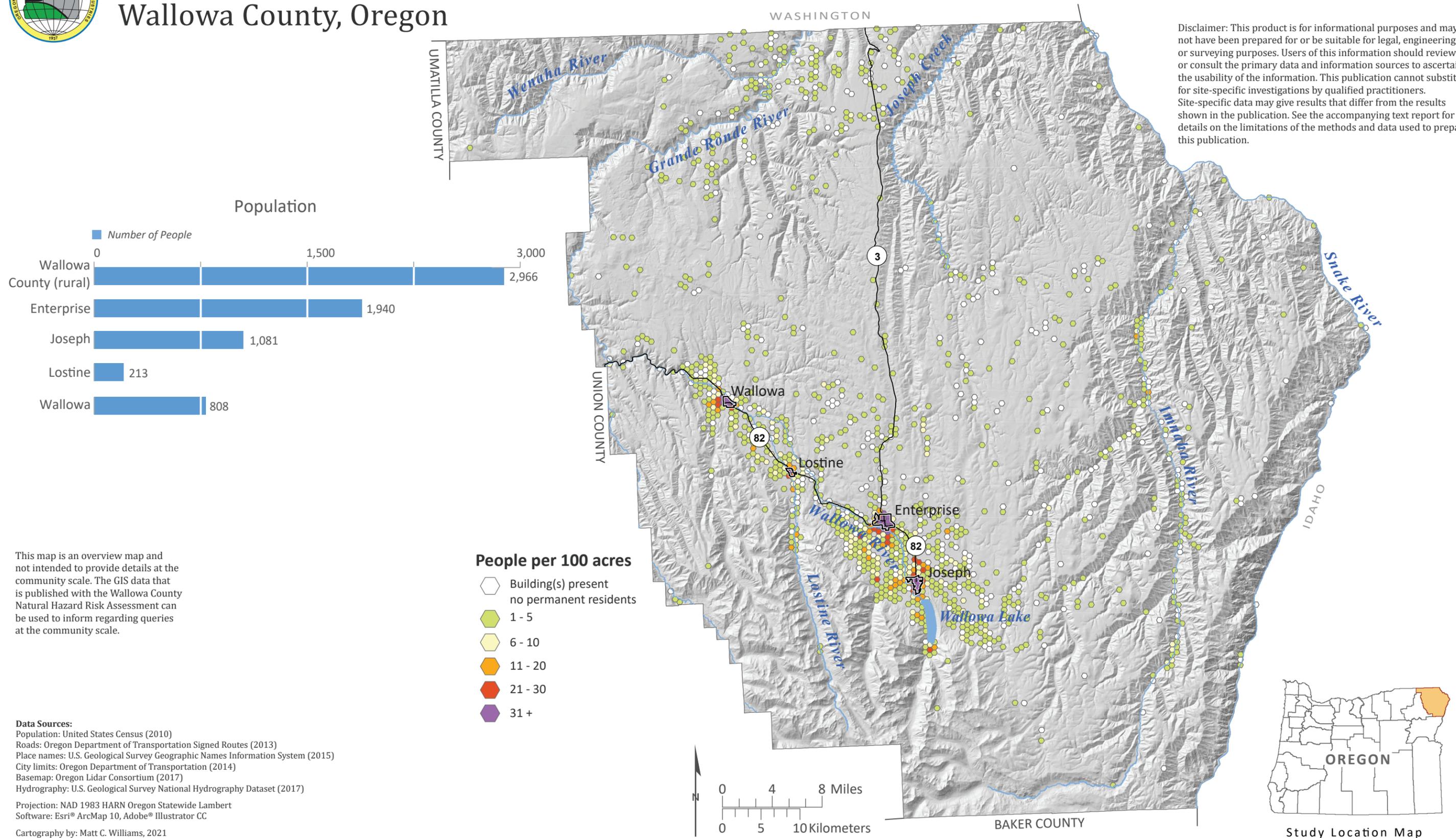
Data Sources:
 Building footprints: Statewide Building Footprints of Oregon (2021)
 Roads: Oregon Department of Transportation Signed Routes (2013)
 Place names: U.S. Geological Survey Geographic Names Information System (2015)
 City limits: Oregon Department of Transportation (2014)
 Basemap: Oregon Lidar Consortium (2017)
 Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)
 Projection: NAD 1983 HARN Oregon Statewide Lambert
 Software: Esri® ArcMap 10, Adobe® Illustrator CC
 Cartography by: Matt C. Williams, 2021





Population Density Map of Wallowa County, Oregon

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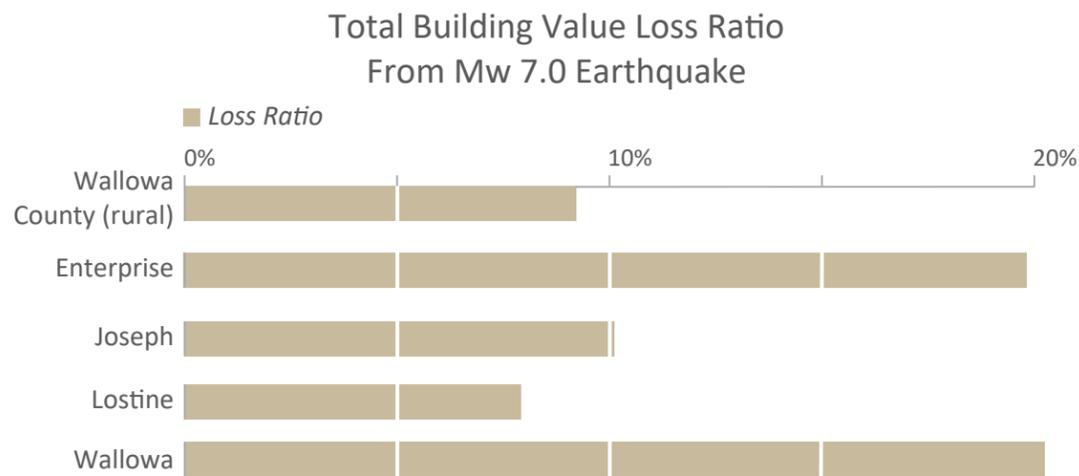
Data Sources:
 Population: United States Census (2010)
 Roads: Oregon Department of Transportation Signed Routes (2013)
 Place names: U.S. Geological Survey Geographic Names Information System (2015)
 City limits: Oregon Department of Transportation (2014)
 Basemap: Oregon Lidar Consortium (2017)
 Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)
 Projection: NAD 1983 HARN Oregon Statewide Lambert
 Software: Esri® ArcMap 10, Adobe® Illustrator CC
 Cartography by: Matt C. Williams, 2021



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

Peak Ground Acceleration (PGA) is the maximum acceleration in a given location or rather how hard the ground is shaking during an earthquake. It is one measurement of ground motion, which is closely associated with the level of damage that occurs from an earthquake.

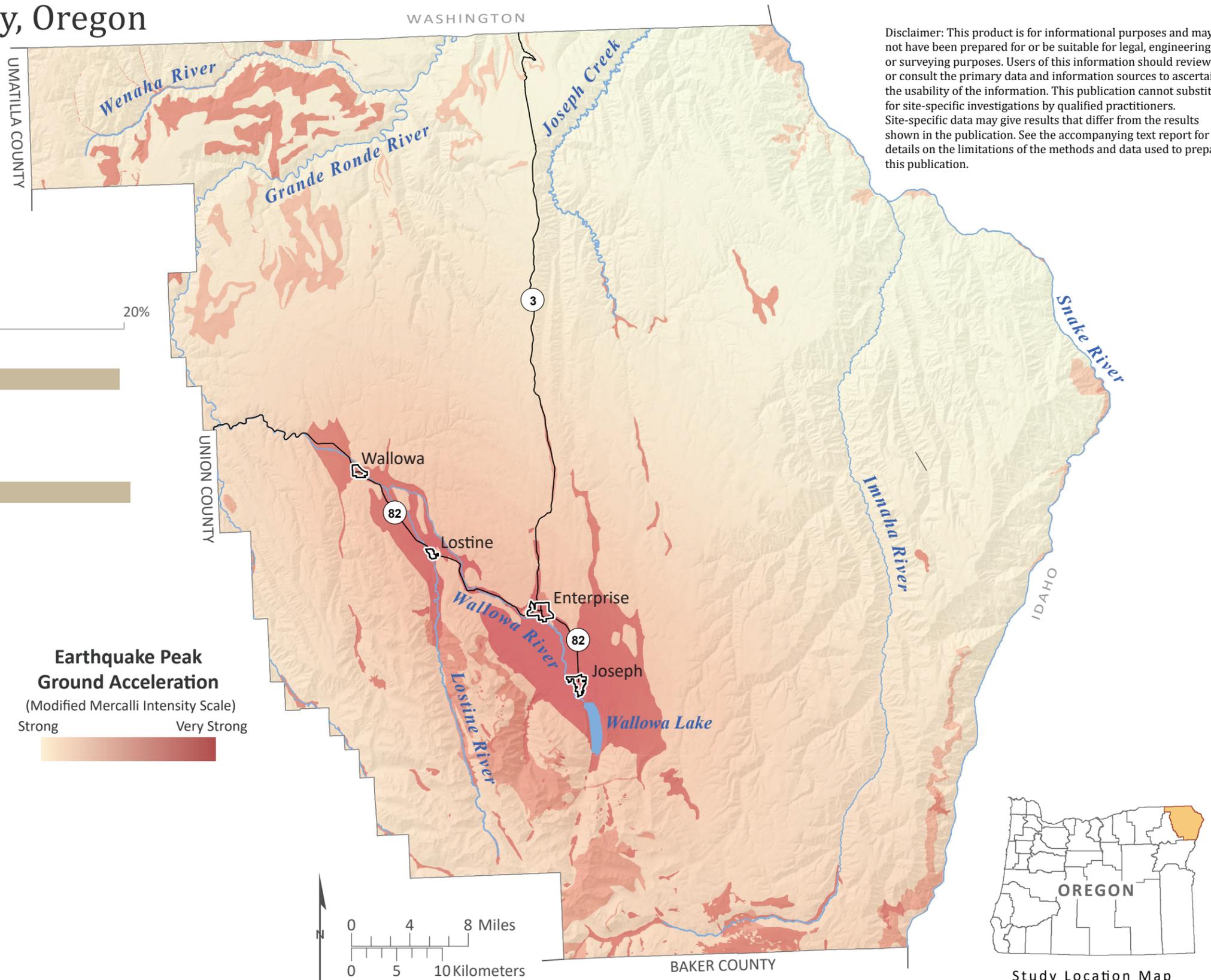
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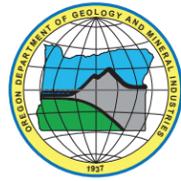


This map is an overview map and not intended to provide details at the community scale. The GIS data that is published with the Wallowa County Natural Hazard Risk Assessment can be used to inform regarding queries at the community scale.



Data Sources:
 Earthquake peak ground acceleration: Oregon Seismic Hazard Database (2021)
 Roads: Oregon Department of Transportation Signed Routes (2013)
 Place names: U.S. Geological Survey Geographic Names Information System (2015)
 City limits: Oregon Department of Transportation (2014)
 Basemap: Oregon Lidar Consortium (2017)
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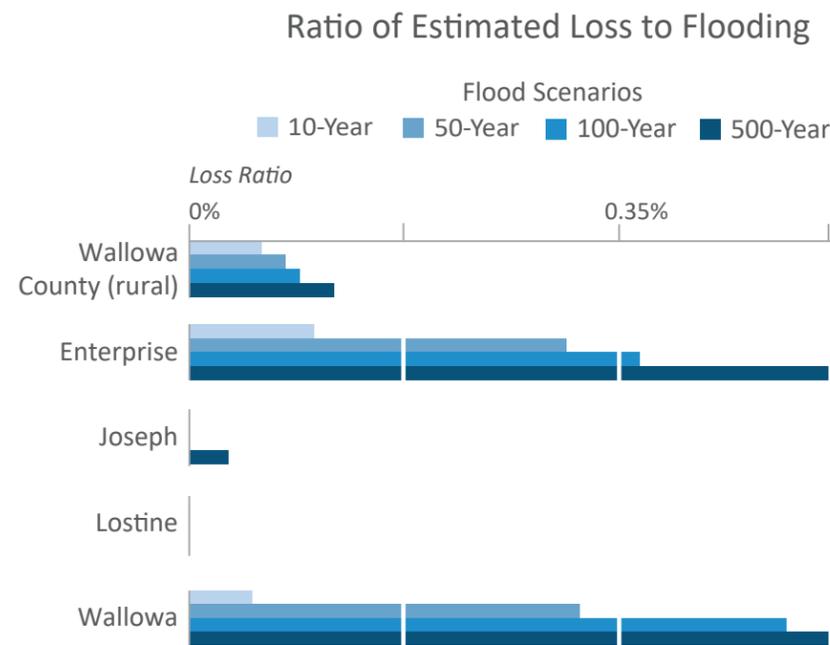




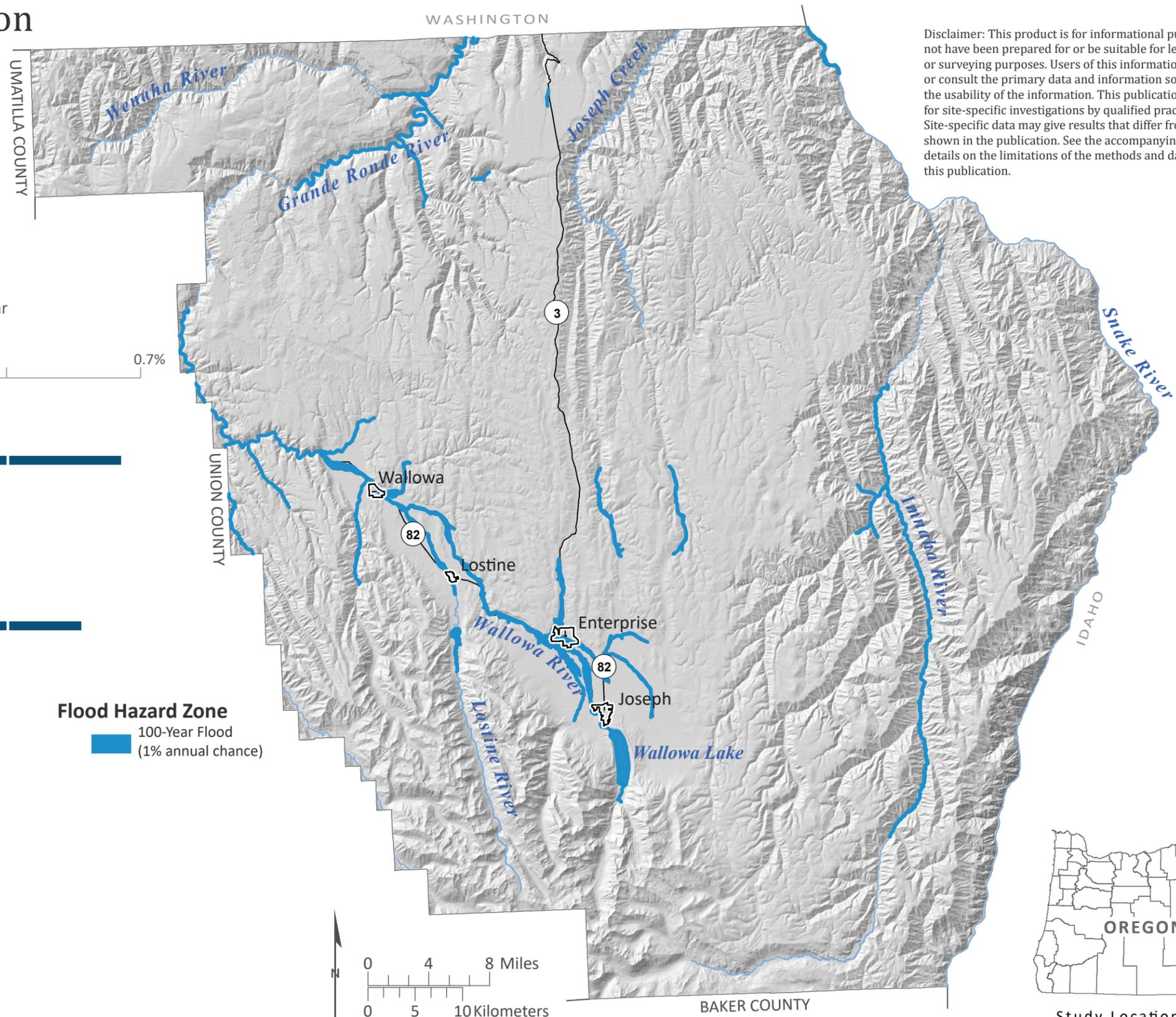
Flood Hazard Map of Wallowa County, Oregon

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

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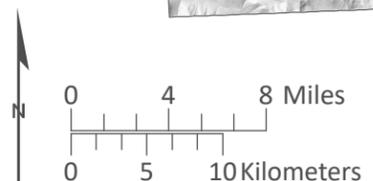


Flood Hazard Zone
 100-Year Flood (1% annual chance)



This map is an overview map and not intended to provide details at the community scale. The GIS data that is published with the Wallowa County Natural Hazard Risk Assessment can be used to inform regarding queries at the community scale.

Data Sources:
 Flood hazard zone (100-year): Wallowa County Flood Insurance Rate Map (1988)
 Roads: Oregon Department of Transportation Signed Routes (2013)
 Place names: U.S. Geological Survey Geographic Names Information System (2015)
 City limits: Oregon Department of Transportation (2014)
 Basemap: Oregon Lidar Consortium (2017)
 Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)
 Projection: NAD 1983 HARN Oregon Statewide Lambert
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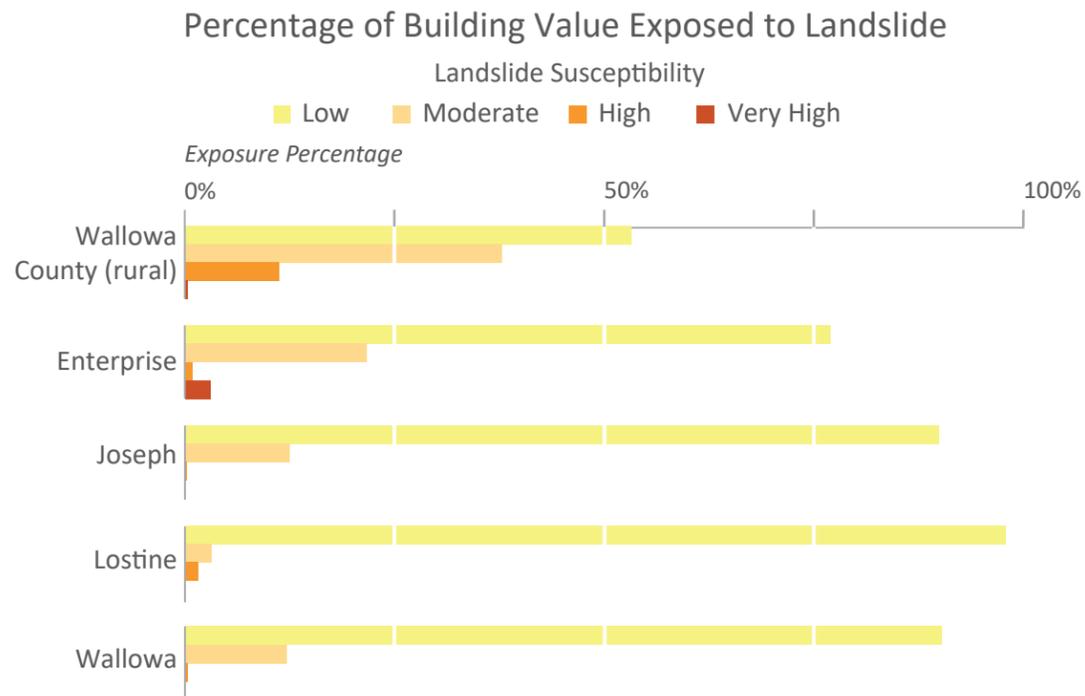




Landslide Susceptibility Map of Wallowa County, Oregon

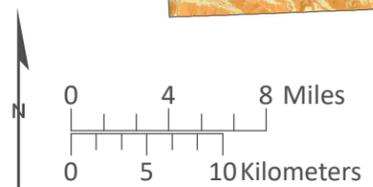
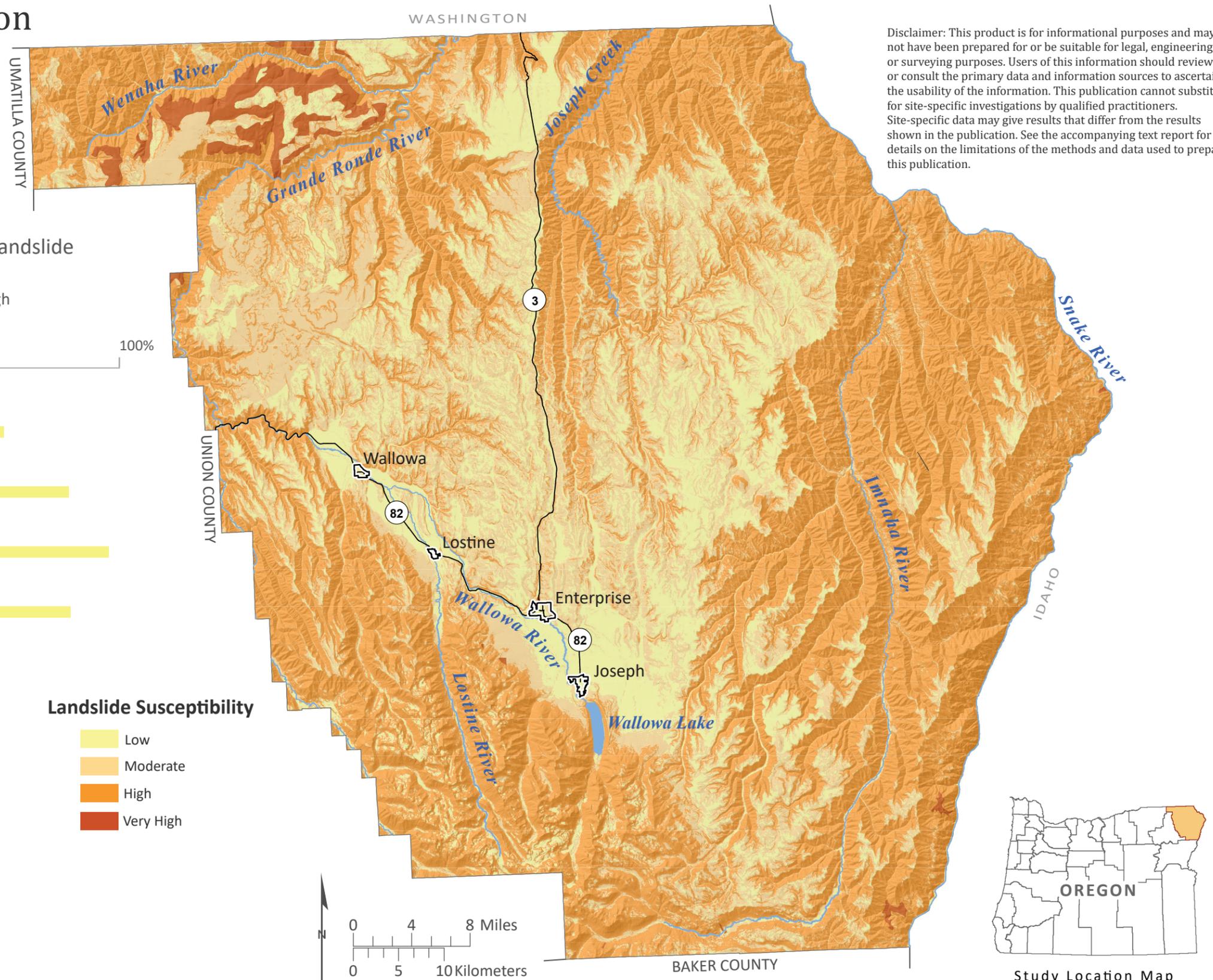
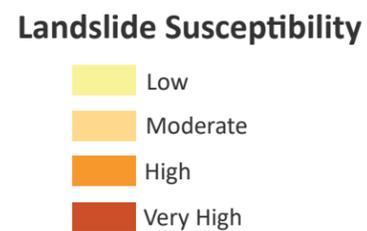
Landslide susceptibility is categorized as Low, Moderate, High, and Very High which describes the general level of susceptibility to landslide hazard. The dataset is an aggregation of three primary sources: landslide inventory (SLIDO), generalized geology, and slope.

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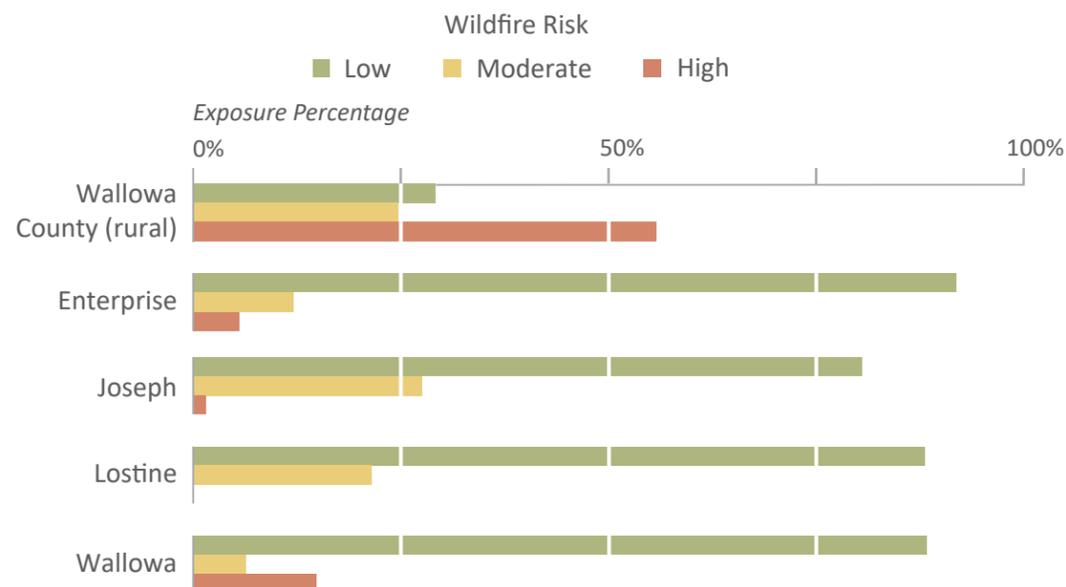


Wildfire Risk Map of Wallowa County, Oregon

The Pacific Northwest Quantitative Wildfire Risk Assessment: Methods and Results (PNRA; Pyrologix LCC, 2018) is a comprehensive report that includes a database developed by the United States Forest Service for the states of Oregon and Washington. The PNRA produced the Burn Probability dataset that we used to calculate risk. The Burn Probability dataset was categorized into 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.

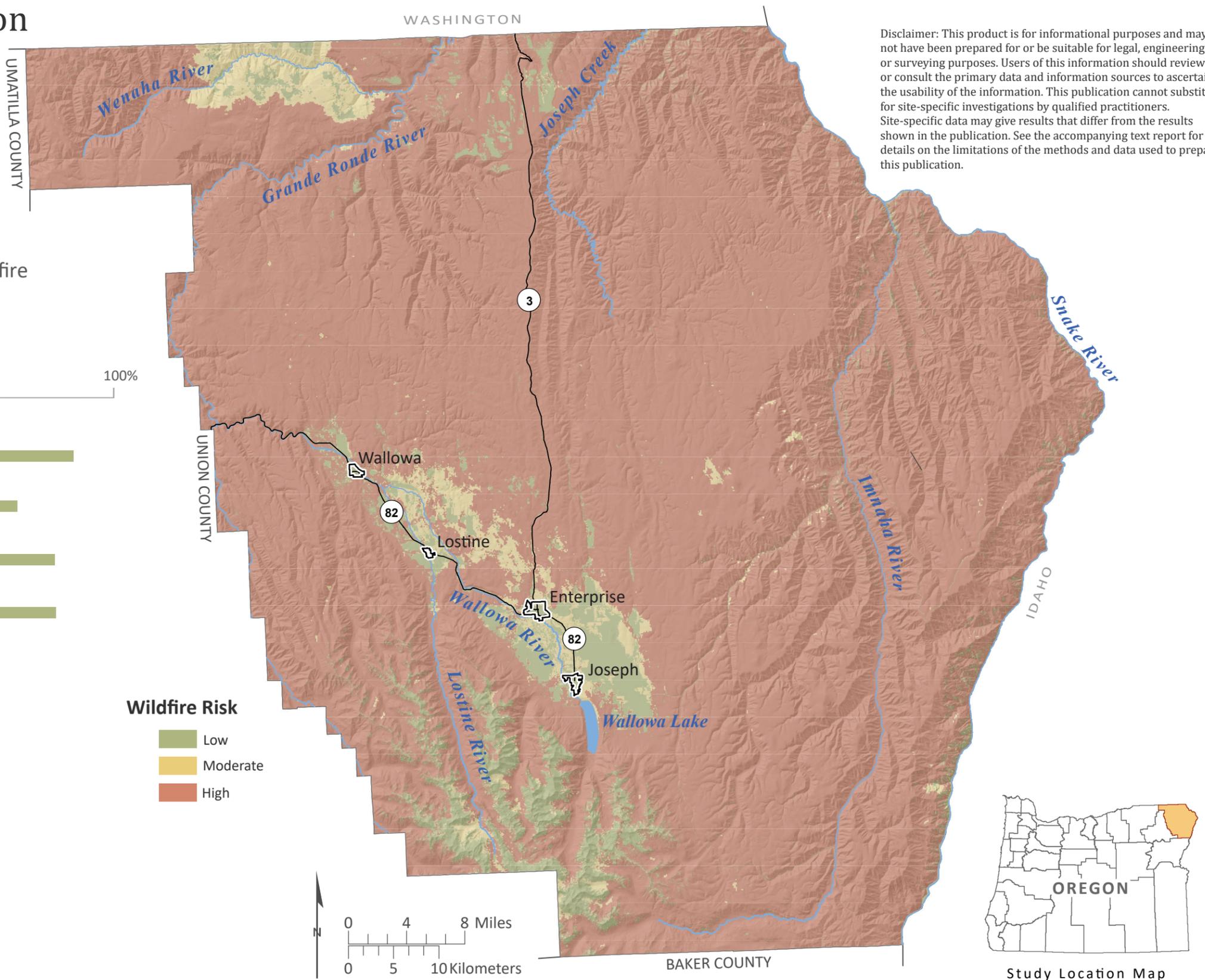
Disclaimer: This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information. This publication 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.

Percentage of Building Value Exposed to Wildfire



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Data Sources:
 Wildfire risk data: Oregon Department of Forestry, Pyrologix, LCC. (2018)
 Roads: Oregon Department of Transportation Signed Routes (2013)
 Place names: U.S. Geological Survey Geographic Names Information System (2015)
 City limits: Oregon Department of Transportation (2014)
 Basemap: Oregon Lidar Consortium (2017)
 Hydrography: U.S. Geological Survey National Hydrography Dataset (2017)
 Projection: NAD 1983 HARN Oregon Statewide Lambert
 Software: Esri® ArcMap 10, Adobe® Illustrator CC
 Cartography by: Matt C. Williams, 2021



Appendix F:
Future Climate Projections
Wallowa County, Oregon
prepared by the
Oregon Climate Change Research Institute

Future Climate Projections Wallowa County, Oregon

April 2022

Oregon Climate Change Research Institute



Wallowa Lake and Mountains, Oregon. Photograph by Rick Obst, CC BY 2.0, via Wikimedia Commons



Future Climate Projections: Wallowa County, Oregon

Report to the Oregon Department of Land Conservation and Development

Meghan Dalton, Erica Fleishman, and Dominique Bachelet
Oregon Climate Change Research Institute
College of Earth, Ocean, and Atmospheric Sciences
104 CEOAS Admin Building
Oregon State University
Corvallis, OR 97331

April 2022

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Executive Summary

Climate change is expected to increase the occurrence of many climate-related natural hazards. Confidence that the risk of heat waves will increase is very high (Table 1) given strong evidence in the peer-reviewed literature, consistency among the projections of different global climate models, and robust theoretical principles underlying increasing temperatures in response to ongoing emissions of greenhouse gases. Confidence that the risk of many other natural hazards will increase as climate changes is high or medium (Table 1), reflecting moderate to strong evidence and consistency among models, yet these risks are influenced by multiple secondary factors in addition to increasing temperatures. Confidence in projections of changes in risks is indicated as low if projections suggest relatively few to no changes or evidence is limited.

Table 1. Projected direction and level of confidence in changes in the risks of climate-related natural hazards. Very high confidence means that the direction of change is consistent among nearly all global climate models and there is robust evidence in the peer-reviewed literature. High confidence means that the direction of change is consistent among more than half of models and there is moderate to robust evidence in the peer-reviewed literature. Medium confidence means that there is moderate evidence in the peer-reviewed literature and that the direction of change is consistent among more than half of models. Low confidence means the direction of change is small compared to the range of model responses or there is limited evidence in the peer-reviewed literature.

	Low Confidence	Medium Confidence	High Confidence	Very High Confidence
Risk Increasing 	 Reduced Air Quality	 Drought  Expansion of Pests, Pathogens, & Non-native Invasive Species	 Heavy Rains  Flooding  Wildfire  Loss of Wetlands	 Heat Waves
Risk Unchanging =	 Windstorms			
Risk Decreasing 				 Cold Waves

This report presents future climate projections for Wallowa County relevant to specific natural hazards for the 2020s (2010–2039) and 2050s (2040–2069) relative to the 1971–2000 historical baseline. The projections are presented for a lower greenhouse gas emissions scenario (RCP 4.5) as well as a higher greenhouse gas emissions scenario (RCP 8.5), with multiple global climate models. All projections in this executive summary refer to the 2050s, relative to the historical baseline, under the higher emissions scenario. Projections for both time periods and emissions scenarios are included in the main report.



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 in 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 ground water 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.

Introduction

Industrialization has increased the amount of greenhouse gases emitted worldwide, which is causing Earth’s atmosphere, oceans, and lands to warm (IPCC, 2021). 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. The scope of the analysis that yielded this report is limited to the geographic area encompassed by Coos, Curry, and Wallowa Counties, Oregon, which are the focus of the Pre-Disaster Mitigation (PDM) 18 grants that DLCD received from the Federal Emergency Management Agency. Products of this analysis include county-specific data, graphics, and narrative summaries of climate projections related to ten climate-related natural hazards (Table 2). This information will be integrated into the Natural Hazards Mitigation Plan (NHMP) updates for the three counties, and can be used in other county plans, policies, and programs. In addition to the county reports, OCCRI will share data and provide other technical assistance to the counties. This report covers climate change projections related to natural hazards relevant to Wallowa County.

Table 2. Selected natural hazards and related climate metrics.

	<p>Heat Waves Hottest Day, Warmest Night Hot Days, Warm Nights</p>		<p>Cold Waves Coldest Day, Coldest Night Cold Days, Cold Nights</p>
	<p>Heavy Rains Wettest Day, Wettest Five Days Wet Days, Landslide Risk Days</p>		<p>River Flooding Annual Maximum Daily Flows Atmospheric Rivers Rain-on-Snow Events</p>
	<p>Drought Summer Flow, Spring Snow Summer Soil Moisture Summer Precipitation</p>		<p>Wildfire Fire Danger Days Extremely Dry Air Days</p>
	<p>Reduced Air Quality Days with Unhealthy Smoke Levels</p>		<p>Loss of Wetlands</p>
	<p>Windstorms</p>		<p>Expansion of Pests, Pathogens, and Non-native Invasive Species</p>

Future Climate Projections Background

Introduction

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. County-level summaries of changes in climate metrics (Table 2) are projected to the beginning and middle of the twenty-first century relative to a historical baseline. More information about the data sources is in the Appendix.

Global Climate Models

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. Compared with previous generations of GCMs, the CMIP6 models generally have higher resolution, better represent Earth system processes, and improve simulation of recent mean values of climate change indicators (IPCC, 2021). However, 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.

Differences in simulations of Oregon’s projected average temperature between CMIP5 and CMIP6 were estimated in the Fifth Oregon Climate Assessment (Dalton and Fleishman, 2021). The CMIP6 models generally projected greater warming over Oregon than the CMIP5 models, largely because temperature in the CMIP6 models was more sensitive to a doubling of atmospheric carbon dioxide. The latter outcome reflected a larger amplification of temperature increases by clouds within the CMIP6 models (Dalton and Fleishman, 2021; IPCC, 2021). Therefore, the CMIP5-based results in this report based on CMIP5 may underestimate increases in temperature if the CMIP6 models’ higher sensitivity to increases in atmospheric carbon dioxide is accurate.

GCMs are the most sophisticated tools for understanding Earth’s climate, but they still simplify the climate system. There are several ways to implement such simplifications in a GCM. As a result, different GCMs yield projections that are at least slightly different. Accordingly, it is best practice to average and report the range of projections from at least ten GCMs. More information about GCMs and uncertainty is in the Appendix.

A Climate Modeling Timeline
(When Various Components Became Commonly Used)

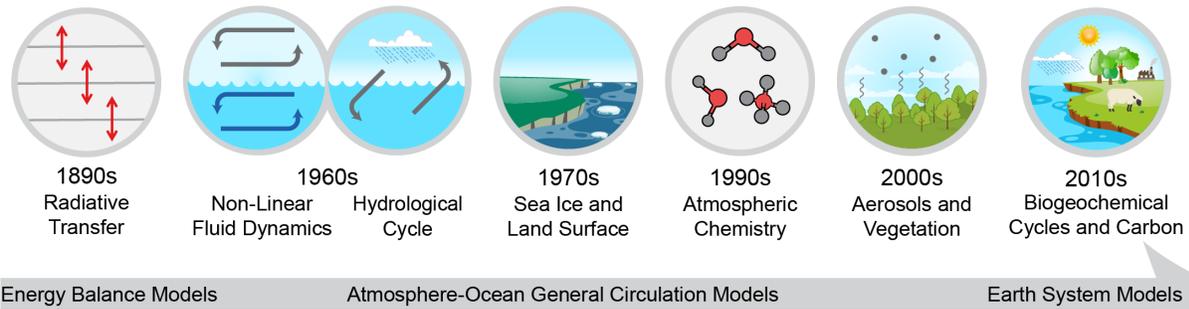


Figure 1. As scientific understanding of climate has evolved over the last 120 years, increasing amounts of physics, chemistry, and biology have been incorporated into calculations and, eventually, models. Various processes and components of the climate system became regularly included in scientific understanding of global climate calculations and, over the second half of the century as computing resources became available, formalized in global climate models. (Source: science2017.globalchange.gov)

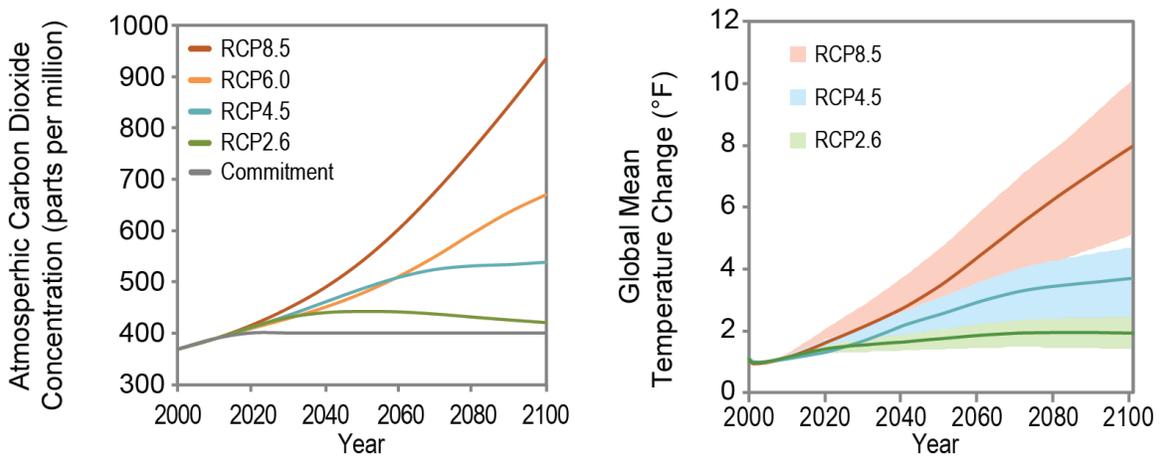


Figure 2. Future scenarios of atmospheric carbon dioxide concentrations (left) and global temperature change (right) resulting from several different emissions pathways, called Representative Concentration Pathways (RCPs), which are considered in the fourth and most recent National Climate Assessment. (Source: science2017.globalchange.gov)

Greenhouse Gas Emissions

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 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).

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. The emissions scenarios for CMIP6 correspond to emissions scenarios for CMIP5. For CMIP6, the RCPs were augmented by shared socioeconomic pathways that describe more explicitly the social and economic scenarios corresponding to each RCP (Dalton and Fleishman, 2021; IPCC, 2021). More information about emissions scenarios is in the Appendix.

Downscaling

Global climate models simulate the climate across contiguous grid cells of about 60 by 60 miles each. To make these coarse-resolution simulations more locally relevant, GCM outputs are combined with historical observations, yielding higher-resolution projections. This process is called statistical downscaling. The future climate projections in this report were statistically downscaled to a resolution of about 2.5 by 2.5 miles (Abatzoglou and Brown, 2012). More information about downscaling is in the Appendix.

Future Time Periods

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 (Table 3).

Because each of the 20 GCMs is based on slightly different assumptions, each yields a slightly different value for the historical baseline. Therefore, this report presents the average and range of projected *changes* in values of climate variables relative to each model’s historical baseline rather than presenting the average and range of projected absolute values of variables. The average of the 20 historical baselines, called the *average historical baseline*, is also presented to aid in understanding the relative magnitude of projected changes. The average historical baseline and average projected future change can be used to infer the average projected future absolute value of a given variable. However, the average historical baseline and range of projected future changes cannot be used to infer the range of projected future absolute values.

Table 3. Historical and future time periods averaged for projections.

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

How to Use the Information in this Report

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.¹

The projected direction and magnitude of change in values of climate variables in this report are best interpreted relative to the historical climate conditions under which a particular asset or system was designed to operate. For this reason, considering the projected changes between the historical and future periods allows one to envision how current natural and human systems of interest will respond to future climate conditions that are different from past conditions. In some cases, the projected change may be small enough for the existing system to accommodate. In other cases, the projected change may be large enough to require adjustments, or adaptations, to the existing system. However, engineering or design projects would require an analysis that is more detailed than this report.

The information in this 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.

¹ Read more: <https://nca2014.globalchange.gov/report/appendices/faqs#narrative-page-38784>

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 (Table 4).

**Annual Average Temperature Projections
Wallowa County**

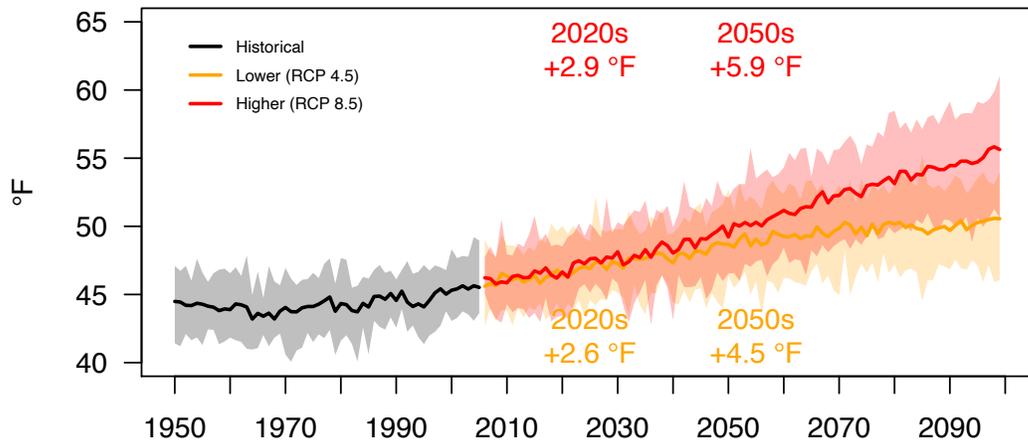


Figure 3. Projected annual average temperature in Wallowa County as simulated by 20 downscaled global climate models under a lower (RCP 4.5) and a higher (RCP 8.5) greenhouse gas emissions scenario. Solid lines and shading represent the 20-model mean and range, respectively. The multi-model mean differences for the 2020s (2010–2039 average) and the 2050s (2040–2069 average) relative to the average historical baseline (1971–2000 average) are shown.

Table 4. Average (and range) of projected future changes in Wallowa County’s annual temperature relative to the historical baselines (1971–2000 average) of each of 20 global climate models under two emissions scenarios.

Emissions Scenario	2020s (2010–2039 average)	2050s (2040–2069 average)
Higher (RCP 8.5)	+2.9°F (1.7–4.1)	+5.9°F (3.3–7.8)
Lower (RCP 4.5)	+2.6°F (1.2–4.0)	+4.5°F (2.2–6.1)



Heat Waves

Extreme heat has become more frequent and intense worldwide since the 1950s, largely due to human-caused climate change (IPCC, 2021). The number, duration, and intensity of extreme heat events in Oregon is projected to increase due to continued warming temperatures. In fact, the temperature on the hottest days in summer are projected to increase even more than the mean summer temperature in the Northwest (Dalton *et al.*, 2017). Heat waves occur periodically as a result of natural variability, but human-caused climate change is increasing their severity (Vose *et al.*, 2017). In addition, evidence of increases in summer extreme heat events defined by nighttime minimum temperatures is stronger than evidence of increases in extreme heat events based on maximum temperatures (Dalton and Fleishman, 2021).

Extreme heat can refer to days on which maximum or minimum temperatures are over a threshold, seasons in which temperatures are well above average, and heat waves, or multiple days on which temperature are above a threshold. This report presents projected changes in three metrics of extremes daytime heat (maximum temperature) and nighttime heat (minimum temperature) (Table 5).

Table 5. Metrics and definitions of heat extremes.

Metric	Definition
Hot Days	Number of days per year on which maximum temperature is 90°F or higher
Warm Nights	Number of days per year on which minimum temperature is 65°F or higher
Hottest Day	Highest value of maximum temperature per year
Warmest Night	Highest value of minimum temperature per year
Daytime Heat Waves	Number of events per year in which the maximum temperature on at least three consecutive days is 90°F or higher
Nighttime Heat Waves	Number of events per year in which the minimum temperature on at least three consecutive days is 65°F of higher

In Wallowa County, the number of hot days and warm nights, and the temperatures on the hottest day and warmest night, are projected to increase by the 2020s (2010–2039) and 2050s (2040–2069) under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 6, Figure 4, Figure 5). For example, by the 2050s under the higher emissions scenario, the number of hot days, relative to each GCM’s 1971–2000 historical baseline, is projected to increase by 7–35. The average number of hot days per year is projected to be 25 more than the average historical baseline of 10 days. The average

number of warm nights per year is projected to be 8 more than the average historical baseline of virtually zero days.

Similarly, under the higher emissions scenario the temperature on the hottest day of the year is projected to increase by 2.7–10.4°F by the 2050s relative to the GCMs’ historical baselines. The average projected increase in temperature on the hottest day is 7.8°F above the average historical baseline of 92.6°F. The average projected increase in temperature on the warmest night is 6.7°F above the average historical baseline of 60.8°F.

Under the higher emissions scenario, the numbers of daytime and nighttime heat waves are projected to increase by 1.0–3.8 and 0.1–2.2 events, respectively, by the 2050s relative to the GCMs’ historical baselines. The average number of daytime and nighttime heat waves is projected to increase by 2.6 and 1.1 events, respectively, above the average historical baseline of 1.3 and zero events (Table 6, Figure 6).

Table 6 Mean (and range) of projected future changes in extreme heat metrics in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average) of each of 20 global climate models (GCMs), under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario. The average historical baseline across the 20 GCMs and the average projected future change can be used to infer the average projected future absolute value of a given variable. However, the average historical baseline and the range of projected future changes cannot be used to infer the range of projected future absolute values.

	Average Historical Baseline	2020s		2050s	
		Lower	Higher	Lower	Higher
Hot Days	9.6 days	8.5 days (1.9-12.7)	10.1 days (2.9-14.1)	17.1 days (4.8-25.5)	25 days (6.9-35.3)
Warm Nights	0.4 days	1.6 days (0.4-3.7)	1.8 days (0.9-3.7)	4.2 days (0.8-9.7)	8.3 days (1.9-19.3)
Hottest Day	92.6°F	3.3°F (0.6-4.8)	3.7°F (0.9-5.2)	5.7°F (1.7-7.7)	7.8°F (2.7-10.4)
Warmest Night	60.8°F	2.8°F (1.1-4.6)	3.1°F (2.1-4.5)	4.8°F (1.9-7.8)	6.7°F (3.6-9.5)
Daytime Heat Waves	1.3 events	1.1 events (0.3-1.7)	1.3 events (0.5-1.8)	2 events (0.8-3.2)	2.6 events (1-3.8)
Nighttime Heat Waves	0 events	0.2 events (0-0.4)	0.2 events (0.1-0.4)	0.5 events (0-1.2)	1.1 events (0.1-2.2)

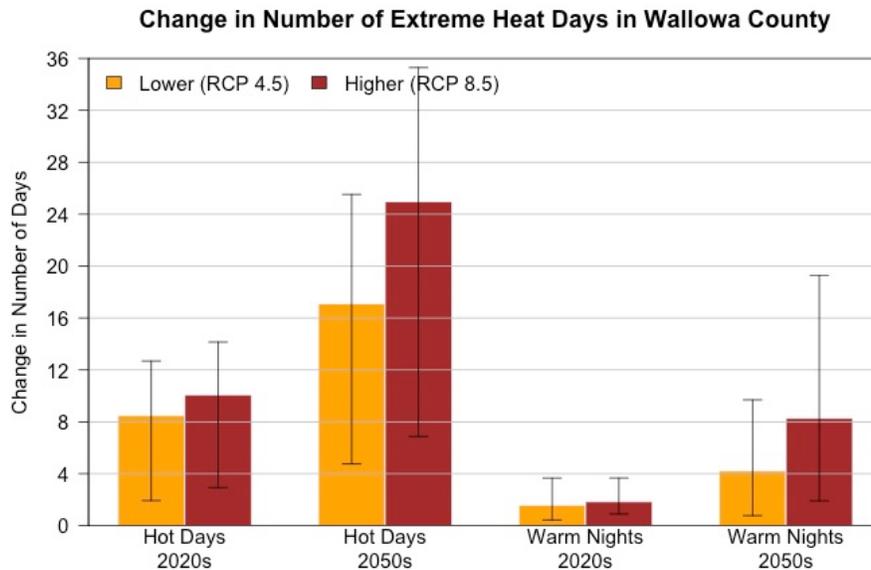


Figure 4. Projected changes in the number of hot days (left two sets of bars) and warm nights (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average), under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline. Hot days are those on which the maximum temperature is 90°F or higher; warm nights are those on which the minimum temperature is 65°F or higher.

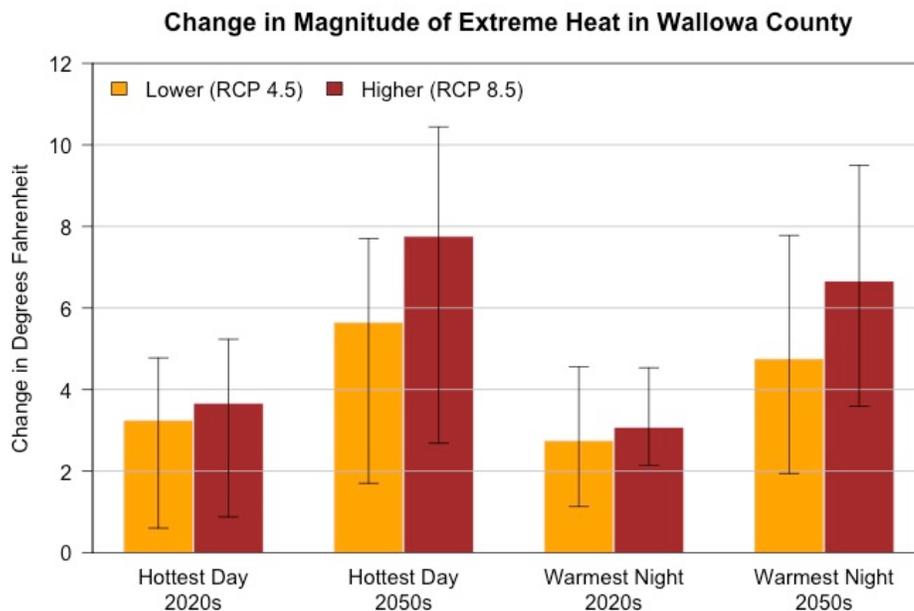


Figure 5. Projected changes in the temperature on the hottest day of the year (left two sets of bars) and warmest night of the year (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average), under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline.

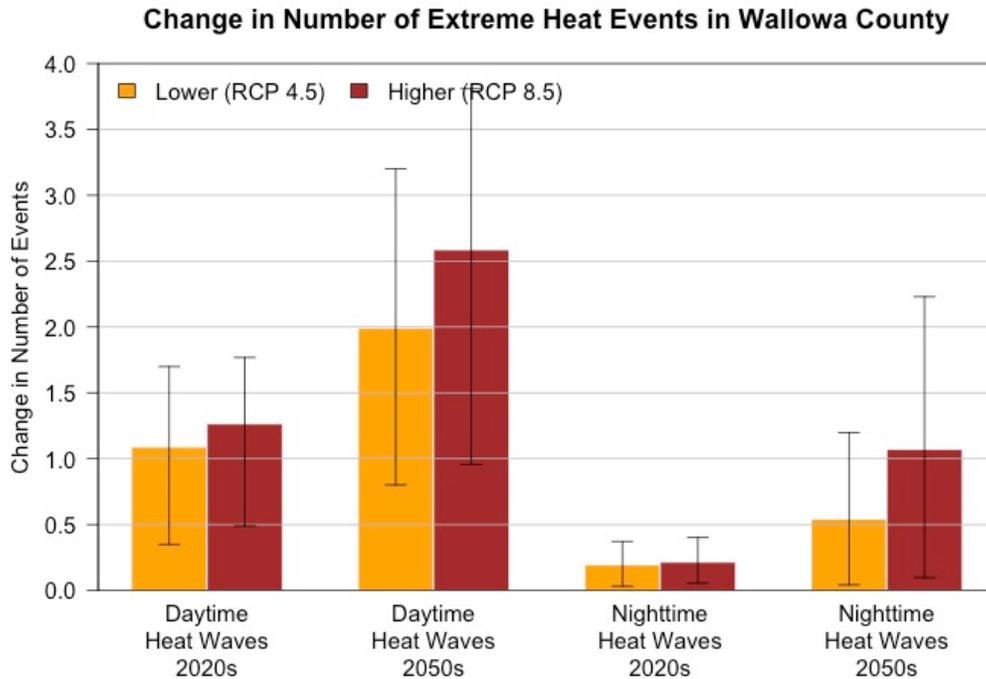


Figure 6. Projected changes in the number of daytime heat waves (left two sets of bars) and nighttime heat waves (right two sets of bars) heat waves in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average) under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline. Daytime heat waves are defined as three or more consecutive days on which the maximum temperature is 90°F or higher; nighttime heat waves are three or more consecutive days on which the minimum temperature is 65°F or higher.

Key Messages

- ⇒ 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

Over the past century, cold extremes have become less frequent and severe in the Northwest and worldwide. This trend is driven by human-caused climate change and is expected to continue (Vose *et al.*, 2017; IPCC, 2021). This report presents projected changes in three metrics of extreme daytime cold (maximum temperature) and nighttime cold (minimum temperature) (Table 7).

Table 7. Metrics and definitions of cold extremes.

Metric	Definition
Cold Days	Number of days per year on which the maximum temperature is 32°F or lower
Cold Nights	Number of days per year on which the minimum temperature is 0°F or lower
Coldest Day	Lowest value of maximum temperature per year
Coldest Night	Lowest value of minimum temperature per year
Daytime Cold Waves	Number of events per year in which maximum temperature on at least three consecutive days is 32°F or lower
Nighttime Cold Waves	Number of events per year in which minimum temperature on at least three consecutive days is 0°F or lower

In Wallowa County, the number of cold days and nights is projected to decrease by the 2020s (2010–2039) and 2050s (2040–2069) under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 8, Figure 7). For example, climate models projected that by the 2050s under the higher emissions scenario, the number of cold days will decrease by 11–27 relative to each GCM’s 1971–2000 historical baseline. The average projected number of cold days per year is 19 less than the average historical baseline of 31 days. The average projected number of cold nights per year is 2 less than the average historical baseline of 3 nights.

Similarly, the temperatures on the coldest day and night are projected to increase by the 2020s and 2050s under both emissions scenarios (Table 8, Figure 8). For example, by the 2050s under the higher emissions scenario, the temperature on the coldest night of the year is projected to increase by 0.8–18.1°F relative to the GCMs’ historical baselines. The average projected increase in the temperature on the coldest night is 9.9°F above the average historical baseline of -3.3°F. The average projected increase in the temperature on the coldest day is 6.7°F above the average historical baseline of 15.9°F.

Under the higher emissions scenario, the number of daytime and nighttime cold waves is projected to decrease by 1.3–3.5 and 0.0–0.4 events, respectively, by the 2050s relative to the GCMs’ historical baselines. The average number of daytime and nighttime cold waves is projected to be 2.4 and 0.2 events, respectively, less than the average historical baseline of 3.9 and 0.3 events (Table 8, Figure 9).

Table 8. Mean (and range) of projected future changes in extreme cold metrics in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average) of each of 20 global climate models (GCMs), under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario. The average historical baseline across the 20 GCMs and the average projected future change can be used to infer the average projected future absolute value of a given variable. However, the average historical baseline and the range of projected future changes cannot be used to infer the range of projected future absolute values.

	Average Historical Baseline	2020s		2050s	
		Lower	Higher	Lower	Higher
Cold Days	30.7 days	-9.5 days (-17.4 - -0.9)	-11.4 days (-18.1 - -2.8)	-16.1 days (-22.1 - -7.8)	-19 days (-27.4 - -11)
Cold Nights	2.7 days	-1 days (-2 - 0.3)	-1.4 days (-2.6 - -0.3)	-1.8 days (-3 - -0.7)	-2 days (-2.9 - -0.6)
Coldest Day	15.9°F	2.1°F (-2.1 - 6.2)	3.5°F (0 - 9.4)	5.3°F (0.5 - 8.7)	6.7°F (0.6 - 13.1)
Coldest Night	-3.3°F	3.4°F (-2.1 - 8.7)	5.3°F (0.4 - 13)	7.8°F (1 - 14)	9.9°F (0.8 - 18.1)
Daytime Cold Waves	3.9 events	-1.2 events (-2.3 - -0.1)	-1.4 events (-2.3 - -0.5)	-2 events (-2.9 - -1)	-2.4 events (-3.5 - -1.3)
Nighttime Cold Waves	0.3 events	-0.1 events (-0.3 - 0.1)	-0.2 events (-0.3 - 0.1)	-0.2 events (-0.4 - 0)	-0.2 events (-0.4 - 0)

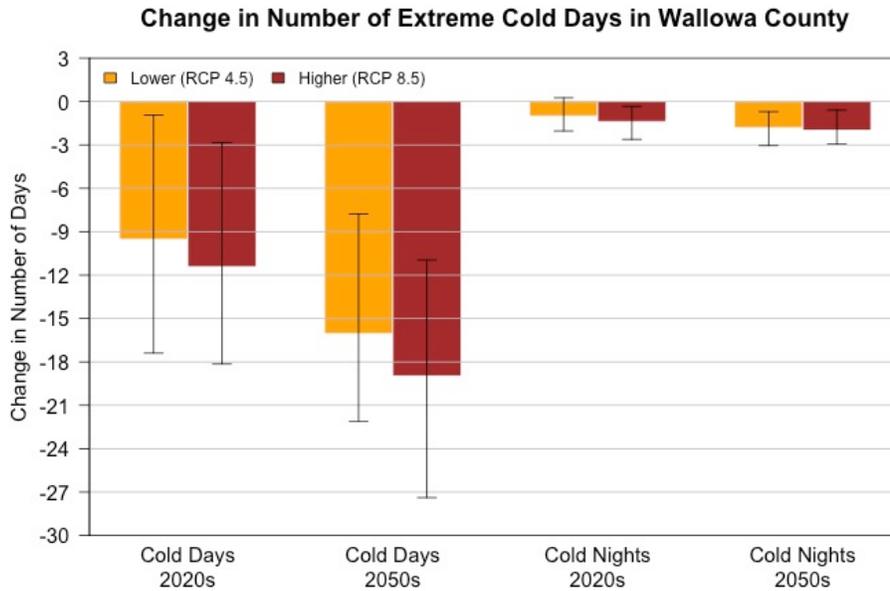


Figure 7. Projected changes in the number of cold days (left two sets of bars) and cold nights (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average) under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline. Cold days are those on which the maximum temperature is 32°F or lower; cold nights are those on which the minimum temperature is 0°F or lower.

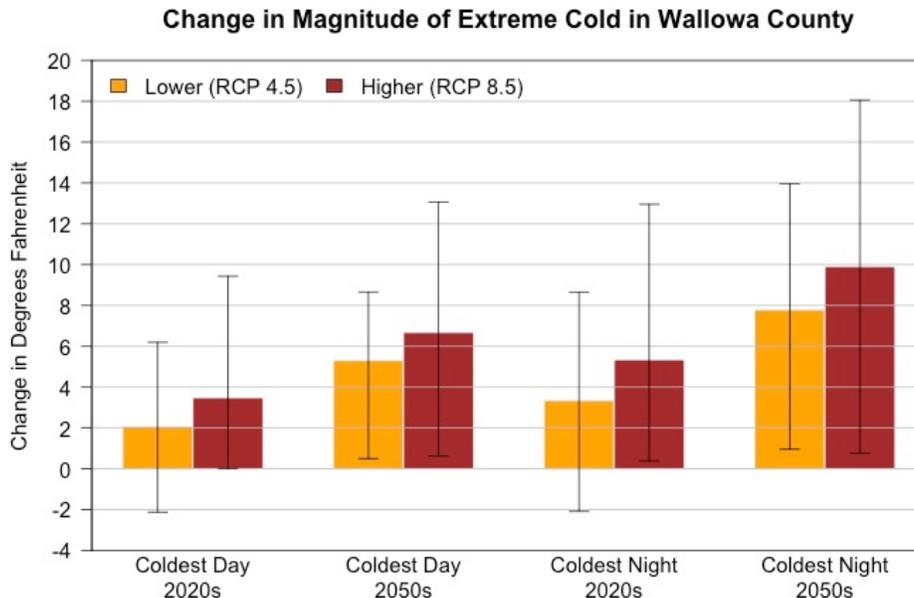


Figure 8. Projected changes in the temperature on the coldest day of the year (left two sets of bars) and coldest night of the year (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average) under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline.

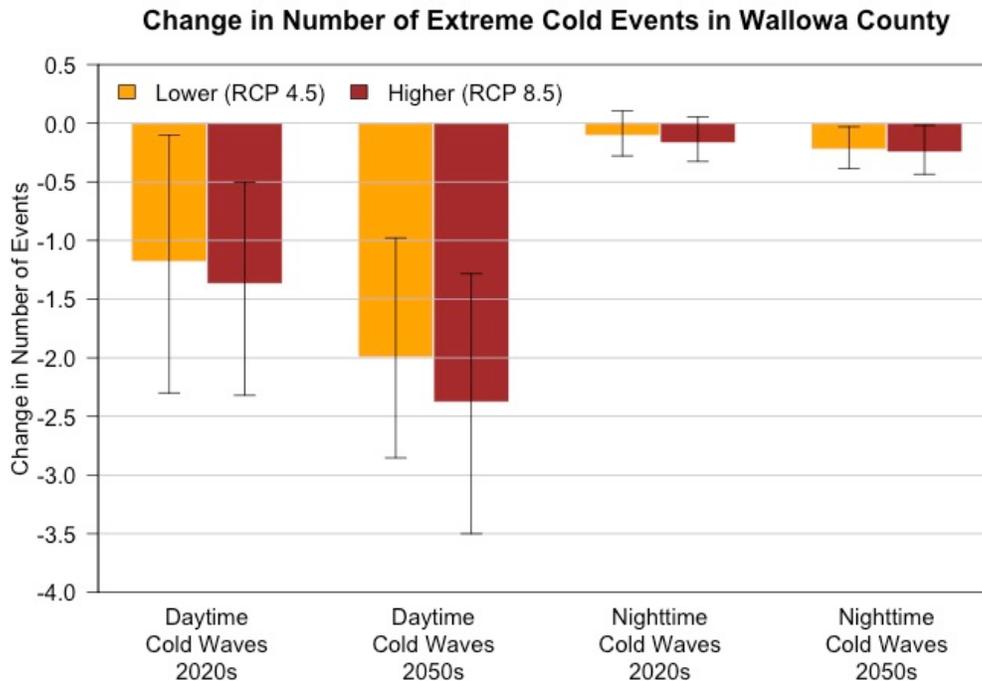


Figure 9. Projected changes in the number of daytime cold waves (left two sets of bars) and nighttime cold waves (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average), under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline. Daytime cold waves are defined as three or more consecutive days on which the maximum temperature is 32°F or lower; nighttime cold waves are three or more consecutive days on which the minimum temperature is 0°F or lower.

Key Messages

- ⇒ 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

There is greater uncertainty in projections of future precipitation than projections of future temperature. Precipitation has high natural variability, and the atmospheric patterns that influence precipitation are represented differently among GCMs. Global mean precipitation is likely to decrease in many dry regions in the subtropics and mid-latitudes and to increase in many mid-latitude wet regions (IPCC, 2013; Stevenson *et al.*, 2022). Because the location of the boundary between mid-latitude increases and decreases in precipitation varies among GCMs, some models project increases and others decreases in precipitation in Oregon (Mote *et al.*, 2013).

Observed annual precipitation in Oregon has high year-to-year variability and has not changed significantly; future trends in annual precipitation are expected to be dominated by natural variability (Dalton *et al.*, 2017; Dalton and Fleishman, 2021). On average, summers in Oregon are projected to become drier and other seasons to become wetter, resulting in a slight increase in annual precipitation by the 2050s. However, some models project increases and others decreases in each season (Dalton *et al.*, 2017).

Extreme precipitation events in the Northwest are governed by atmospheric circulation and its interaction with complex topography (Parker and Abatzoglou, 2016). Atmospheric rivers—long, narrow swaths of warm, moist air that carry large amounts of water vapor from the tropics to mid-latitudes—generally result in extreme precipitation events across large areas west of the Cascade Range. By contrast, low pressure systems that are not driven by westerly flows from offshore often lead to locally extreme precipitation east of the Cascade Range (Parker and Abatzoglou, 2016).

The frequency and intensity of heavy precipitation has increased across most land areas worldwide since the 1950s (IPCC, 2021). Observed trends in the frequency of extreme precipitation events across Oregon vary among locations, time periods, and metrics, but overall, the frequency has not changed substantially. As the atmosphere warms, it holds more water vapor. As a result, the frequency and intensity of extreme precipitation, including atmospheric rivers, is expected to increase (Dalton *et al.*, 2017; Kossin *et al.*, 2017; Dalton and Fleishman, 2021). Atmospheric rivers are associated with the majority of fall and winter extreme precipitation events in Oregon. Climate models project an increase in the number of days on which an atmospheric river is present, and they project that atmospheric rivers will account for an increasing proportion of total annual precipitation across the Northwest (Dalton and Fleishman, 2021).

In addition, regional climate models project that the rain shadow effect over the Cascade Range in winter will weaken, resulting in relatively larger increases in seasonal precipitation and precipitation extremes east of the Cascade Range and smaller increases west of the Cascade Range (Mote *et al.*, 2019).

This report presents projected changes in four metrics of precipitation extremes (Table 9).

Table 9. Metrics and definitions of precipitation extremes.

Metric	Definition
Wettest Day	Highest one-day precipitation total per water year (1 October–30 September)
Wettest Five Days	Highest consecutive five-day precipitation total per water year
Wet Days	Number of days per water year on which precipitation exceeds 0.75 inches
Landslide Risk Days	Number of days per water year that exceed the landslide threshold developed by the US Geological Survey for Seattle, Washington (see https://pubs.er.usgs.gov/publication/ofr20061064). $P3/(3.5-.67*P15)>1$, where P3 = Precipitation accumulation on prior days 1–3 P15 = Precipitation accumulation on prior days 4–18

In Wallowa County, the amount of precipitation on the wettest day and wettest consecutive five days is projected to increase on average by the 2020s (2010–2039) and 2050s (2040–2069), relative to the 1971–2000 historical baseline, under both the lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios (Table 10, Figure 10). However, some models project decreases in these metrics for certain time periods and scenarios.

Climate models project that by the 2050s under the higher emissions scenario, the amount of precipitation on the wettest day of the year, relative to each GCM’s 1971–2000 historical baseline, will increase by 6.1–26% (Figure 10). The average projected amount of precipitation on the wettest day of the year is 15.6% greater than the average historical baseline of 1 inch.

Climate models project that by the 2050s under the higher emissions scenario, the amount of precipitation on the wettest consecutive five days of the year will increase by 0.8–20.1% (Figure 10). The average projected amount of precipitation on the wettest consecutive five days is 10.7% above the average historical baseline of 2.4 inches.

The average number of days per year on which precipitation exceeds 0.75 inches is projected to increase slightly (Figure 11). For example, by the 2050s under the higher emissions scenario, the number of wet days per year is projected to increase by 0.8 (range 0.3–1.3). The historical baseline is an average of 3 days per year.

Landslides are often triggered by rainfall when the soil becomes saturated. As a surrogate measure of landslide risk, this report presents a threshold based on recent rainfall (cumulative precipitation over the previous 3 days) and antecedent precipitation (cumulative precipitation on the 15 days prior to the previous 3 days). By the 2050s under the higher emissions scenario, the average number of days per year on which the landslide risk threshold is exceeded is projected to increase by 1 (range 0–3 days) (Figure 11). The historical baseline is an average of 4 days per year. Landslide risk depends on multiple site-specific factors, and this metric does not reflect all aspects of the hazard. The landslide risk

threshold was developed for Seattle, Washington, and may be less applicable to other locations.

Table 10. Mean (and range) of projected changes in extreme precipitation in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average) relative to the historical baseline (1971–2000 average) of each of 20 global climate models (GCMs), under a lower (RCP 4.5) and higher (RCP 8.5) emissions scenario. The average historical baseline across the 20 GCMs and the average projected future change can be used to infer the average projected future absolute value of a given variable. However, the average historical baseline and the range of projected future changes cannot be used to infer the range of projected future absolute values.

	Average Historical Baseline	2020s		2050s	
		Lower	Higher	Lower	Higher
Wettest Day	1 inches	10.5% (3.6-17.5)	7.9% (-1.2-19.6)	11.5% (-0.3-22.7)	15.6% (6.1-26)
Wettest Five-Days	2.4 inches	7.2% (-1.4-17.9)	4.6% (-3.7-21)	7.3% (-4.8-16.6)	10.7% (0.8-20.1)
Wet Days	3.4 days	0.4 days (-0.1-1)	0.3 days (-0.2-1.1)	0.6 days (0.1-1.2)	0.8 days (0.3-1.3)
Landslide Risk Days	4.2 days	0.5 days (-0.1-1.6)	0.4 days (-0.4-1.4)	0.6 days (0-1.4)	1 days (0-3)

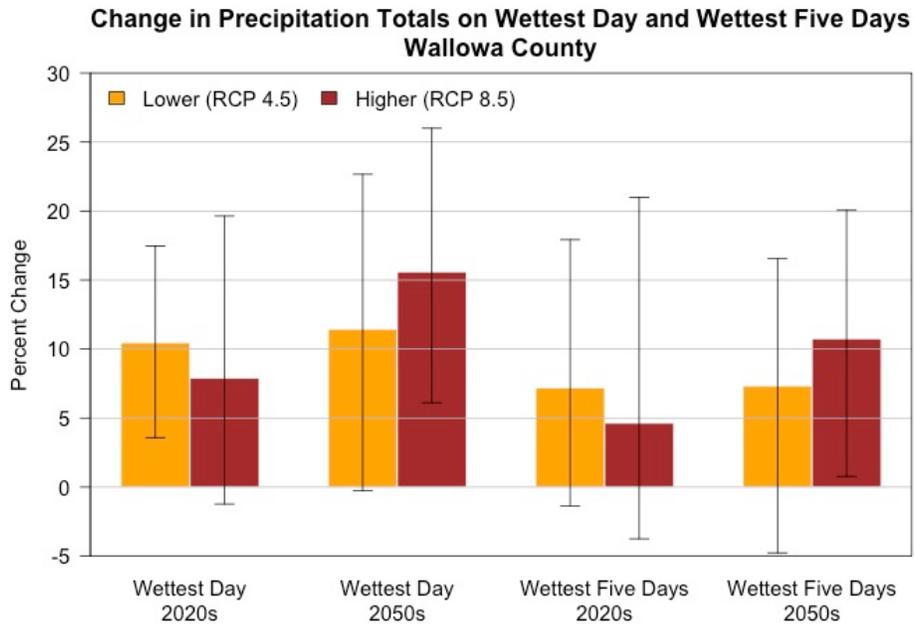


Figure 10. Projected percent changes in the amount of precipitation on the wettest day of the year (left two sets of bars) and wettest consecutive five days of the year (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average), under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline.

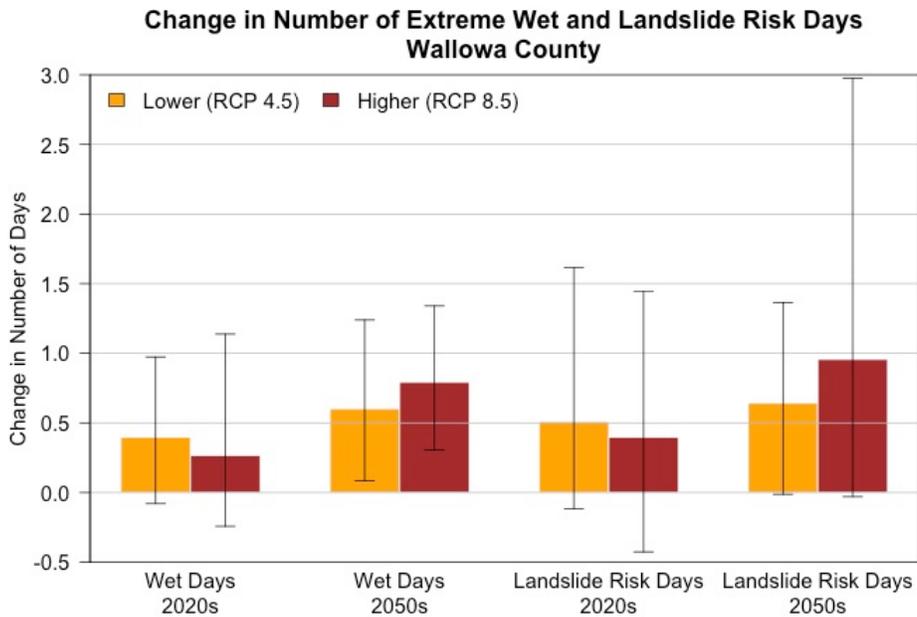


Figure 11. Projected changes in the number of wet days (left two sets of bars) and landslide risk days (right two sets of bars) in Wallowa County by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the historical baseline (1971–2000 average), under two emissions scenarios. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models relative to each model’s historical baseline.

Landslide risk also can become high when heavy precipitation falls on an area that burned within approximately the past five to ten years. By the year 2100, under the higher emissions scenario, the probability that an extreme rainfall event will occur within one year after an extreme fire-weather event in Oregon or Washington was projected to increase by 700% relative to 1980–2005 (Touma *et al.*, 2022). Similarly, projections suggest that by 2100, across Oregon and Washington, 90% of extreme fire-weather events are likely to be succeeded within five years by three or more extreme rainfall events (Touma *et al.*, 2022). Although fire weather is not synonymous with wildfire, these results highlight the increasing likelihood of compounded climate extremes that elevate the risk of natural hazards.

Key Messages

- ⇒ 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

Streams in the Northwest are projected to shift toward higher winter runoff, lower summer and fall runoff, and earlier peak runoff, particularly in snow-dominated regions (Raymond *et al.*, 2013; Naz *et al.*, 2016). These changes are expected to result from increases in the intensity of heavy precipitation; warmer temperatures that cause more precipitation to fall as rain and less as snow, in turn causing snow to melt earlier in spring; and increasing winter precipitation and decreasing summer precipitation (Dalton *et al.*, 2017; Mote *et al.*, 2019; Dalton and Fleishman, 2021).

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

The monthly hydrograph of the Grand Ronde River at Troy is characteristic of a snow-dominated basin in which flow peaks during late spring snowmelt (Figure 12). By the 2050s (2040–2069), under both emissions scenarios, streamflow is projected to peak earlier in spring as warmer temperatures cause the snowpack to melt earlier. In addition, winter streamflow is projected to increase due to increased winter precipitation and a greater percentage of precipitation falling as rain rather than snow. Mean monthly flows do not translate directly to flood risk because floods occur over shorter periods of time. However, increases in monthly flow may imply increases in flood likelihood, particularly if increases are projected to occur during months in which flood occurrence historically has been high.

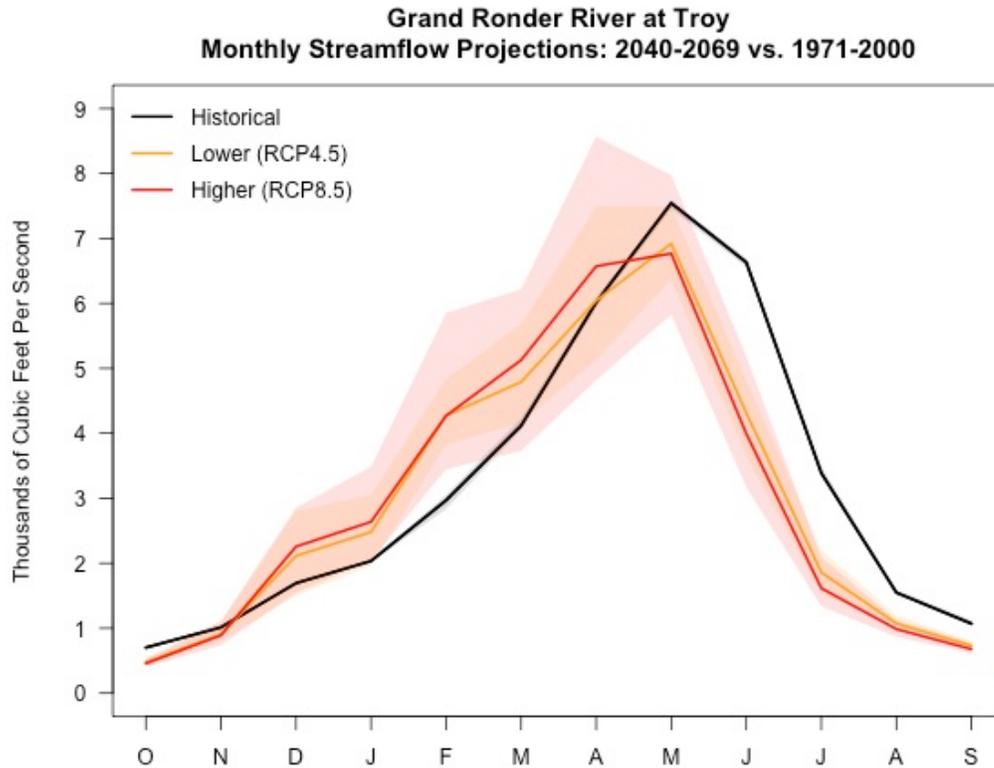


Figure 12. Simulated monthly, bias-corrected, non-regulated streamflow at the Grand Ronde River at Troy in 2040–2069 compared to 1971–2000. Solid lines and shading represent the mean and range across ten global climate models. (Data source: Integrated Scenarios of the Future Northwest Environment, <https://climatetoolbox.org/tool/future-streamflows>)

This report describes projected changes in single-day flood levels in terms of the magnitude of water-year maximum daily flows with 2-year, 10-year, and 25-year return periods (50%, 10%, and 4% probability, respectively, that this daily flow magnitude would be exceeded in a given year). Flood magnitudes are compared between a historical baseline period (1961–2010) and the 2050s (2031–2080). These longer time periods, necessary for the flood analysis, extend the earliest and latest years of the time periods referenced elsewhere in this report by a decade each. The results of the flood analysis can be interpreted as either an increase in flood magnitude given a flood frequency, or an increase in flood frequency given a flood magnitude. Flood risk projections are not available for the 2020s because the time period necessary for this projection overlapped the historical baseline. These analyses are exploratory and should not be applied to engineering or design.

On the Grand Ronde River at Troy, the average magnitudes of single-day floods with 2-year, 10-year, and 25-year return periods are projected to increase by 17%, 32%, and 37%, respectively, by the 2050s, compared to 1961–2010, under the higher emissions scenarios (RCP 8.5) (Figure 13). However, a few models project decreases in the magnitude of maximum daily flows for each return period.

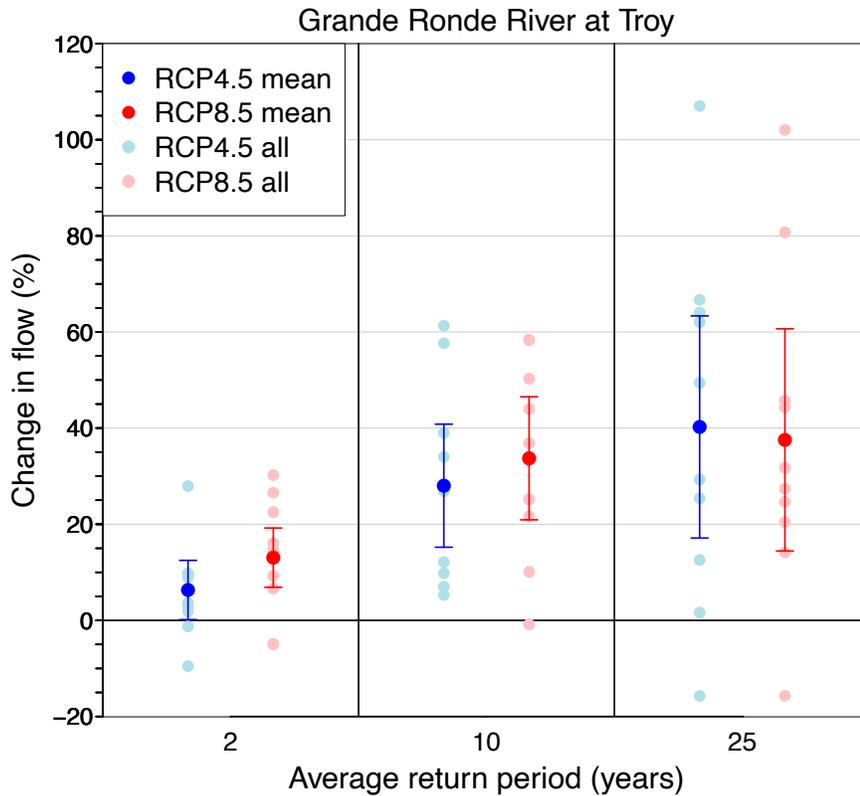


Figure 13. Projected change in water-year maximum daily, non-regulated streamflows with 2-year, 10-year, and 25-year return periods for the Grand Ronde River at Troy from 1961–2010 to 2031–2080 under lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. Larger blue and red dots and bars represent the mean and two standard errors across ten global climate models. Smaller light blue and light red dots represent individual models. (Data source: Integrated Scenarios of the Future Northwest Environment, <https://climate.northwestknowledge.net/IntegratedScenarios/>; Figure source: David Rupp, OCCRI)

In parts of the Blue Mountains (Wallowa Mountains, Hells Canyon Wilderness Area, and northeast Wallowa-Whitman National Forest), the magnitude of a flood with a 1.5-year return period (67% probability that this flood level would be exceeded in a given year) is expected to increase by the 2080s (2070–2099), relative to the 1970–1999 historical baseline, under a medium emission scenario (SRES-A1B), particularly at intermediate elevations, as more precipitation falls as rain rather than snow (Clifton *et al.*, 2018) (Figure 14). The SRES-A1B scenario is from an earlier generation of emissions scenarios and is most similar to RCP6.0 (Figure 2). Floods of this magnitude can damage roads. Projections of changes in floods of this magnitude are not available for the 2020s and 2050s in Wallowa County.

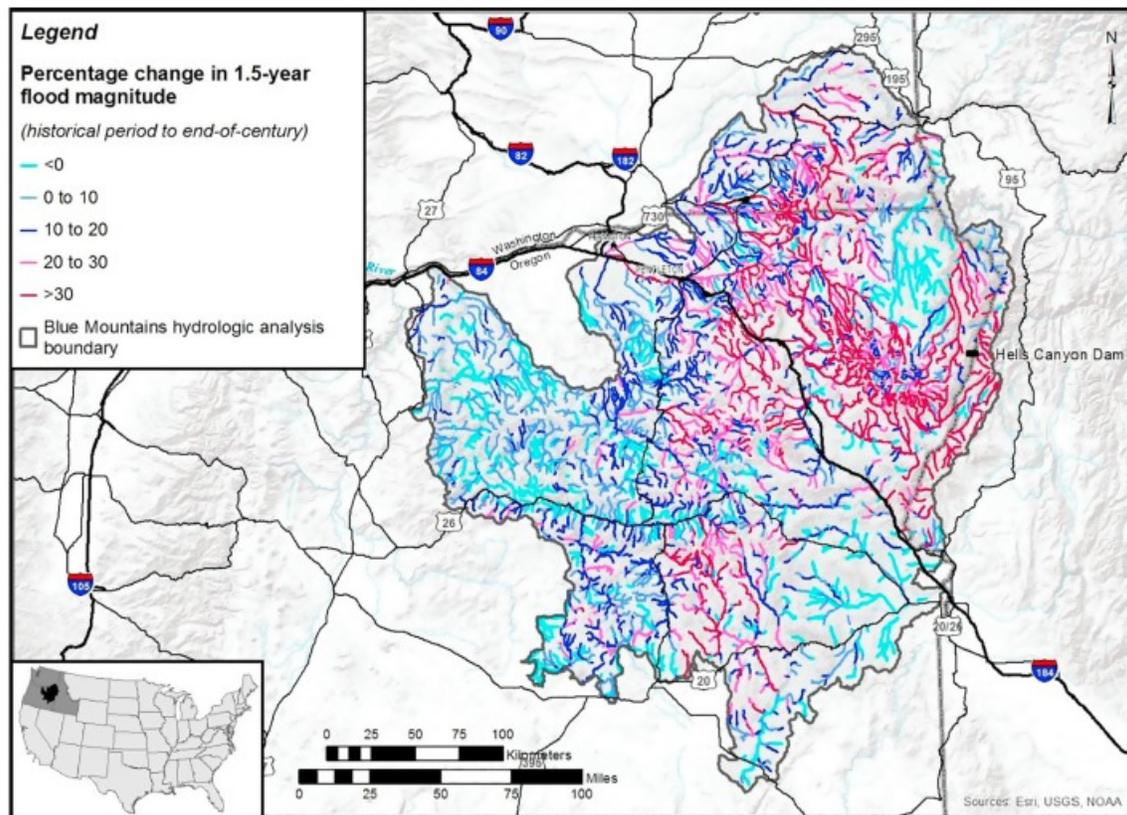


Figure 14. Projected change by the 2080s (2070–2099), relative to the 1970–1999 historical baseline, in the daily flow magnitude of a flood with a 1.5-year return interval under a medium emissions scenario (SRES-A1B) in the Blue Mountains. (Source: Clifton et al., 2018)

Across much of the western United States, major floods—peak flow magnitudes associated with 100-year and 25-year return periods (1% and 4% probability that this daily flow magnitude would be exceeded in a given year)—are projected to increase by 2070–2099, compared to the 1971–2000 historical baseline, under the higher emissions scenario (Maurer *et al.*, 2018). Peak flow magnitudes with 25-year and 100-year return periods along the Grand Ronde River at Troy are projected to increase by about 12% and 17%, respectively, by 2070–2099 relative to the historical baseline (Table 11). In effect, the magnitude of flooding currently corresponding to 25-year and 100-year peak flow events will become magnitudes corresponding to 14-year and 35-year events, respectively (Maurer *et al.*, 2018). Flood levels with 10-year and 100-year return periods (10% and 1% probability that this flood level would be exceeded in a given year) on the Grand Ronde River at Troy were projected to increase by 48% and 68%, respectively, from 1950–1999 to 2050–2099 under the higher emissions scenario (Queen *et al.*, 2021).

Some of the Northwest’s highest floods occur when large volumes of warm rain from atmospheric rivers combine with a deep snowpack, resulting in rain-on-snow floods (Safeeq *et al.*, 2015). The frequency and amount of moisture transported by atmospheric rivers is projected to increase along the West Coast in response to increases in air temperature (Kossin *et al.*, 2017), which in turn increase the likelihood of flooding (Konrad and Dettinger, 2017).

Table 11. Percent change in peak flow associated with multiple return periods for the Grand Ronde River at Troy under the higher emissions scenario. The time period of analysis varies among sources.

Return Period (Probability that this level would be exceeded in a given year)	Average Percent Change in Flow	Time Periods	Source
2-year (50%)	17%	2031–2080 vs. 1961–2010	David Rupp
10-year (10%)	48%	2050-2099 vs. 1950-1999	Queen et al. (2021)
	32%	2031–2080 vs. 1961–2010	David Rupp
25-Year (4%)	12%	2070–2099 vs. 1971–2000	Maurer et al. (2018)
	37%	2031–2080 vs. 1961–2010	David Rupp
100-Year (1%)	17%	2070–2099 vs. 1971–2000	Maurer et al. (2018)
	68%	2050-2099 vs. 1950-1999	Queen et al. (2021)

Future changes in the frequency of rain-on-snow events likely will vary along an elevational gradient. At lower elevations, the frequency is projected to decrease due to decreasing snowpack, whereas at higher elevations the frequency is projected to increase due to the shift from snow to rain (Surfleet and Tullos, 2013; Safeeq *et al.*, 2015; Musselman *et al.*, 2018). How such changes in frequency of rain-on-snow events are likely to affect streamflow varies. For example, projections for the Santiam River, Oregon, indicate an increase in annual peak daily flows at return intervals less than 10 years, but a decrease in annual peak daily flows at return intervals greater than or equal to 10-years (Surfleet and Tullos, 2013). Average runoff from rain-on-snow events in watersheds in northern coastal Oregon is projected to decline due to depletion of the snowpack (Musselman *et al.*, 2018), which may imply that the driver of floods in these areas shifts from rain-on-snow events to extreme rainfall that exceeds soil capacity (Berghuijs *et al.*, 2016; Musselman *et al.*, 2018).

Key Messages

- ⇒ 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 is common in the Northwest. The incidence, extent, and severity of drought has increased over the last 20 years relative to the twentieth century, and this trend is expected to continue under future climate change (Dalton and Fleishman, 2021). Drought can be defined in many ways (Table 12), but most fundamentally is insufficient water to meet needs (Redmond, 2002; Dalton and Fleishman, 2021).

Table 12. Definitions and characteristics of various drought classes. (Source: Dalton and Fleishman, 2021; Fleishman *et al.*, unpublished)

Drought Class	Definition & Characteristics
Meteorological	<ul style="list-style-type: none"> • lack of precipitation • evaporative demand that exceeds precipitation • minimum period of time for consideration operationally is 90 days
Hydrological	<ul style="list-style-type: none"> • prolonged meteorological drought affects surface or subsurface water supply, such as streamflow, reservoir and lake levels, or groundwater levels • tends to evolve more slowly than meteorological drought, with extents longer than six months
Agricultural	<ul style="list-style-type: none"> • occurs when meteorological and hydrological drought impacts agricultural production • reflects precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, and reduced availability of irrigation water
Socioeconomic	<ul style="list-style-type: none"> • occurs when meteorological, hydrological, or agricultural drought reduces the supply of some economic or social good or service • often affects state and federal drought declarations
Ecological	<ul style="list-style-type: none"> • undesirable changes in ecological state caused by deficits in water availability • usually caused by meteorological or hydrological drought • sensitivity to water limitation varies among species and life stages
Flash	<ul style="list-style-type: none"> • relatively short periods of warm surface temperatures, low relative humidities and precipitation deficits, and rapidly declining soil moisture • tend to develop and intensify rapidly within a few weeks, and may be generated or magnified by prolonged heat waves
Snow	<ul style="list-style-type: none"> • snowpack—or snow water equivalent (SWE)—is below average for a given point in the water year, traditionally 1 April • often followed by summers with low river and stream flows • warm snow drought—low snowpack with above average precipitation and temperature • dry snow drought—low snowpack and low precipitation

Summers in Oregon are expected to become warmer and drier, and mountain snowpack is projected to decline due to warmer winter temperatures (Dalton and Fleishman, 2021). Across the western United States, the decline in mountain snowpack is projected to reduce summer soil moisture in the mountains (Gergel *et al.*, 2017). Climate change is expected to result in lower summer streamflows in snow-dominated basins across the Northwest as snowpack melts earlier due to warmer temperatures and decreases in summer precipitation (Dalton *et al.*, 2017; Mote *et al.*, 2019). For example, a decrease in summer flows is expected for the Grand Ronde River at Troy by the 2050s (2040–2069) (Figure 12). As mountain snowpack declines, seasonal drought will become less predictable and snow droughts will increase the likelihood of meteorological and hydrological drought in subsequent seasons (Dalton and Fleishman, 2021).

This report presents projected changes in four variables indicative of drought: low spring snowpack (snow drought), low summer soil moisture from the surface to 140 cm below the surface (agricultural drought), low summer runoff (hydrological drought), and low summer precipitation (meteorological drought). Drought is presented in terms of a change in the probability of exceeding the magnitude of seasonal drought conditions for which the historical probability of exceedance in a given year was 20% (i.e., 5-year return period) (Figure 15).

In Wallowa County, spring snowpack (snow water equivalent on April 1), summer runoff, summer soil moisture, and summer precipitation are projected to decline by the 2050s under both lower (RCP 4.5) and higher (RCP 8.5) emissions scenarios. Therefore, seasonal drought conditions will occur more frequently by the 2050s under both emissions scenarios (Figure 15). By the 2050s under the higher emissions scenario, the annual probability of low spring snowpack, low summer runoff, and low summer soil moisture each is projected to be about 50% (i.e., 2-year return period), and the annual probability of low summer precipitation is projected to be 32% (i.e., about a 3-year return interval). Drought projections for the 2020s were not evaluated due to data limitations, but drought magnitudes in the 2020s likely will be smaller than those in the 2050s.

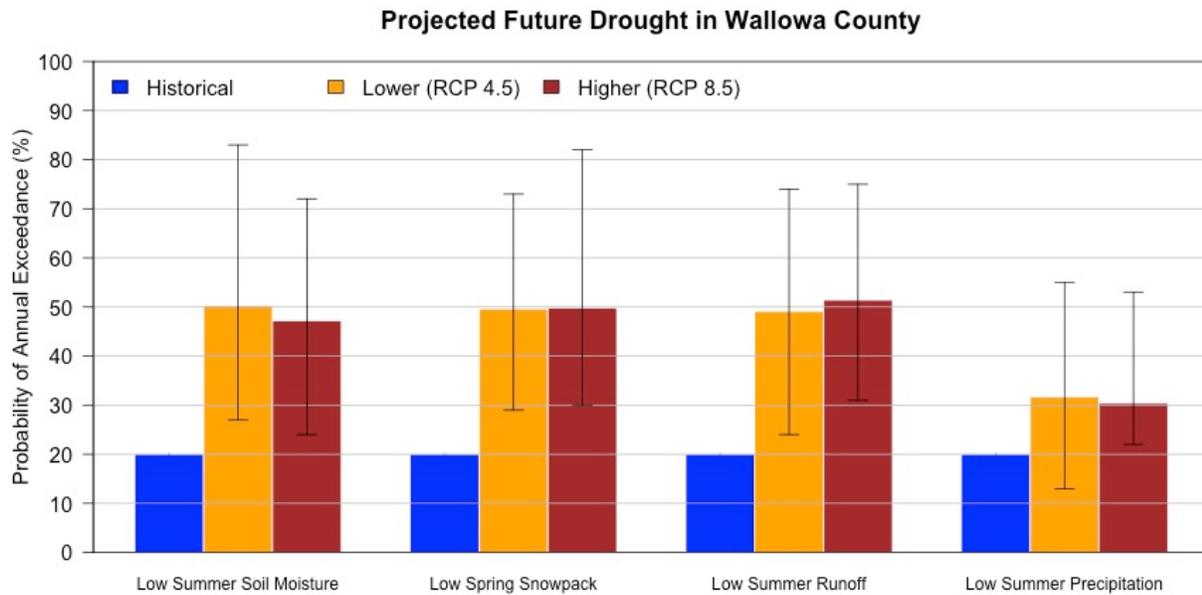


Figure 15. Projected probability of exceeding the magnitude of seasonal drought conditions for which the historical probability of exceedance in a given year was 20%. Projections are for the 2050s (2040–2069), relative to the historical baseline (1971–2000), under two emissions scenarios. Seasonal drought conditions include low summer soil moisture (average from June through August), low spring snowpack (April 1 snow water equivalent), low summer runoff (total from June through August), and low summer precipitation (total from June through August). The bar and whiskers represent the mean and range across ten global climate models. (Data Source: Integrated Scenarios of the Future Northwest Environment, <https://climate.northwestknowledge.net/IntegratedScenarios/>)

Projected changes in spring snowpack and summer streamflow in northeast Oregon are spatially variable. Within the Blue Mountains, projected declines in spring snowpack generally were greatest at low to mid-elevations, but large declines were also apparent at some higher elevations, such as in the Wenaha-Tucannon Wilderness, and at mid-elevations in the Hells Canyon Wilderness (Clifton *et al.*, 2018). Projected declines in spring snowpack were lowest in Eagle Cap Wilderness, but summer runoff in this area is highly sensitive to late-season snowpack (Clifton *et al.*, 2018). By the 2080s (2070–2099), summer streamflows in about half of the perennial streams in the Blue Mountains are projected to decrease by less than 10%, whereas summer streamflows in the Wallowa Mountains and Wenaha-Tucannon Wilderness are projected to decrease by more than 30% (Clifton *et al.*, 2018) (Figure 16). Although spring snowpack declines were lowest in Eagle Cap in the Wallowa Mountains, the area’s high sensitivity to even small changes in late-season snowpack resulted in large projected decreases in summer runoff (Clifton *et al.*, 2018). The highest risks of summer water shortages associated with low streamflows are in the Burnt, Powder, Upper Grande Ronde, and Wallowa sub-basins (Clifton *et al.*, 2018).

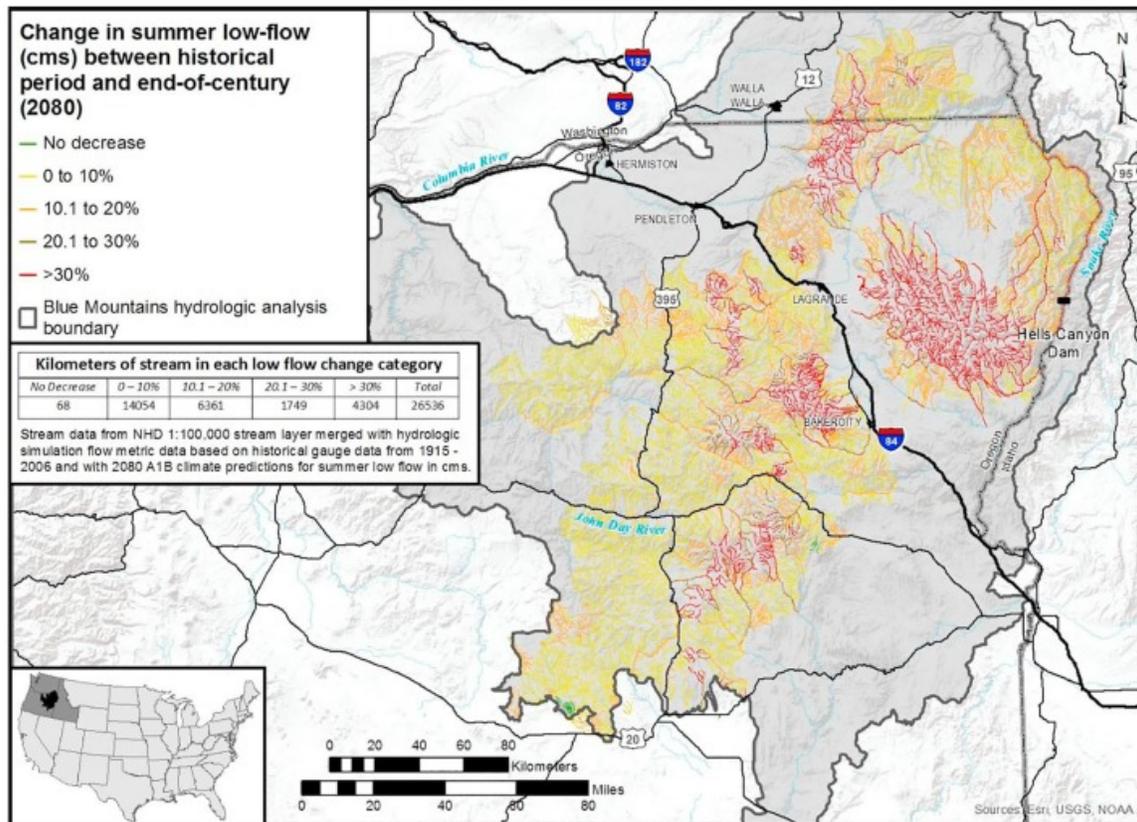


Figure 16. Projected decrease in mean summer streamflow from 1970–1999 to the 2080s (2070–2099) for streams in the Blue Mountains under a medium emissions scenario (SRES-A1B). This scenario is from an earlier generation of emissions scenarios and is most similar to RCP 6.0 (Figure 2). (Source: Clifton et al., 2018)

Key Messages

- ⇒ 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.



Human activities have modified fire dynamics in the western United States through clearance of native vegetation for agriculture and urbanization, fragmentation and exploitation of forests and other natural land-cover types, human population growth and increased recreational activities, and replacement of indigenous or no fire management by extensive fire suppression and vegetation management. From 1985 through 2017, the annual area burned by high-severity fires across forests in the western United States increased eightfold (Parks and Abatzoglou, 2020).

Over the last several decades, warmer and drier conditions during summer have contributed to an increase in vegetation dryness and enabled more frequent large wildfires, an increase in the total area burned, and a longer wildfire season across the western United States, particularly in forested ecosystems (Dennison *et al.*, 2014; Jolly *et al.*, 2015; Westerling, 2016; Williams and Abatzoglou, 2016). The lengthening of the wildfire season is largely due to declining mountain snowpack and earlier spring snowmelt (Westerling, 2016).

Vapor pressure deficit (VPD)—atmospheric aridity—is more strongly associated with forest area burned than precipitation, drought indices, or temperature (Sedano and Randerson, 2014; Williams *et al.*, 2014; Seager *et al.*, 2015; Rao *et al.*, 2022). The climate models included in the sixth phase of the Coupled Model Intercomparison Project suggest that human emissions of greenhouse gases explain a large percentage of the observed VPD increase (Zhuang *et al.*, 2021). In the western United States from 1984 through 2015, about half of the observed increase in vegetation dryness—driven mainly by VPD—and 4.2 million hectares (16,000 square miles) of burned area were attributable to human-caused climate change (Abatzoglou and Williams, 2016).

Fire danger is generally evaluated on the basis of daytime conditions that may cause wildfires to spread. Historically, wildfires were less active overnight. However, nights have become hotter and drier, and the temperature and duration of wildfires is expected to increase as a result (Balch *et al.*, 2022). In the western United States, the number of nights during which atmospheric conditions are conducive to burning has increased by 45% since 1979 (Balch *et al.*, 2022). Vegetation can also amplify or dampen the effect of aridity on wildfires. The geographic co-occurrence of plants with high water sensitivity (e.g., plants that do not close their stomata, shallow-rooted plants on porous soils) and high VPD suggests that the distribution of vegetation in the western United States has amplified the effect of climate change on wildfire hazard (Rao *et al.*, 2022).

High temperatures contribute to the drying of dead vegetation, but high VPD reduces moisture in live vegetation (e.g., the tree canopy), increasing the likelihood that any source of ignition will create a wildfire. The interaction between continued development in areas with flammable vegetation and increases in VPD suggests that projections of changing wildfire risk in the western United States may be conservative (Rao *et al.*, 2022), especially given that over 80% of all ignitions in the United States are now human-caused (Balch *et al.*, 2017) and that human activities have extended both the temporal and geographic extent of the fire season (Balch *et al.*, 2017; Bowman *et al.*, 2020). Furthermore, extreme wildfires may correspond to concurrent extreme weather, including high temperatures,

aridity, and wind speeds, that is becoming more common (Abatzoglou *et al.*, 2021).

Projecting wildfire risk across the western United States in response to changes in climate and land use requires understanding the interactions among biological, climatic, and human factors. The probability of wildfire occurrence in the Cascade Range of Oregon as a function of temperature and precipitation is projected to increase by 63% under the lower emissions scenario (RCP 4.5) to 122% under the higher emissions scenario (RCP 8.5) (Gao *et al.*, 2021). Multiple modeling approaches simulate an increase in forest area burned in the western United States (Abatzoglou *et al.*, 2021). Similarly, model simulations of a common fire index that is based on precipitation and temperature, the Keetch–Byram Drought Index, and a proxy for fuel availability suggests that the number of days on which fire risk is extremely high will increase through the end of the twenty-first century (Brown *et al.*, 2021). Overall, wildfire frequency, intensity, and area burned are projected to continue increasing in the Northwest, even in climatologically wet areas in western Oregon (Dalton *et al.*, 2017; Mote *et al.*, 2019; Dalton and Fleishman, 2021)

This report considers the number of days with extreme values of 100-hour fuel moisture (FM100) and vapor pressure deficit (VPD) as a proxy for wildfire risk. FM100 is a measure of the percentage of moisture in the dry weight of dead vegetation with 1–3 inch diameter, and commonly is used by the Northwest Interagency Coordination Center (<https://gacc.nifc.gov/nwcc/>) to predict fire danger. A majority of climate models project that fuel moisture will decline across Oregon by the 2050s (2040–2069) under the higher emissions scenario (Gergel *et al.*, 2017). Drying of vegetation leads to greater wildfire risk, especially when coupled with decreases in summer soil moisture and increases in the evaporative demand. VPD is a measure of the dryness of the air; dry air causes live plants to release more water into the air and therefore to become drier and more flammable. CMIP6 model simulations given a higher emissions scenario projected that warm season VPD over the next 30 years will increase at a rate similar to that observed across the western United States from 1980 through 2020 (Zhuang *et al.*, 2021). Increases in VPD also were projected by CMIP5 models to contribute substantially to wildfire risk in eastern Oregon (Ficklin and Novick, 2017; Chiodi *et al.*, 2021). Furthermore, observed increases in nighttime temperatures (Balch *et al.*, 2022) and in nighttime VPD (Chiodi *et al.*, 2021), such as has been observed in the Blue Mountains of eastern Oregon, have been linked to fires burning longer into the night and increases in early morning fire intensity thereby reducing the window of opportunity for suppression. In addition, annual area of forests burned increases exponentially with increases in VPD across the western United States (Zhuang *et al.*, 2021; Juang *et al.*, 2022).

In this report, the future change in wildfire risk is expressed as the increase in the average annual number of days on which fire danger is very high and VPD is extreme. Projections are presented for two future periods under two emissions scenarios compared to the historical baseline. A day on which fire danger is very high is defined as a day on which FM100 is lower (i.e., vegetation is drier) than the historical 10th percentile value. Historically, fire danger was very high on 36.5 days per year. A day on which VPD is extreme is defined as a day on which VPD exceeds the historical warm season (March–November) 90th percentile value.

In Wallowa County, the average number of days per year on which fire danger is very high is projected to increase by 16 days (range -4 – 38) by the 2050s, compared to the historical baseline, under the higher emissions scenario (Figure 17). The average number of days per year on which VPD 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 (Figure 18).

The impacts of wildfire on air quality are discussed in the following section on 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.

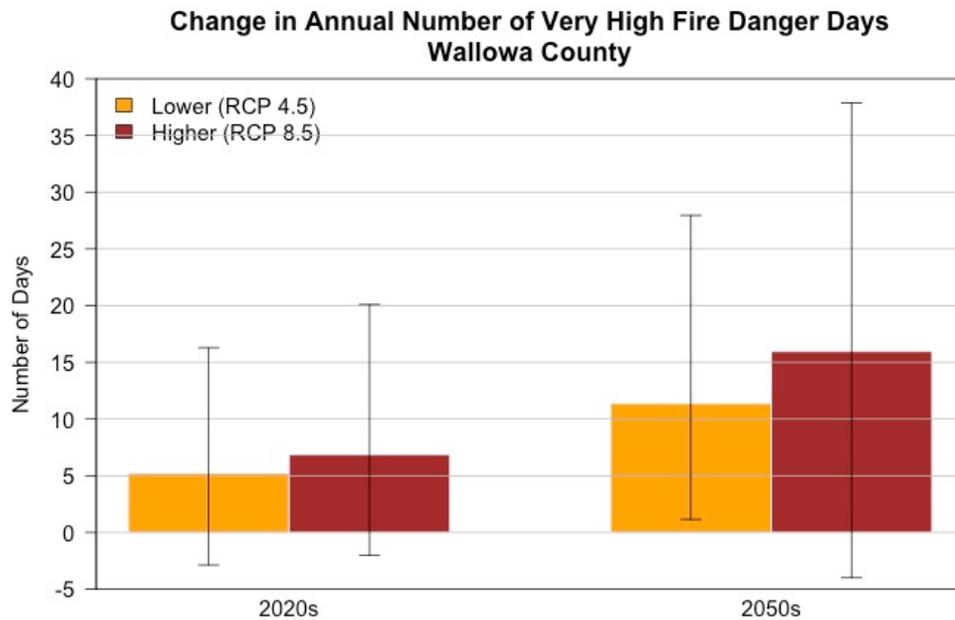


Figure 17. Projected changes by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the 1971–2000 historical baseline and under two emissions scenarios, in the number of days on which fire danger in Wallowa County is very high. The bars and whiskers represent the mean and range, respectively, of changes across 18 global climate models. (Data Source: Climate Toolbox, climatetoolbox.org/tool/Climate-Mapper)

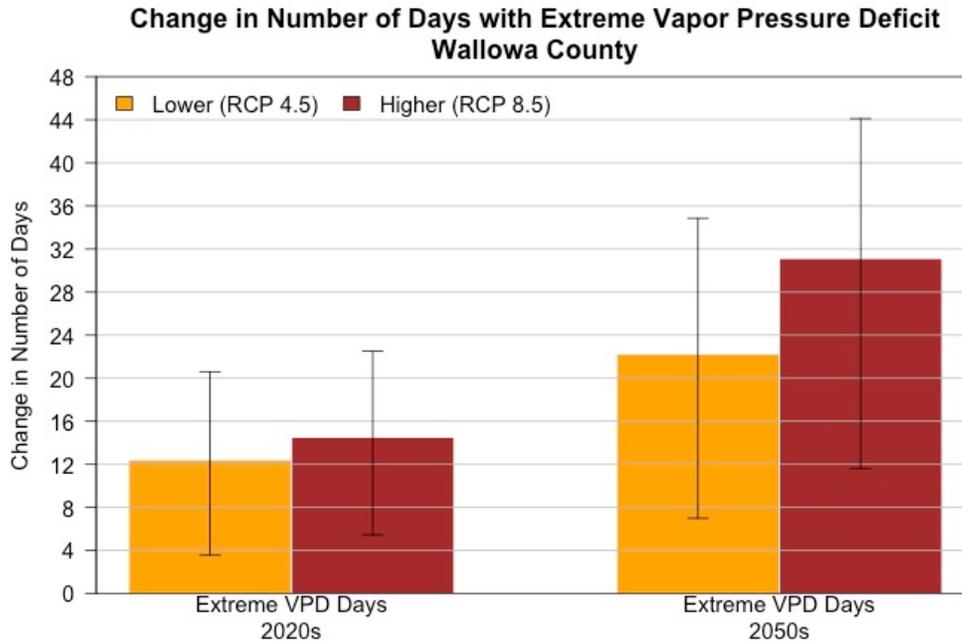


Figure 18. Projected changes by the 2020s (2010–2039 average) and 2050s (2040–2069 average), relative to the 1971–2000 historical baseline under two emissions scenarios, in the number of days on which vapor pressure deficit in Wallowa County is extreme. The bars and whiskers represent the mean and range, respectively, of changes across 20 global climate models. (Data Source: Climate Toolbox, climatetoolbox.org/tool/Climate-Mapper)

Key Messages

- ⇒ 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

Climate change is expected to reduce outdoor air quality. Warmer temperatures may increase ground-level ozone concentrations, increases in the number and size of wildfires may increase concentrations of smoke and particulate matter, and increases in pollen abundance and the duration of pollen seasons may increase aeroallergens. Such poor air quality is expected to exacerbate allergy and asthma conditions and increase the incidence of respiratory and cardiovascular illnesses and death (Fann *et al.*, 2016).

Over the past several decades, fire seasons have increased in length, and the intensity and severity of wildfires have increased; this trend is expected to continue as a result of complex factors including traditional forest management practices, increasing population density in fire risk zones, and climate change (Sheehan *et al.*, 2015). Large wildfires in the western United States created extensive smoke plumes that traveled at high altitudes over long distances and affected air quality not only near to but far from those wildfires. Hazardous levels of air pollution are most common near wildfires. Fires emit fine particulate matter (less than 2.5 micrometers in diameter [PM_{2.5}]), which exacerbates chronic cardiovascular and respiratory illnesses (Cascio, 2018). In addition, because exposure to PM_{2.5} increases susceptibility to viral respiratory infections, exposure to wildfire smoke is likely to increase the susceptibility to and the severity of reactions from Covid-19 (Henderson, 2020). Wildfire smoke also impairs visibility and can disrupts outdoor recreational and social activities, in turn affecting physical and mental health (Nolte *et al.*, 2018).

From 2000 through 2020, the frequency, duration, and area of co-occurrence of two air pollutants related to wildfire smoke, PM_{2.5} and ozone, increased in the western United States (Kalashnikov *et al.*, 2022). Wildfires emit ozone precursors that in hot and sunny conditions react with other pollutants to increase the concentration of ozone. The area in which PM_{2.5} and ozone co-occurred more than doubled during the past 20 years.

Wildfires are the primary cause of exceedances of air quality standards for PM_{2.5} in western Oregon and parts of eastern Oregon (Liu *et al.*, 2016), although woodstove smoke and diesel emissions also contribute (Oregon DEQ, 2016). Fine particulates from vehicles, woodstoves, and power plants can be regulated, but it is much more difficult to control wildfires and, therefore, increasingly chronic smoke exposure with potentially severe health consequences (Liu *et al.*, 2016). Across the western United States, PM_{2.5} levels from wildfires are projected to increase 160% by 2046–2051, relative to 2004–2009 under a medium emissions scenario (SRES A1B) (Liu *et al.*, 2016). The SRES A1B scenario, which is from an earlier generation of emissions scenarios, is most similar to RCP 6.0 (Figure 2). Using CMIP6 models combined with an empirical statistical model, PM_{2.5} levels in August and September in the Northwest were projected to double to triple by 2080–2100 under lower (SSP5-4.5) and higher (SSP5-8.5) emissions scenarios (Xie *et al.*, 2022).

This report presents quantitative projections of future air quality reflecting PM_{2.5} from wildfire smoke. Smoke wave days are defined as two or more consecutive days with simulated, county-averaged, wildfire-derived PM_{2.5} values in the highest 2% of simulated daily values from 2004 through 2009 (Liu *et al.*, 2016). Smoke wave intensity is defined as the concentration of PM_{2.5} on smoke wave days. Mean number of smoke wave days and

mean smoke wave intensity are projected for two six-year periods, 2004–2009 and 2046–2051, under a medium emissions scenario. More information about the methods underlying these projections of future air quality is in the Appendix. In Wallowa County, the number of smoke wave days is projected to increase by 150%, whereas the intensity is projected to increase by 73% (Figure 19).

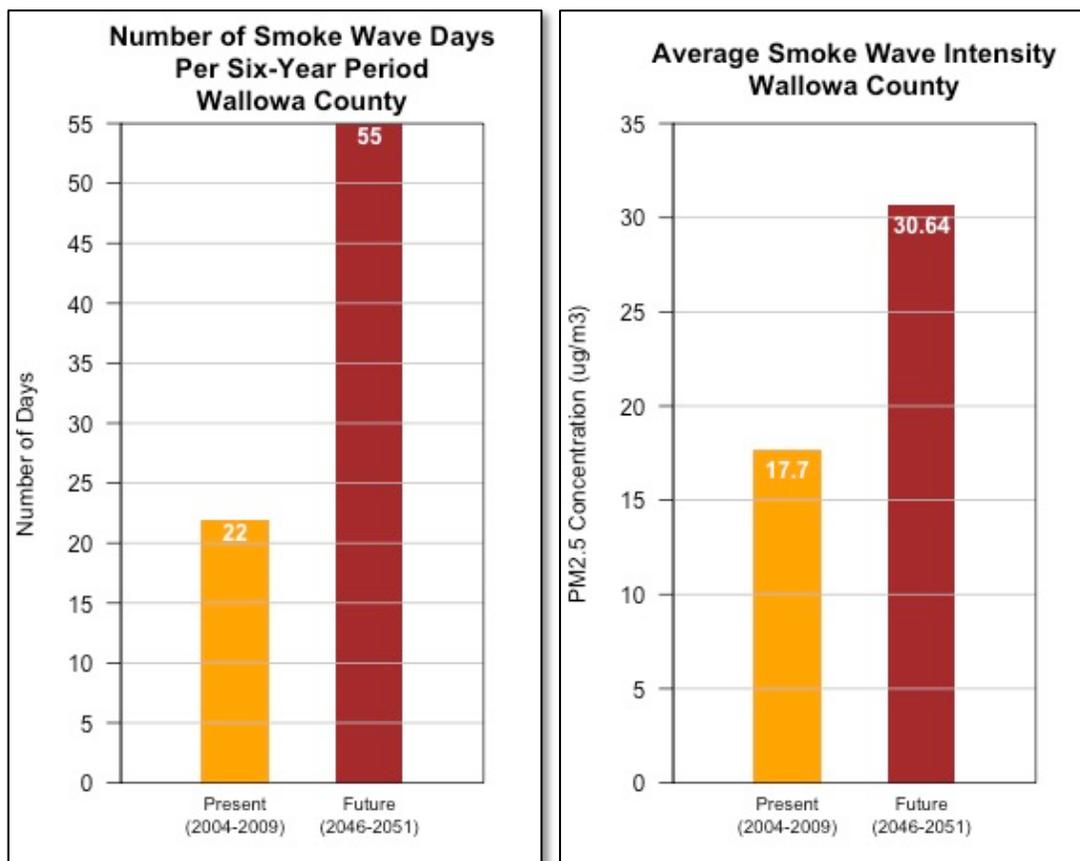


Figure 19. Simulated present (2004–2009) and future (2046–2051) number (left) and intensity (right) of smoke wave days in Wallowa County under a medium emissions scenario. Values represent the mean among 15 global climate models. (Data source: Liu et al. 2016, <https://khanotations.github.io/smoke-map/>)

Vegetation is also responding to changes in climate and atmospheric concentrations of carbon dioxide by producing more pollen, and by producing pollen earlier in the spring and for longer periods of time (Ziska *et al.*, 2009). From 1990 through 2018, pollen seasons increased by about 20 days and pollen concentration increased by 21% in the conterminous United States (Anderegg *et al.*, 2021), including northern California (Paudel *et al.*, 2021).

Fungal spores also could become more abundant following extreme floods or droughts, which are expected to become more common with climate change. The period during which outdoor airborne mold spores are detectable increased in the last 20 years as a result of increasing concentrations of carbon dioxide and changes in climate and land use

(Paudel *et al.*, 2021). Furthermore, because both ozone and particulates affect the sensitivity of respiratory systems to airborne allergens, the combined effects of climate change, air pollution, and changes in vegetation phenology will likely increase the severity of respiratory diseases and allergies (D'Amato *et al.*, 2020).

Key Messages

- ⇒ The risk of 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

In the United States, wetlands are defined under the Clean Water Act as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” Wetlands also may be associated with the edges of lakes and with streams and rivers (Halofsky *et al.*, 2019). All of these wetland types, some of which are fed by surface water and some by ground water, occur in the Blue Mountains (Dwire *et al.*, 2018).

Wetlands and their associated plants and animals are likely to be affected by increases in air temperature, which generally are correlated with increases in freshwater temperature; decreases in snowpack and summer stream flows; and increases in evapotranspiration (Lee *et al.*, 2015). Projected effects in the Northwest include reductions in water levels and hydroperiod duration, and may be most pronounced in wetlands that become temporary in dry years (Lee *et al.*, 2015). Wetlands along low-gradient, wide valley bottoms that are dominated by riparian trees and understory species may be most susceptible to decreases in flow and water volume, in part because recruitment of some riparian species depends on seasonal flooding (Dwire *et al.*, 2018). Systems that are fed primarily by ground water may have more consistent temperature, water chemistry, and water levels than wetlands that are fed primarily by surface water (Halofsky *et al.*, 2019). However, effects of climate change on ground water aquifers that are recharged by snowpack, such as those in the Blue Mountains, are uncertain (Dwire *et al.*, 2018). Moreover, where increasing aridity leads to greater demand for ground water, decreases in ground water availability may affect wetlands. Additionally, changes in vegetation at the perimeter of wetlands that result from land use or changes in climate, such as replacement of riparian hardwoods to conifers and shrubs (Dwire *et al.*, 2018), may affect water temperatures (Halofsky *et al.*, 2019), chemistry, and nutrient cycles.

At least four populations of Columbia spotted frog (*Rana luteiventris*), a rare species that was petitioned for listing under the U.S. Endangered Species Act in 1989, occurred in wetlands in Wallowa County as of 2005 (Bull, 2005). If increases in temperature or decreases in water availability increase use of wetlands by domestic cattle, habitat quality for this and other native species likely will decrease (Adams *et al.*, 2018). Populations of Columbia spotted frog also are likely to decline if permanent wetlands occupied by the species become temporary (Hossack *et al.*, 2013; McCaffery *et al.*, 2014; Kissel *et al.*, 2019), and as mean peak snow water equivalent decreases (McCaffery *et al.*, 2012).

Key Messages

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



Climate change has the potential to alter surface winds through changes in the global free atmospheric circulation and storm systems, and through changes in the connection between the free atmosphere and Earth's surface. West of the Cascade Range, changes in surface wind speeds tend to follow changes in upper atmosphere winds associated with extratropical cyclones (Salathé *et al.*, 2015). The trend in winter extratropical storm frequency in the northeast Pacific since 1950 was positive, although not statistically significant (Vose *et al.*, 2014). However, uncertainty in projections of future extratropical cyclone frequency is high (IPCC, 2013).

Future projections indicate a slight northward shift in the jet stream and extratropical cyclone activity in the North Pacific. Over the Northern Hemisphere, the frequency of the most intense extratropical cyclones generally is projected to decrease, although in the northern North Pacific the frequency is projected to increase (IPCC, 2021) Therefore, there is no consensus on whether extratropical storms (Vose *et al.*, 2014; Seiler and Zwiers, 2016; Chang, 2018) and associated extreme winds (Kumar *et al.*, 2015) will intensify or become more frequent along the Northwest coast under a warmer climate.

Key Messages

- ⇒ 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

Changes in climate and atmospheric concentrations of carbon dioxide can affect the distribution and population dynamics of native and non-native species of plants and animals that are considered to be invasive or pests in natural and agricultural systems. Increasing concentrations of carbon dioxide not only lead to increases in global temperature, but affect plants' primary productivity, water-use efficiency, and nutrient content. Changes in climate, ongoing human additions of nitrogen to the environment, and their interactions also affect the growth and competitive relations among plant and animal species (Greaver *et al.*, 2016). 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, and are likely to vary locally. Moreover, the responses may change over time.

Species-environment relations are not static (MacDonald, 2010; Walsworth *et al.*, 2019). Therefore, even when the current ecology of a species is well understood, it often is difficult to predict with confidence how the species will respond to projected changes in climate, especially when climate change interacts with land-use change or other environmental changes. Species adapt not only in response to climate change but in response to all types of environmental change, including management actions (Thomas *et al.*, 1979; Skelly *et al.*, 2007; Winter *et al.*, 2016). These responses may be rapid, on the order of years or decades, especially when organisms have short generation times (Boughton, 1999; MacDonald *et al.*, 2008; Willis and MacDonald, 2011; Singer, 2017). Adaptive capacity also is affected by whether individuals can move freely or whether habitat fragmentation and other barriers impede movement (Thorne *et al.*, 2008; Willis and MacDonald, 2011; Fleishman and Murphy, 2012). Monocultures, dense populations, and even-aged populations of plants or animals generally are more susceptible to pests and pathogens than individuals in areas with higher species richness or populations with greater demographic diversity.

Many insects that defoliate or otherwise damage or kill conifers in Oregon and elsewhere in the Northwest are native herbivores that are eruptive. For example, densities of native mountain pine beetles (*Dendroctonus ponderosae*) generally are low, but eruptions can result in 60% stand-level mortality over tens to hundreds of square kilometers (Abrams *et al.*, 2021). Therefore, research often concentrates on the environmental conditions that lead to increases in the size and distribution of insect populations and the susceptibility of trees to predation and mortality. Organisms that are physiologically stressed, especially at intermediate levels of stress, generally are more susceptible to herbivores and pathogens.

Douglas-fir beetle (*Dendroctonus pseudotsugae*), an insect native to Oregon, can damage both stressed and, especially during their outbreaks, healthy Douglas-fir (*Pseudotsuga menziesii*) trees. The effects of outbreaks on trees generally are greatest during hot, dry summers when trees may be water-stressed (Agne *et al.*, 2018). Additionally, warm winters may decrease beetle mortality, increasing the likelihood of an eruption (Agne *et al.*, 2018). The effects of Douglas-fir engraver beetles (*Scolytus unispinosus*) on their host trees also tend to be greater during periods of drought (Agne *et al.*, 2018). However, adults of both species of beetles have an obligate winter diapause, and increases in winter

temperature that interfere with diapause may decrease their effects on conifers (Bentz *et al.*, 2010).

Both water availability and temperature are associated with outbreaks of and mortality from mountain pine beetles, which feed on ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), and many other species of *Pinus*. When population sizes of mountain pine beetles are small, the insects tend to inhabit small and stressed trees, which provide limited nutrition (Bone and Nelson, 2019). When their population sizes are large, mountain pine beetles also inhabit larger trees, which provide more nutrition (Bone and Nelson, 2019). Substantial increases in the density of mountain pine beetles may require consecutive warm years (Bone and Nelson, 2019). In Washington and Oregon, outbreaks appear to be most likely when mean August temperature exceeds 15°C (59°F) (Preisler *et al.*, 2012). The probability of considerable mortality increased as minimum winter temperature increased and during or following years with low summer precipitation (Preisler *et al.*, 2012). Furthermore, mountain pine beetles that were acclimated to and relatively tolerant of cold winter temperatures generally caused higher tree mortality (Preisler *et al.*, 2012). However, the magnitude and abruptness of cold spells in spring and the duration of cold spells in midwinter that result in beetle mortality are unknown (Bone and Nelson, 2019). It is possible that mortality is higher following consecutive years with periods of extreme cold than in a single year with a marked cold spell (Bone and Nelson, 2019).

Western spruce budworms (*Choristoneura freemani*) are moths native to Oregon. They feed on the foliage of Douglas-fir, grand fir (*Abies grandis*), white fir (*Abies concolor*), and other conifers, reducing tree growth and increasing trees' susceptibility to other insects and pathogens and the likelihood of mortality (Flower *et al.*, 2014). Outbreaks can occur over extensive areas and for durations of more than a decade (local mean 8–15 years), and can be synchronous (Flower *et al.*, 2014). Synchrony decreases as the distance between outbreak locations increases, but synchrony increased over the twentieth century, likely reflecting changes in both climate and land use (Flower *et al.*, 2014). Data from dendroclimatological reconstruction and the observational record indicated that outbreaks over the past several centuries were associated with warm and dry conditions during the preceding two to four years (Flower *et al.*, 2014; Xu *et al.*, 2019), perhaps especially one and two years prior to the outbreak (Xu *et al.*, 2019), and cool and wet conditions in the year of the outbreak and the three following years (Flower *et al.*, 2014). Thus, outbreaks typically may begin toward the end of a drought. Heavy precipitation and low temperatures in late spring and early summer can reduce the likelihood of outbreak, perhaps by displacing budworms from trees or via mortality of the insects (Flower *et al.*, 2014). Nevertheless, understanding of relations between outbreaks of western spruce budworm and climate has been characterized as poor, and those relations may differ between the west and east sides of the Cascade Range (Agne *et al.*, 2018). Additionally, relations between seasonal drought and outbreaks of western spruce budworm were stronger in the northwestern than in the southwestern United States (Xu *et al.*, 2019), which raises the possibility that as aridity increases in the Northwest, the insects will become less sensitive to water limitation.

There is some concern that extensive herbivory and mortality increases the likelihood of

wildfires or severe wildfires in coniferous forests. However, there was little evidence that wildfires in Oregon and Washington from 1984–2012 were more likely, larger, or more severe following outbreaks of mountain pine beetles or western spruce budworms (Meigs *et al.*, 2015, 2016). In fact, wildfires were less likely following outbreaks of western spruce budworms (Meigs *et al.*, 2015). Moreover, fire severity following eruptions generally was lower than in areas without such outbreaks, perhaps because herbivory decreased the biomass of live vegetation (Meigs *et al.*, 2016).

Douglas-fir tussock moth (*Orgyia pseudotsugata*), a native defoliator of Douglas-fir, true firs (*Abies* spp.), and spruce, may become more abundant and widespread, and its effects on conifers more extensive, as the climate continues to become warmer and drier (Agne *et al.*, 2018). In Oregon, larch casebearer (*Coleophora laricella*), a non-native moth introduced to the United States from Europe in the late 1800s, feeds on the leaves of western larch (*Larix occidentalis*). The insects generally require 66 ± 4 (mean \pm SE) degree-days above 5°C (41°F) to break winter diapause and become mobile (Ward *et al.*, 2020). Therefore, larch casebearer also may become more prevalent given projected changes in temperature.

Balsam woolly adelgid (*Adelges piceae*) is a non-native aphid that was introduced to the eastern United States from Europe around 1900 and was detected in Oregon around 1930 (apps.fs.usda.gov/r6_decaid/views/balsam_woolly_adelgid.html). The adelgid feeds on the sap of fir trees (*Abies* spp.), which are most common at relatively high elevations. Higher levels of herbivory and tree damage were associated with high minimum temperatures in late summer and early autumn, which may increase survival of overwintering juvenile aphids; and cool, wet conditions in May, which may increase tree growth (Hrinkevich *et al.*, 2016).

Non-native forbs classified as noxious weeds that were recognized as high priorities in the 2021 Wallowa County Multi-Jurisdictional Natural Hazard Mitigation Plan are common bugloss (*Anchusa officinalis*), leafy spurge (*Euphorbia esula*), meadow hawkweed (*Hieracium pratense*), knapweeds (*Centaurea* spp.) dalmatian toadflax (*Linaria dalmatica*), sulfur cinquefoil (*Potentilla recta*), and rush skeletonweed (*Chondrilla juncea*). In eastern Oregon, the primary knapweeds are spotted knapweed (*C. maculosa*), diffuse knapweed (*C. diffusa*), Russian knapweed (*C. repens*), and yellow starthistle (*C. solstitialis*). All of these species are perennial with the exception of three of the knapweeds. Spotted knapweed is biennial or a short-lived perennial, diffuse knapweed is annual or biennial, and yellow starthistle is annual. The density and distribution of weedy plants tends to increase in response to ground disturbance, whether from wildfire, livestock grazing, recreational activities, or removal of overstory trees and shrubs. The competitive advantage of non-native forbs and grasses over native taxa may be strongest in relatively warm and dry microclimates, which often coincide with lower elevations (Dodson and Root, 2015). Additionally, non-native invasive plants generally gain a competitive advantage from nitrogen deposition. For example, the size of yellow starthistle plants increased substantially in response to experimentally increased carbon dioxide and nitrogen deposition, whereas co-occurring native plants responded less strongly (Dukes *et al.*, 2011).

The rapid expansion of non-native invasive grasses, such as cheatgrass (*Bromus tectorum*) and ventenata grass (*Ventenata dubia*), has increased fine-fuel biomass and spatial

continuity of fuels in sagebrush-dominated ecosystems (Balch *et al.*, 2013; Kerns *et al.*, 2020; Tortorelli *et al.*, 2020). Expansion of cheatgrass leads to a positive feedback loop in which increases in fire frequency and extent facilitate further increases in the distribution and density of cheatgrass.

Cheatgrass currently is most abundant in areas where precipitation is greatest during autumn and spring, which facilitates the species' germination and growth (Bradley *et al.*, 2016), and with hot, dry summers. Percent cover and biomass of cheatgrass also tends to increase in years with heavy winter and spring precipitation (Knapp, 1998; Garton *et al.*, 2011), and may remain high during the following year (Bradley *et al.*, 2016). Germination, growth, and reproduction of cheatgrass generally are highest at intermediate elevations with moderate temperatures and water availability. At low elevations, cheatgrass is limited by relatively high temperatures and low precipitation, and at high elevations, the species is limited by low soil temperatures (Meyer *et al.*, 2001; Chambers *et al.*, 2007, 2017; Compagnoni and Adler, 2014). Projected increases in temperature at high elevations (as at all elevations) may reduce that constraint on cheatgrass expansion in the future. Furthermore, soil moisture and nutrient levels commonly increase as elevation increases, supporting higher primary productivity and competition between cheatgrass and other species (Chambers *et al.*, 2007; Compagnoni and Adler, 2014), especially perennial grasses, which can reduce the cover and density of cheatgrass (Reisner *et al.*, 2013; Bradley *et al.*, 2016; Larson *et al.*, 2017).

Key Messages

- ⇒ 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.

Appendix

Future Climate Projections Background

Read more about global climate models, emissions scenarios, and uncertainty in the Climate Science Special Report—Volume 1 of the Fourth National Climate Assessment (<https://science2017.globalchange.gov>).

Global climate models (GCMs) and downscaling: <https://science2017.globalchange.gov/chapter/4#section-3>

Emissions scenarios: <https://science2017.globalchange.gov/chapter/4#section-2>

Uncertainty: <https://science2017.globalchange.gov/chapter/4#section-4>

Coupled Model Intercomparison Project phase 6 (CMIP6) climate models and emissions scenarios: see section B. Possible Climate Futures, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.

Climate and Hydrological Data

Statistically downscaled GCM outputs from the fifth phase of the Coupled Model Intercomparison Project (CMIP5) were the basis for projections of future temperature, precipitation, and hydrology in this report. The coarse resolution of the GCMs outputs (100–300 km) was downscaled to a resolution of about 6 km with the Multivariate Adaptive Constructed Analogs (MACA) statistical downscaling method, which is skillful in complex terrain (Abatzoglou and Brown, 2012). The MACA approach uses gridded observational data to train the downscaling. It applies bias corrections and matches the spatial patterns of observed coarse-resolution to fine-resolution statistical relationships. For a detailed description of the MACA method see:

<https://climate.northwestknowledge.net/MACA/MACAmethod.php>.

MACA data are the inputs to integrated models of climate, hydrology, and vegetation run by the Integrated Scenarios of the Future Northwest Environment project (<https://climate.northwestknowledge.net/IntegratedScenarios/>). Snow dynamics were simulated by the Integrated Scenarios project, which applied the Variable Infiltration Capacity hydrological model (VIC version 4.1.2.1; Liang *et al.*, 1994 and updates) to a 1/16 x 1/16 degree (6 km) grid.

Simulations of daily maximum temperature, minimum temperature, and precipitation from 1950 through 2099 for 20 GCMs (Table 13) and two emissions scenarios (RCP 4.5 and RCP 8.5) are available. Hydrological simulations of snow water equivalent (SWE) are available for the 10 GCMs used as input to VIC. All available modeled outputs were obtained from the Integrated Scenarios data archives and included in this report to represent the mean and range of projections among the largest possible ensemble of GCMs.

Table 13. The 20 CMIP5 GCMs represented in this report. Asterisks indicate the ten GCMs used as inputs to the Variable Infiltration Capacity hydrological model.

Model Name	Modeling Center
BCC-CSM1-1 BCC-CSM1-1-M*	Beijing Climate Center, China Meteorological Administration
BNU-ESM	College of Global Change and Earth System Science, Beijing Normal University, China
CanESM2*	Canadian Centre for Climate Modeling and Analysis
CCSM4*	National Center for Atmospheric Research, USA
CNRM-CM5*	National Centre of Meteorological Research, France
CSIRO-Mk3-6-0*	Commonwealth Scientific and Industrial Research Organization/Queensland Climate Change Centre of Excellence, Australia
GFDL-ESM2G GFDL-ESM2M	NOAA Geophysical Fluid Dynamics Laboratory, USA
HadGEM2-CC* HadGEM2-ES*	Met Office Hadley Center, UK
INMCM4	Institute for Numerical Mathematics, Russia
IPSL-CM5A-LR IPSL-CM5A-MR* IPSL-CM5B-LR	Institut Pierre Simon Laplace, France
MIROC5* MIROC-ESM MIROC-ESM-CHEM	Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Studies, Japan
MRI-CGCM3	Meteorological Research Institute, Japan
NorESM1-M*	Norwegian Climate Center, Norway

All simulated climate data and the streamflow data, with the exception of snow water equivalent, were bias-corrected with quantile-mapping by the Integrated Scenarios project. Quantile mapping adjusts simulated values by comparing the cumulative probability distributions of simulated and observed values. In practice, the simulated and observed values of a variable (e.g., daily streamflow) over the historical time period are sorted and ranked, and each value is assigned a probability of exceedance. The bias-corrected value of

a given simulated value is assigned the observed value with the same probability of exceedance as the simulated value. The historical bias in the simulations is assumed to be constant. Therefore, the relations between simulated and observed values in the historical period were applied to the future scenarios. Climate data in the MACA dataset reflect quantile mapping relationships for each non-overlapping 15-day window in the calendar year. Streamflow data reflect quantile mapping relationships for each calendar month.

The Integrated Scenarios project simulated hydrology with VIC (Liang *et al.*, 1994) run on a 1/16 x 1/16 degree (6 km) grid. To generate daily streamflow estimates, daily runoff from VIC grid cells was routed to selected locations along the stream network. Where records of naturalized flow were available, the daily streamflow estimates were bias-corrected so their statistical distributions matched those of the naturalized streamflows.

Vapor pressure deficit and 100-hour fuel moisture were computed by the Integrated Scenarios project with the same MACA climate variables according to the equations in the National Fire Danger Rating System (NWCG, 2019).

Smoke Wave Data

Data from Liu et al. (2016) are available at <https://khanotations.github.io/smoke-map/>. Variables used in this report included, “Total # of SW days in 6 yrs” and “Average SW Intensity”. The former is the number of days within each time period on which the concentration of fine particulate matter (PM_{2.5}), averaged within each county, exceeded the 98th quantile of the distribution of daily, wildfire-specific PM_{2.5} values from 2004 through 2009 (smoke wave days). The latter is the average concentration of PM_{2.5} across smoke wave days within each time period. Liu et al. (2016) used 15 GCMs from the third phase of the Coupled Model Intercomparison Project under a medium emissions scenario (SRES-A1B) as inputs to a fire prediction model and the GEOS-Chem three-dimensional global chemical transport model. The available data include only the multi-model mean value (not the range), which should be interpreted as the direction of projected change rather than the actual expected value.

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APPENDIX G: ECONOMIC ANALYSIS OF NATURAL HAZARD MITIGATION PROJECTS

This appendix was originally developed by the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Community Service Center (now the Institute for Policy Research and Engagement or IPRE) and included in many of the NHMPs that ODPR/IPRE did with local jurisdictions. It has been reviewed and accepted by the Federal Emergency Management Agency (FEMA) as a means of documenting how the prioritization of mitigation actions includes a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and associated costs. In the *2015 Sweet Home NHMP*, there is an appendix titled Principles of Benefit-Cost Analysis. Portions of that appendix have been included here.

This appendix outlines three approaches for conducting economic analyses of natural hazard mitigation projects:

- the benefit/cost analysis,
- the cost-effectiveness analysis, and
- the STAPLE/E Approach.

The appendix describes the importance of implementing mitigation activities, different approaches to economic analysis of mitigation strategies, and methods to calculate costs and benefits associated with mitigation strategies.

Information in this section is derived in part from the Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon's Office of Emergency Management, 2000), and FEMA Publication 331, *Report on Costs and Benefits of Natural Hazard Mitigation*. This section is not intended to provide a comprehensive description of benefit/cost analysis, nor is it intended to evaluate local projects. It is intended to (1) raise benefit/cost analysis as an important issue, and (2) provide some background on how economic analysis can be used to evaluate mitigation projects.

Why Evaluate Mitigation Strategies?

Mitigation actions reduce the cost of disasters by minimizing property damage, injuries, and the potential for loss of life, and by reducing emergency response costs. Evaluating possible natural hazard mitigation actions provides decision-makers with an understanding of the potential benefits and costs, as well as a basis upon which to compare alternative projects.

Evaluating mitigation projects is a complex and difficult undertaking, which is influenced by many variables such as these three:

- Natural disasters affect all segments of the communities they strike, including individuals, businesses, and public services such as fire, police, utilities, and schools.
- While some of the direct and indirect costs of disaster damages are measurable, some of the costs are non-financial and difficult to quantify in dollars.

- Many of the impacts of such events produce “ripple-effects” throughout the community, greatly increasing the disaster’s social and economic consequences.

While not easily accomplished, there is value in assessing the positive and negative impacts from mitigation actions, and obtaining an instructive benefit/cost comparison.

What are some Economic Analysis Approaches for Evaluating Mitigation Strategies?

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into three general categories: benefit/cost analysis, cost-effectiveness analysis and the STAPLE/E approach.

Benefit/Cost Analysis

Benefit/cost analysis is a key mechanism used by OEM, FEMA, and other state and federal agencies in evaluating hazard mitigation projects and is required by the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended.

Benefit/cost analysis is used in natural hazards mitigation to show if the benefits to life and property protected through the mitigation action exceed the cost of the mitigation action. A benefit/cost analysis for a mitigation action can assist communities in determining whether a project is worth undertaking now to avoid disaster-related damages later.

Benefit/cost analysis is based on calculating the frequency and severity of a hazard, avoiding future damages, and risk. In benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented. A project must have a benefit/cost ratio greater than 1 (the net benefits will exceed the net costs) to be eligible for FEMA funding.

Benefit/cost analysis is the tool that provides answers to a central question for hazard mitigation projects: **“Is it worth it?”** If hazard mitigation were free, individuals and communities would undertake mitigation with robust enthusiasm and the risks from hazards would soon be greatly reduced. Unfortunately, mitigation is not free, but often rather expensive. For a given situation, is the investment in mitigation justified? Is the owner (public or private) better off economically to accept the risk or invest now in mitigation to reduce future damages? These are hard questions to answer! Benefit-cost analysis can help a community answer these difficult questions.

Cost-Effectiveness Analysis

Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. This type of analysis, however, does not necessarily measure costs and benefits in terms of dollars. Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Investing in Public Sector Mitigation Actions

Evaluating mitigation strategies in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of who realizes them, and potentially to a large number of people and economic entities. Some benefits cannot be evaluated monetarily, but still affect the public in profound ways. Economists have developed methods to evaluate the economic feasibility of public decisions which involve a diverse set of beneficiaries and non-market benefits.

Investing in Private Sector Mitigation Actions

Private sector mitigation projects may occur on the basis of one or two approaches: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. A building or landowner, whether a private entity or a public agency, required to conform to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
- Evaluate the most feasible alternatives and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchases. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

STAPLE/E Approach

Considering detailed benefit/cost or cost-effectiveness analysis for every possible mitigation action could be time consuming and impractical. There are approaches for conducting a quick evaluation of the proposed mitigation actions which could be used to identify those that merit more detailed assessment. One of those methods is the STAPLE/E approach.

Using STAPLE/E criteria, mitigation actions can be evaluated quickly. This set of criteria requires the assessment of the mitigation actions based on the Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLE/E) constraints and opportunities of implementing the particular mitigation action in your community.

The second chapter in FEMA's *How-To Guide Developing the Mitigation Plan – Identifying Mitigation Actions and Implementation Strategies* as well as the *State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process* outline some specific considerations in analyzing each aspect. The following are suggestions for how to examine each aspect of the STAPLE/E approach from the *State of Oregon's Local Natural Hazard Mitigation Plan: An Evaluation Process*.

Social: Community development staff, local non-profit organizations, or a local planning board can help answer these questions.

- Is the proposed action socially acceptable to the community?
- Are there equity issues involved that would mean that one segment of the community is treated unfairly?
- Will the action cause social disruption?

Technical: The city or county public works staff, and building department staff can help answer these questions.

- Will the proposed action work?
- Will it create more problems than it solves?
- Does it solve a problem or only a symptom?
- Is it the most useful action in light of other community goals?

Administrative: Elected officials or the city or county administrator, can help answer these questions.

- Can the community implement the action?
- Is there someone to coordinate and lead the effort?
- Is there sufficient funding, staff, and technical support available?
- Are there ongoing administrative requirements that need to be met?

Political: Consult the mayor, city council or city board of commissioners, city or county administrator, and local planning commissions to help answer these questions.

- Is the action politically acceptable?
- Is there public support both to implement and to maintain the project?

Legal: Include legal counsel, land use planners, risk managers, and city council or county planning commission members, among others, in this discussion.

- Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
- Are there legal side effects? Could the activity be construed as a taking?
- Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action?
- Will the community be liable for action or lack of action?
- Will the activity be challenged?

Economic: Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.

- What are the costs and benefits of this action?
- Do the benefits exceed the costs?
- Are initial, maintenance, and administrative costs taken into account?
- Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private?)

- How will this action affect the fiscal capability of the community?
- What burden will this action place on the tax base or local economy?
- What are the budget and revenue effects of this activity?
- Does the action contribute to other community goals, such as capital improvements or economic development?
- What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: Watershed councils, environmental groups, land use planners and natural resource managers can help answer these questions.

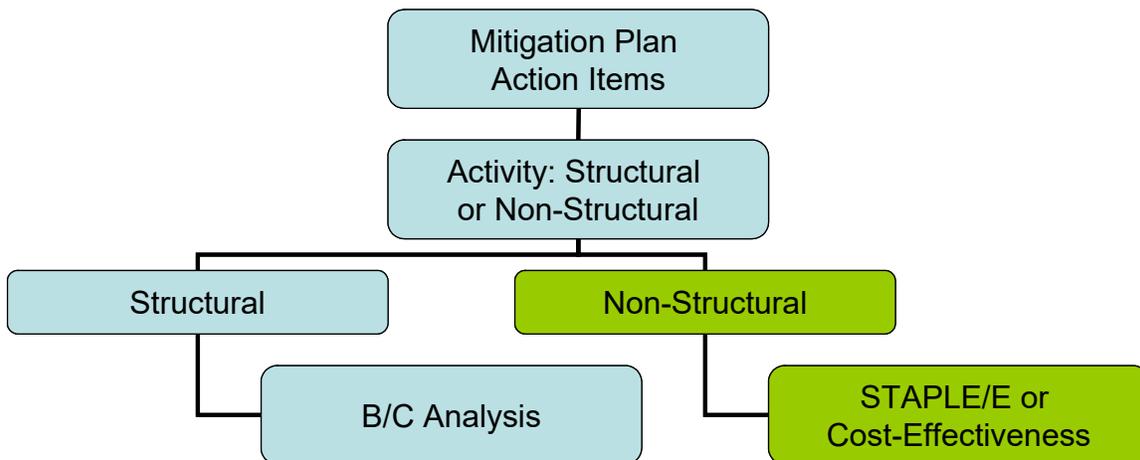
- How will the action impact the environment?
- Will the action need environmental regulatory approvals?
- Will it meet local and state regulatory requirements?
- Are endangered or threatened species likely to be affected?

The STAPLE/E approach is helpful for doing a quick analysis of mitigation projects. Most projects that seek federal funding and others often require more detailed benefit/cost analyses.

When to use the Various Approaches

It is important to realize that various funding sources require different types of economic analyses. The following figure is to serve as a guideline for when to use the various approaches.

Figure H-1 Economic Analysis Flowchart



Source: Tricia Sears, DLCDC, November 2018, based on OPDR 2005.

Implementing the Approaches

Below is a framework that could be used in further analyzing the feasibility of implementing prioritized mitigation actions after determining – through the use of one of the economic analysis approaches described above – whether or not to implement the mitigation action.

1. Identify the Activities

Activities for reducing risk from natural hazards can include structural projects to enhance disaster resistance, education and outreach, and acquisition or demolition of exposed properties, among others. Different mitigation projects can assist in minimizing risk to natural hazards but do so at varying economic costs.

2. Calculate the Costs and Benefits

Choosing economic criteria is essential to systematically calculating costs and benefits of mitigation projects and selecting the most appropriate activities. Potential economic criteria to evaluate alternatives include:

- **Determine the project cost.** This may include initial project development costs, and repair and operating costs of maintaining projects over time.
- **Estimate the benefits.** Projecting the benefits, or cash flow resulting from a project can be difficult. Expected future returns from the mitigation effort depend on the correct specification of the risk and the effectiveness of the project, which may not be well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.
- **Consider costs and benefits to society and the environment.** These are not easily measured but can be assessed through a variety of economic tools including existence value or contingent value theories. These theories provide quantitative data on the value people attribute to physical or social environments. Even without hard data, however, impacts of structural projects to the physical environment or to society should be considered when implementing mitigation projects.
- **Determine the correct discount rate.** Determination of the discount rate can just be the risk-free cost of capital, but it may include the decision-maker's time preference and also a risk premium. Including inflation should also be considered.

3. Analyze and Rank the Activities

Once costs and benefits have been quantified, economic analysis tools can rank the possible mitigation activities. Two methods for determining the best activities given varying costs and benefits include net present value and internal rate of return.

- **Net present value.** Net present value is the value of the expected future returns of an investment minus the value of the expected future cost expressed in today's dollars. If the net present value is greater than the projected costs, the project may be determined feasible for implementation. Selecting the discount rate and identifying the present and future costs and benefits of the project calculates the net present value of projects.
- **Internal rate of return.** Using the internal rate of return method to evaluate mitigation projects provides the interest rate equivalent to the dollar returns expected from the project. Once the rate has been calculated, it can be compared to rates earned by investing in alternative projects. Projects may be feasible to implement when the internal rate of return is greater than the total costs of the project. Once the mitigation projects are ranked on the basis of economic criteria, decision-makers can consider other factors, such as risk, project effectiveness, and economic, environmental, and social returns in choosing the appropriate project for implementation.

Economic Returns of Natural Hazard Mitigation

The estimation of economic returns, which accrue to building or land owners as a result of natural hazard mitigation, is difficult. Owners evaluating the economic feasibility of mitigation should consider reductions in physical damages and financial losses. A partial list follows:

- Building damages avoided,
- Content damages avoided,
- Inventory damages avoided,
- Rental income losses avoided,
- Relocation and disruption expenses avoided, and
- Proprietor's income losses avoided.

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation project and the resulting reduction in damages and losses. Equally as difficult is assessing the probability that an event will occur. The damages and losses should only include those that will be borne by the owner. The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines. This is important because most businesses depreciate assets over a period of time.

Additional Costs from Natural Hazards

Property owners should also assess changes in a broader set of factors that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic value of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices,
- Availability of resource supplies,
- Commodity and resource demand changes,
- Building and land values,

- Capital availability and interest rates,
- Availability of labor,
- Economic structure,
- Infrastructure,
- Regional exports and imports,
- Local, state, and national regulations and policies, and
- Insurance availability and rates.

Changes in the resources and industries listed above are more difficult to estimate and require models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy. Decision-makers should understand the total economic impacts of natural disasters in order to calculate the benefits of a mitigation activity. This suggests that understanding the local economy is an important first step in being able to understand the potential impacts of a disaster, and the benefits of mitigation activities.

Additional Considerations

Conducting an economic analysis for potential mitigation activities can assist decision-makers in choosing the most appropriate strategy for their community to reduce risk and prevent loss from natural hazards. Economic analysis can also save time and resources from being spent on inappropriate or unfeasible projects. Several resources and models are listed on the following page that can assist in conducting an economic analysis for natural hazard mitigation activities.

Benefit/cost analysis is complicated, and the numbers may divert attention from other important issues. It is important to consider the qualitative factors of a project associated with mitigation that cannot be evaluated economically. There are alternative approaches to implementing mitigation projects. With this in mind, opportunity rises to develop strategies that integrate natural hazard mitigation with projects related to watersheds, environmental planning, community economic development, and small business development, among others. Incorporating natural hazard mitigation with other community projects can increase the viability of project implementation.

As noted in the *2015 Sweet Home NHMP*,

Although benefit-cost analysis is a powerful tool for helping to evaluate and prioritize mitigation projects, and a requirement for all FEMA hazard mitigation grants, benefit-cost analysis should not be considered the sole determinant for mitigation actions. In some cases, the potential for negative effects from a particular natural hazard may simply be deemed unacceptable, such as the potential for deaths and injuries, and thus mitigation may be undertaken without benefit-cost analysis.

Resources

These resources were identified in the *2014 Umatilla County NHMP* with this section, and in other NHMPs during 2014-2015; these may not be widely available at this time.

CUREe Kajima Project, *Methodologies for Evaluating the Socio-Economic Consequences of Large Earthquakes*, Task 7.2 Economic Impact Analysis, Prepared by University of California, Berkeley

Team, Robert A. Olson, VSP Associates, Team Leader; John M. Eiding, G&E Engineering Systems; Kenneth A. Goettel, Goettel and Associates, Inc.; and Gerald L. Horner, Hazard Mitigation Economics Inc., 1997

Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects*, Riverine Flood, Version 1.05, Hazard Mitigation Economics, Inc., 1996

Federal Emergency Management Agency, *Report on the Costs and Benefits of Natural Hazard Mitigation*. Publication 331, 1996.

Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in the City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects* Volume V, Earthquakes, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olsen Associates, Prepared for Oregon Military Department – Office of Emergency Management, July 1999.

Interagency Hazards Mitigation Team, *State Hazard Mitigation Plan*, (Oregon State Police – Office of Emergency Management, 2000.)

Risk Management Solutions, Inc., *Development of a Standardized Earthquake Loss Estimation Methodology*, National Institute of Building Sciences, Volume I and II, 1994.

VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings*, Volumes 1 & 2, Federal Emergency management Agency, FEMA Publication Numbers 227 and 228, 1991.

VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model*, Volume 1, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

APPENDIX H: GRANT PROGRAMS AND RESOURCES

Introduction

There are numerous local, state, and federal funding sources available to support natural hazard mitigation projects and planning. The following section includes an abbreviated list of the most common funding sources and resources utilized by local jurisdictions in Oregon. Because grant programs often change, it is important to periodically review available funding sources for current guidelines and program descriptions.

Note that FEMA administers three programs that provide funding for eligible mitigation planning and projects that reduces disaster losses and protect life and property from future disaster damages. The three programs are the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) Program, and the Building Resilient Infrastructure and Communities (BRIC) (formerly the Pre-Disaster Mitigation (PDM) Program).

<https://www.fema.gov/hazard-mitigation-assistance>

Post-Disaster Federal Programs

Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP involves a paper application which is first offered to the counties with declared disasters within the past year, then becomes available statewide if funding is still available.

<http://www.fema.gov/hazard-mitigation-grant-program>

Disaster Loan Assistance

There are four types of loans available from the U.S. Small Business Administration (SBA): home and personal property loans; business physical disaster loans; economic injury loans; and military reservist injury loans. When physical disaster loans are made to homeowners and businesses following disaster declarations by the SBA, up to 20% of the loan amount can go towards specific measures taken to protect against recurring damage in similar future disasters.

<http://www.sba.gov/category/navigation-structure/loans-grants/small-business-loans/disaster-loans>

Pre-Disaster Federal Programs

Building Resilient Infrastructure and Communities (BRIC)

The Pre-Disaster Mitigation (PDM) grant transitioned to the Building Resilient Infrastructure and Communities (BRIC) program for applications in FY 2020. The Pre-Disaster Mitigation (PDM) Program provided funds to state, local, and Tribal entities for hazard mitigation planning and the implementation of mitigation projects before a disaster.

As described on FEMA’s website, “Building Resilient Infrastructure and Communities (BRIC) will support states, local communities, tribes and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards...The BRIC program guiding principles are supporting communities through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.”

The website also describes, “The Building Resilient Infrastructure and Communities (BRIC) program aims to categorically shift the federal focus away from reactive disaster spending and toward research-supported, proactive investment in community resilience. FEMA anticipates BRIC funding projects that demonstrate innovative approaches to partnerships, such as shared funding mechanisms, and/or project design. For example, an innovative project may bring multiple funding sources or in-kind resources from a range of private and public sector stakeholders or offer multiple benefits to a community in addition to the benefit of risk reduction.”

<https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities>

Flood Mitigation Assistance Program

The overall goal of the Flood Mitigation Assistance (FMA) Program is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other National Flood Insurance Program (NFIP) insurable structures. This specifically includes:

- Reducing the number of repetitively or substantially damaged structures and the associated flood insurance claims;
- Encouraging long-term, comprehensive hazard mitigation planning;
- Responding to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development activities; and
- Complementing other federal and state mitigation programs with similar, long-term mitigation goals.

<http://www.fema.gov/flood-mitigation-assistance-program>

Detailed program and application information for federal post-disaster and pre-disaster programs can be found in the *Hazard Mitigation Assistance Guidance*, dated February 27, 2015, available at: [Hazard Mitigation Assistance Guidance Feb 27, 2015 \(fema.gov\)](https://www.fema.gov/hazard-mitigation-assistance-guidance-feb-27-2015). Note that guidance regularly changes. Verify that you have the most recent edition. Flood mitigation assistance is usually offered annually; applications are submitted online. Applicants need a user profile approved by the State Hazard Mitigation Officer (SHMO), which should be garnered well before the application period opens.

For Oregon Military Department, Office of Emergency Management (OEM) grant guidance on Federal Hazard Mitigation Assistance, visit:

<https://www.oregon.gov/OEM/emresources/Grants/Pages/HMA.aspx>

Contact: Amie Bashant, State Hazard Mitigation Officer (SHMO), amie.bashant@state.or.us

State Programs

State Preparedness and Incident Response Equipment (SPIRE)

Oregon House Bill 2687 became effective in August 2017. It established a grant program to distribute emergency preparedness equipment to local governments and other recipients to be used to decrease risk of life and property resulting from an emergency. Items purchased must qualify as capital assets, meaning individual items must cost at least \$5,000. A total of \$5,000,000 is available to procure emergency preparedness equipment to help Oregon communities prepare, respond, and recover from emergencies.

The deadline for this grant program, as listed on the OEM website, is March 1, 2019. Jim Jungling is the contact for the SPIRE program, jim.jungling@state.or.us. According to Jim Jungling, this was the only opportunity the SPIRE grant was offered. The equipment procurement and distribution should be complete by the end of 2021. It is possible that the grant could be funded again in the future by the Oregon Legislature.¹ <https://www.oregon.gov/oem/emresources/Grants/Pages/Spire.aspx>

Seismic Rehabilitation Grant Program

The Seismic Rehabilitation Grant Program (SRGP) provides state funds to strengthen public schools and emergency services buildings so they will be less damaged during an earthquake. Reducing property damage, injuries, and casualties caused by earthquakes is the goal of the SRGP.

<http://www.orinfrastructure.org/Infrastructure-Programs/Seismic-Rehab/>

Community Development Block Grant Program

The Community Development Block Grant (CDBG) Program provides annual grants on a formula basis to states, cities, and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons. The program is authorized under Title 1 of the Housing and Community Development Act of 1974, Public Law 93-383, as amended 42 U.S.C. 5301 et seq. The program was designed to reinforce several important values and principles of community development.

CDBG funds may be used for activities which include, but are not limited to:

- Acquisition of real property
- Relocation and demolition

¹Jim Jungling, Grants Coordinator, OEM, personal communication, 7/2/21.

- Rehabilitation of residential and non-residential structures
- Construction of public facilities and improvements, such as water and sewer facilities, streets, neighborhood centers, and the conversion of school buildings for eligible purposes
- Public services, within certain limits
- Activities relating to energy conservation and renewable energy resources
- Provision of assistance to profit-motivated businesses to carry out economic development and job creation/retention activities.

Each activity must meet one of the following national objectives for the program: benefit low- and moderate-income persons, prevention or elimination of slums or blight, or address community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community for which other funding is not available. Generally, the following types of activities are ineligible:

- Acquisition, construction, or reconstruction of buildings for the general conduct of government
- Political activities
- Certain income payments
- Construction of new housing (with some exceptions).

[Community Development Block Grant Program | HUD.gov / U.S. Department of Housing and Urban Development \(HUD\)](#)

Oregon Watershed Enhancement Board

The Oregon Watershed Enhancement Board is a state agency that provides grants to help Oregonians take care of local streams, rivers, wetlands, and natural areas. Community members and landowners use scientific criteria to decide jointly what needs to be done to conserve and improve rivers and natural habitat in the places where they live. OWEB grants are funded from the Oregon Lottery, federal dollars, and salmon license plate revenue. The agency is led by an 18-member citizen board drawn from the public at large, tribes, and federal and state natural resource agency boards and commissions. The mission statement is “To help protect and restore healthy watersheds and natural habitats that support thriving communities and strong economies.” There are numerous programs, grants, and technical assistance options available.

[Oregon Watershed Enhancement Board : About Us : About Us : State of Oregon](#)

[Oregon Watershed Enhancement Board : OWEB Index : State of Oregon](#)

Federal Mitigation Programs, Activities & Initiatives

Basic & Applied Research/Development

National Earthquake Hazard Reduction Program (NEHRP), National Science Foundation

Through broad based participation, the NEHRP attempts to mitigate the effects of earthquakes. Member agencies in NEHRP are the US Geological Survey (USGS), the National Science Foundation (NSF), the Federal Emergency Management Agency (FEMA), and the National Institute for Standards and Technology (NIST). The agencies focus on research and development in areas such as the science of earthquakes, earthquake performance of buildings and other structures, societal impacts, and emergency response and recovery. There are grants available. <http://www.nehrp.gov/>

Decision, Risk, and Management Science Program, National Science Foundation

Supports scientific research directed at increasing the understanding and effectiveness of decision making by individuals, groups, organizations, and society. Disciplinary and interdisciplinary research, doctoral dissertation research, and workshops are funded in the areas of judgment and decision making; decision analysis and decision aids; risk analysis, perception, and communication; societal and public policy decision making; management science and organizational design. The program also supports small grants for exploratory research of a time-critical or high-risk, potentially transformative nature. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5423

Hazard ID and Mapping

National Flood Insurance Program: Flood Mapping; FEMA

Flood maps are one tool that communities use to know which areas have the highest risk of flooding. FEMA maintains and updates data through flood maps and risk assessments. Flood insurance rate maps and flood plain management maps for all NFIP communities. <http://www.fema.gov/national-flood-insurance-program-flood-hazard-mapping>

Cooperating Technical Partners (CTP) Program

The Cooperating Technical Partners Program is an innovative approach to create partnerships between FEMA and communities participating in the NFIP. Other partners include regional and state agencies, tribes, territories and universities that have the interest and capability to become more active participants in the FEMA flood hazard mapping program. The purpose of the CTP Program is to provide, through a Cooperative Agreement, funds to ensure that partners can perform program management and technical mapping-related activities.

[Cooperating Technical Partners Program | FEMA.gov](#)

The National Map, USGS

The National Map is a suite of products and services that provide access to base geospatial information to describe the landscape of the United States and its territories. The National Map embodies 11 primary products and services and numerous applications and ancillary services. The National Map supports data download, digital and print versions of topographic maps, geospatial data services, and online viewing.

The National Map (TNM) supporting themes include boundaries, elevation, geographic names, hydrography, land cover, orthoimagery, structures, and transportation. Other types of georeferenced or mapping information can be added within TNM Viewer or brought in with TNM data into a GIS to create specific types of maps or map views and (or) to perform modeling or analyses. [The National Map \(usgs.gov\)](https://www.usgs.gov)

National Cooperative Geologic Mapping Program, USGS

The National Cooperative Geologic Mapping Program (NCGMP) is the primary source of [funds](#) for the production of geologic maps in the United States and provides accurate geologic maps and three-dimensional framework models that help to sustain and improve the quality of life and economic vitality of the Nation and to mitigate natural hazards. The National Cooperative Geologic Mapping Program (NCGMP) is the primary source of [funds](#) for the production of geologic maps in the United States and provides accurate geologic maps and three-dimensional framework models that help to sustain and improve the quality of life and economic vitality of the Nation and to mitigate natural hazards. [National Cooperative Geologic Mapping Program - About \(usgs.gov\)](#)

Soil Survey, USDA-NRCS

The Soils section is part of the National Cooperative Soil Survey, an effort of Federal and State agencies, universities, and professional societies to deliver science-based soil information. Maintains soil surveys of counties or other areas to assist with farming, conservation, mitigation or related purposes. http://soils.usda.gov/survey/printed_surveys/

Oregon Coastal Atlas

The Oregon Coastal Atlas is a multi-group project that has the ambitious goal of being a useful resource for the various audiences that make up the management constituency of the Oregon Coastal Zone. The project is a depot for traditional and digital information which can be used to inform decision-making relating to the Oregon Coastal Zone. We provide background information for different coastal systems, access to interactive mapping, online geospatial analysis tools, and direct download of various planning and natural resource data sets. <http://www.coastalatlantlas.net/>

Oregon Geospatial Data Clearinghouse

Hosted by the Oregon Geospatial Enterprise Office, this is an electronic library of Oregon geographic information including Geographic Information System (GIS) data, orthophotography, Digital Elevation Models, and more. The Geospatial Enterprise Office (GEO) coordinates with government agencies to develop and manage geographic information. It communicates about Geographic Information Systems (GIS) issues with users. It guides development of Oregon's GIS data standards. Working together, state, federal, and local governments are improving the geographic information they share. GEO is also the State's point of contact for other organizations about geographic information and GIS. GEO also hosts the Oregon Geospatial Data Clearinghouse, an electronic library of geographic information. <http://www.oregon.gov/DAS/CIO/GEO/Pages/sdlibrary.aspx>

Oregon Explorer

The Oregon Explorer – maintained by the Institute for Natural Resources at Oregon State – provides several portals developed to provide background information about many topics relevant to Oregon natural hazards. Tools include the Hazards Reporter, an interactive map viewer created to provide

current detailed information for hazards such as flood, tsunami, earthquake, volcano, and landslides for a variety of users including planners.

<http://oregonexplorer.info/hazards/OregonsNaturalHazards>

Oregon HazVu: Statewide Geohazards Viewer

HazVu provides a way to view many different geohazards in Oregon. You can enter the address for your home, school, business, or public buildings in your area to see what hazards might affect you. You can print the map you create. Geohazards include 100-year flooding; Cascadia Subduction Zone earthquake shaking and tsunami; coastal erosion; volcano; landslide; active faults; earthquake soft soil; and more. Assets include state-owned/leased facilities and public buildings such as schools, police and fire stations, and hospitals, as well as links to seismic assessment reports for these public buildings. <https://www.oregongeology.org/hazvu/>

Oregon Risk MAP

Oregon is part of FEMA Region X which covers four states: Alaska, Idaho, Oregon, and Washington. FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program represents a flood hazard mapping and risk analysis process with planning and mitigation considerations woven throughout. Risk MAP involves: (1) discovering local needs, (2) mapping with better base data, and (3) working with community representatives in assessing risk and vulnerability.

Risk MAP concerns the community, making maps and information available in a way that that makes sense, is understandable, and is usable. Risk MAP is a national program to work with states, tribes, territories, and local communities to evaluate and better understand their current flood risk, as well as the actions that can be taken to mitigate and become more resilient against future risk. More details about the Risk MAP program can be found [here](#), and specific project information can be found by entering your community information into the Projects page.

<https://www.fema.gov/risk-map-region-x>

RAPTOR - Real Time Assessment and Planning Tool for Oregon

The State of Oregon initiated RAPTOR in 2010 to share information on a common operating picture (COP) as part of the US Department of Homeland Security's Virtual USA Northwest Pilot Project program. RAPTOR enables users access to live data in combination with traditional map layers to create a comprehensive picture anywhere, anytime.

RAPTOR is a web mapping application that allows users to display data from various resources onto a single map. RAPTOR supports our Emergency Operations Plan by sharing information before, during and after an event. RAPTOR allows us to develop, implement and operate data sharing with our community. RAPTOR enhances our overall readiness because as we all know, incidents do not stop at our borders. <http://www.oregon.gov/oem/emops/Pages/RAPTOR.aspx>

Project Support

Coastal Zone Management Program, NOAA.

The National Coastal Zone Management Program comprehensively addresses the nation's coastal issues through a voluntary partnership between the federal government and coastal and Great

Lakes states and territories. Authorized by the Coastal Zone Management Act of 1972, the program provides the basis for protecting, restoring, and responsibly developing our nation’s diverse coastal communities and resources.

Currently 34 coastal states participate. While state partners must follow basic requirements, the program also gives states the flexibility to design unique programs that best address their coastal challenges and regulations. By leveraging both federal and state expertise and resources, the program strengthens the capabilities of each to address coastal issues.

Provides grants for planning and implementation of non-structural coastal flood and hurricane hazard mitigation projects and coastal wetlands restoration. <https://coast.noaa.gov/czm/>

Community Development Block Grant Entitlement Communities Program, US Department of Housing and Urban Development

The Community Development Block Grant (CDBG) Entitlement Program provides annual grants on a formula basis to entitled cities and counties to develop viable urban communities by providing decent housing and a suitable living environment, and by expanding economic opportunities, principally for low- and moderate-income persons. The program is authorized under Title 1 of the Housing and Community Development Act of 1974, Public Law 93-383, as amended; 42 U.S.C.-530.1 et seq. [CDBG Entitlement Program - HUD Exchange](#)

National Cohesive Wildland Fire Management Strategy (USDA, USFS)

The Forest Service has been managing wildland fire on National Forests and Grasslands for more than 100 years. But the Forest Service doesn’t do it alone. Instead, the agency works closely with other federal, tribal, state, and local partners. Over the last few decades, the wildland fire management environment has profoundly changed. Longer fire seasons; bigger fires and more acres burned on average each year; more extreme fire behavior; and wildfire suppression operations in the wildland urban interface (WUI) have become the norm.

To address these challenges, the Forest Service and its other federal, tribal, state, and local partners have developed and are implementing a *National Cohesive Wildland Fire Management Strategy* that has three key components: Resilient Landscapes, Fire Adapted Communities, and Safe and Effective Wildfire Response. [National Cohesive Wildland Fire Management Strategy \(fs.fed.us\)](#)

Assistance to Firefighters Grant Program, FEMA

Fire safety grants fund critically needed resources to equip and train emergency personnel, enhance efficiencies, and support community resilience. Three types of grants are available: Assistance to Firefighters Grant (AFG), Fire Prevention and Safety (FP&S), and Staffing for Adequate Fire and Emergency Response (SAFER). FEMA AFG grants are awarded to fire departments to enhance their ability to protect the public and fire service personnel from fire and related hazards. Fire Prevention & Safety (FP&S) grants support projects that enhance the safety of the public and firefighters from fire and related hazards. SAFER grants fund fire departments and volunteer firefighter interest organizations directly to help them increase capacity in their communities.

<http://www.fema.gov/welcome-assistance-firefighters-grant-program>

Emergency Watershed Protection Program, USDA-NRCS

The Emergency Watershed Protection (EWP) Program, a federal emergency recovery program, helps local communities recover after a natural disaster strikes. The program offers technical and financial assistance to help local communities relieve imminent threats to life and property caused by floods, fires, windstorms and other natural disasters that impair a watershed.

The EWP Program allows communities to quickly address serious and long-lasting damages to infrastructure and to the land. The EWP Program authorities offer NRCS the flexibility to act quickly to help local communities cope with adverse impacts resulting from natural disasters. EWP does not require a disaster declaration by federal or state government officials for program assistance to begin. The NRCS State Conservationist can declare a local watershed emergency and initiate EWP program assistance in cooperation with an eligible sponsor (see the "Eligibility" section below). NRCS will not provide funding for activities undertaken by a sponsor prior to the signing of a cooperative agreement between NRCS and the sponsor.

If funding becomes available, all funded projects must demonstrate they reduce threats to life and property; be economically, environmentally and socially sound; and must be designed to acceptable engineering standards, if applicable.

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/landscape/ewpp>

Rural Development Assistance – Utilities, USDA

USDA's Rural Utilities Service (RUS) provides much-needed infrastructure or infrastructure improvements to rural communities. These include water and waste treatment, electric power, and telecommunications services. These services help to expand economic opportunities and improve the quality of life for rural residents.

<https://www.rd.usda.gov/about-rd/agencies/rural-utilities-service>

Rural Development Assistance – Housing, USDA.

USDA Rural Development Assistance (RDA) operates over fifty financial assistance programs for a variety of rural applications. Select a category that best describes your situation. The RDA program provides grants, loans, and technical assistance in addressing rehabilitation, health and safety needs in primarily low-income rural areas. Declaration of major disaster is necessary.

<https://www.rd.usda.gov/programs-services>

Public Assistance Grant Program, FEMA.

The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from major disasters or emergencies declared by the President.

<http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit>

National Flood Insurance Program, FEMA

The NFIP makes available flood insurance to residents of communities that adopt and enforce minimum floodplain management requirements. Flood insurance is available to anyone living in one of the 23,000 participating NFIP communities. Homes and businesses in high-risk flood areas with mortgages from government-backed lenders are required to have flood insurance.

<http://www.fema.gov/national-flood-insurance-program>

HOME Investments Partnerships Program (IPP), HUD

The HOME IPP provides grants to states, local government and consortia for permanent and transitional housing (including support for property acquisition and rehabilitation) for low-income persons. HOME provides grants to state and local governments to create affordable housing for low-income households. [HOME: HOME Investment Partnerships Program - HUD Exchange](#)

Disaster Recovery Initiative, HUD

HUD provides flexible grants to help cities, counties, and states to recover from Presidentially declared disasters, especially in low-income areas, subject to the availability of supplemental appropriations. In response to Presidentially declared disasters, Congress may appropriate additional funding for the Community Development Block Grant (CDBG) Program as Disaster Recovery grants to rebuild the affected areas and provide crucial seed money to start the recovery process. Since CDBG Disaster Recovery (CDBG-DR) assistance may fund a broad range of recovery activities, HUD can help communities and neighborhoods that otherwise might not recover due to limited resources. The DRI provides grants to fund gaps in available recovery assistance after disasters (including mitigation).

[CDBG-DR: Community Development Block Grant Disaster Recovery Program - HUD Exchange](#)

Emergency Management Performance Grants, FEMA

The purpose of the Emergency Management Performance Grant (EMPG) program is to make grants available to states to assist state, local, territorial and tribal governments in preparing for all hazards, as authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.). EMPG grants help state and local governments to sustain and enhance their all-hazards emergency management programs.

[DHS: Emergency Management Performance Grant \(in.gov\)](#)

Partners for Fish and Wildlife, DOI – FWS

The Partners for Fish and Wildlife Program provides technical and financial assistance to landowners interested in restoring and enhancing wildlife habitat on their land. Projects are custom designed to meet landowners' needs. Since the program's start in 1987, some 50,000 landowners have worked with Partners staff to complete 60,000 habitat restoration projects on 6 million acres. Partners projects are voluntary. Participating landowners continue to own and manage their land to serve their needs while they improve conditions for wildlife. The PFW program provides financial and technical assistance to private landowners interested in pursuing restoration projects affecting wetlands and riparian habitats. <http://www.fws.gov/partners/>

North American Wetland Conservation Fund, DOI-FWS

NAWC fund provides cost-share grants to stimulate public/private partnerships for the protection, restoration, and management of wetland habitats. The grant funds projects for wetlands conservation in the United States, Canada, and Mexico.

<https://www.grants-gov.net/cfda.php?CFDANumber=15.623>

Federal Land Transfer / Federal Land to Parks Program, DOI-NPS

Identifies, assesses, and transfers available federal real property for acquisition for state and local parks and recreation, such as open space. The NPS's Federal Lands to Parks Program gives surplus federal land, usually at no cost, to communities for public parks and recreational areas. Surplus properties are properties held by the federal government that it no longer needs. Since its inception in 1949, this program has transferred about 178,000 acres to state and local governments.

This program exists to help communities get land from the federal government. We advocate for communities that want to acquire land and ensure those properties stay open for public recreational use and taken care of. We are engaged with every step of the process, from applying for properties to securing ownership.

[What We Do - Federal Lands to Parks Program \(U.S. National Park Service\) \(nps.gov\)](#)

Wetlands Reserve program, USDA-NCRS

The Wetlands Reserve Program (WRP) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. WRP offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

[Wetlands Reserve Program \(WRP\) | Conservation Program Maps | NRCS \(usda.gov\)](#)

Secure Rural Schools and Community Self-Determination Act of 2000, US Forest Service.

It was originally enacted in 2000 to provide five years of transitional assistance to rural counties affected by the decline in revenue from timber harvests on federal lands. Funds have been used for improvements to public schools, roads, and stewardship projects. Money is also available for maintaining infrastructure, improving the health of watersheds and ecosystems, protecting communities, and strengthening local economies. The Further Consolidated Appropriations Act, 2020, reauthorized payments for fiscal years 2019 and 2020. <http://www.fs.usda.gov/pts/>

The Oregon Climate Change Adaptation Framework

The 2010 report provides a framework for the continued development of strategies and plans to address future climate conditions in the state. It is the result of a collaborative effort between Oregon's state agencies, and with support from the Oregon Climate Change Research Institute. The 2010 report is being completely updated, through a process led by DLCD, with 24 participating agencies, in 2019-2021. The *2021 State Agency Climate Change Adaptation Framework* was published in January 2021.

https://www.oregon.gov/lcd/Publications/Climate_Change_Adaptation_Framework_2010.pdf

https://www.oregon.gov/lcd/CL/Documents/2021_Climate_Change_Adaptation_Framework_with_Blueprint.pdf

Oregon Climate Assessment Report

The Oregon State Legislature established the Oregon Climate Change Research Institute (OCCRI) within the Department of Higher Education in 2007. OCCRI is a network of over 150 researchers at Oregon State University (OSU), the University of Oregon, Portland State University, Southern Oregon University, and affiliated federal and state labs. OCCRI is administered by OSU. The *Fifth Oregon Climate Assessment Report* was released on January 5, 2021. [OCAR5.pdf | Powered by Box](#)

Oregon Health Authority (OHA)

Environmental public health works to identify, assess and report on threats to human health from exposure to environmental and occupational hazards, and advise Oregon communities on potential risks where they live, work and play to remain healthy and safe. OHA's Climate and Health Program is working with partners to study, prevent, and plan for the health effects of climate change.

The *Climate and Health Resilience Plan* offers a selection of strategies and policy priorities for state, local, and tribal public health practitioners and partners.

<http://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/CLIMATECHANGE/Pages/resilience-plan.aspx>

Oregon's *Public Health Hazard Vulnerability Assessment* summarizes public health consequences of Oregon's likely hazards based on the input from local health jurisdictions, tribal health agencies, and emergency management partners.

<http://www.oregon.gov/oha/PH/Preparedness/Partners/Documents/OHA%208584%20PH%20Hazard%20Vulnerability.pdf>

Oregon Silver Jackets

The Oregon Silver Jackets Team is a subcommittee to the State Interagency Hazard Mitigation Team. It is an interagency team dedicated to establish and strengthen intergovernmental partnerships at the state level as a catalyst in developing comprehensive and sustainable solutions to state flood hazard challenges. [Silver Jackets Website > State Teams > Oregon \(nfrmp.us\)](#)

USGS Natural Hazards

The USGS Natural Hazards Mission Area includes six science programs: Coastal & Marine Geology, Earthquake Hazards, Geomagnetism, Global Seismographic Network, Landslide Hazards, and Volcano Hazards. Through these programs, the USGS provides alerts and warnings of geologic hazards and interactive maps and data.

http://www.usgs.gov/natural_hazards/

State Interagency Hazard Mitigation Team (IHMT) website

Find IHMT meeting dates and locations, agendas, minutes and meeting materials. The State IHMT is comprised of about 18 state agencies involved with natural hazards. The State IHMT meets quarterly to understand losses arising from natural hazards, coordinate recommended strategies to mitigate loss of life, property, and natural resources, and maintain the Oregon Natural Hazards Mitigation Plan. <http://www.oregon.gov/oem/Councils-and-Committees/Pages/IHMT.aspx>

Oregon Natural Hazards Mitigation Plan (NHMP)

The Oregon NHMP identifies and prioritizes potential actions throughout Oregon that would reduce our vulnerability to natural hazards. In addition, the plan satisfies the requirements of the Federal Emergency Management Agency (FEMA) to ensure that Oregon is eligible to receive hazard mitigation and disaster assistance funds from the federal government. The current version of the plan was approved in September 2020 and is valid through September 2025. NHMPs must be updated and reapproved every five years by FEMA - so as to remain valid.

<https://www.oregon.gov/lcd/NH/Pages/Mitigation-Planning.aspx>

Oregon Department of Land Conservation and Development (DLCD) Technical Assistance (TA) Grants

DLCD's General Fund grants are used primarily for Oregon communities' comprehensive planning and plan updates. The fund is divided into functional categories and made available for specific types of projects. During 2019-2021, the categories included Population Forecasting, Technical Assistance, Columbia River Gorge National Scenic Area, Grant Young Memorial Planning Assistance, and a Dispute Resolution grant to the Oregon Consensus Program.

Grant categories have, from time to time, been designated in DLCD's budget notes, in which the Legislature gives direction on how monies should be spent that is applicable only for that particular biennium. DLCD's *2021-2023 General Fund Grants Allocation Plan* provides the guidance for DLCD's decision-making for the upcoming opportunities for DLCD Technical Assistance Grants. The TA Grants use General Fund money appropriated by the Oregon Legislature for each two-year budgetary period. As of 7/2/21, the Oregon Legislature allocation of funds for DLCD TA Grants for the 2021-2023 biennium is \$600,000 to \$700,000.²

<https://www.oregon.gov/lcd/CPU/Pages/Community-Grants.aspx>

Lindbergh Grants Program

The Lindbergh Foundation is the grant administrator. The purpose is to balance the advance of technology and the preservation of the natural human environment. It can be used for the conservation of natural resources and public outreach/education projects. Grants are awarded to specific projects as they are identified. <http://lindberghfoundation.org/>

Energy Trust of Oregon

Energy Trust of Oregon is a nonprofit organization committed to delivering clean, affordable energy to 1.7 million utility customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista, and NW Natural customers. Energy Trust can provide technical support and cash incentives for new construction projects starting at the early design stage to help identify opportunities for improving the energy performance and resilience of the building. Energy Trust also provides information, cash incentives, technical support and resources to support energy investments in existing residential, commercial, municipal, nonprofit, tribal, or institutional sites

² Gordon Howard, Community Services Division Manager, DLCD, personal communication, 7/2/21.

across the state. Energy Trust has resources to support communities who are addressing potential risks to their energy systems, including aging infrastructure, natural disasters and severe weather events. Complete this form on the website to find out how they can support your project:

<https://www.energytrust.org/communities/community-contact-us-form/> and www.energytrust.org

APPENDIX I: FEMA APPROVAL LETTER, REVIEW TOOL, AND RESOLUTIONS OF APPROVAL



FEMA

May 8, 2023

Wallowa County Commissioners
101 South River Street
Enterprise, Oregon 97828

Dear County Commissioners:

On December 14, 2022, the U.S. Department of Homeland Security’s Federal Emergency Management Agency (FEMA) Region 10, approved the Wallowa County Hazard Mitigation Plan as a multi-jurisdictional local plan as outlined in Code of Federal Regulations Title 44 Part 201. This approval provides the below jurisdictions eligibility to apply for the Robert T. Stafford Disaster Relief and Emergency Assistance Act’s, Hazard Mitigation Assistance (HMA) grants projects through December 13, 2027, through your state:

Wallowa County	City of Enterprise	Wallowa County Soil and Water Conservation District
Wallowa Lake Irrigation District	City of Lostine	

The updated list of approved jurisdictions includes the Wallowa County Soil and Water Conservation District, Wallowa Lake Irrigation District, and the City of Lostine that recently adopted the Wallowa County Hazard Mitigation Plan. FEMA individually evaluates all application requests for funding according to the specific eligibility requirements of the applicable program. Though a specific mitigation activity or project identified in the plan may meet the eligibility requirements, it may not automatically receive approval for FEMA funding under any of the programs.

Over the next five years, we encourage your communities to follow the plan’s schedule for monitoring and updating, and to develop further mitigation actions. To continue eligibility, jurisdictions must review, revise as appropriate, and resubmit the plan within five years of the original approval date.

If you have questions regarding your plan’s approval or FEMA’s mitigation grant programs, please contact Joseph Murray, Planner with Oregon Office of Emergency Management, at (503) 378-2911, who coordinates and administers these efforts for local entities.

Sincerely,

Kristen Meyers, Director
Mitigation Division

Enclosures

cc: Anna Feigum, Oregon Department of Emergency Management

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA’s evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan’s strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Wallowa County	Title of Plan: Wallowa County, Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan	Date of Plan: May 2022
Local Point of Contact: Franz Goebel	Address: 101 S. River Street, Room 105 Enterprise, Oregon 97828	
Title: Director of Planning		
Agency: Wallowa County Planning Department		
Phone Number: 541-426-4543 x 1168	E-Mail: plandir@co.wallowa.or.us	

State Reviewer: Joseph Murray	Title: Planner	Date: August 24, 2022
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FEMA Reviewer: Ellie Schwartz	Title: CERC Planner	Date: 9/09/22
Edgar Gomez	Community Planner	10/6/2022
Revisions Required		
Date Received in FEMA Region 10		
Plan Not Approved		
Plan Approvable Pending Adoption	10/6/2022	
Plan Approved	12/14/2022	

FEMA addition of resolution adoptions:
Erin Cooper, Community Planner, 03/31/2023

**SECTION 1:
REGULATION CHECKLIST**

INSTRUCTIONS: The second column of the Regulation Checklist is typically pre-completed by the local jurisdiction seeking FEMA approval; the third and fourth columns must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been ‘Met’ or ‘Not Met.’ The ‘Required Revisions’ summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is ‘Not Met.’ Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST	Location in Plan (section and/or page number)	Met	Not Met
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Acknowledgements, p. iii; Vol. I, p. 14; Vol III, Appendix B, entirety	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Vol. I, p. 14; Vol. III, Appendix B, pp. B-2 to B-4	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Vol. I, p. 14; Vol. I, pp. 57, 61-62; Vol. III, Appendix B, pp. B-2 to B-4; Vol III, Appendix B, pp 45-54	X	
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Vol I, pp. 2-3, pp. 97-101, and p. 105; throughout the Mitigation Actions and Appendix C: Mitigation Action Worksheets (this includes in particular a High Hazard Potential Dam at Wallowa Lake, Mitigation Action DF-1, p. C-58-60)	X	
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Vol. I, pp. 106-107	X	
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement §201.6(c)(4)(i))	Vol. I, pp. 105-106	X	
<u>ELEMENT A: REQUIRED REVISIONS</u>			

ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Vol. I, pp.18-56; Vol II, Wildfire: pp. WF-1 to WF-2; Poor Air Quality: pp. AQ-1 to AQ-5 Severe Weather: pp. SW-1 to SW-5 Drought: pp. DR-2 to DR-8; Insect Pests, Noxious Weeds and Invasive Species: IP-1-to IP-8; Landslide: LS-1 to IP-6; Earthquake: EQ-1 to EQ-5; Flood: FL-1 to FL-6; Dam Failure: FL-11 to FL-14, Volcanic Events: VE-1 to VE-4	X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Vol. I, p. 20, 21, 22, 23, 24, 25, 27, 28, 39, 46, 47-48, 54 and 56; Volume II, WF-10 to WF-12, AQ-7 to AQ-9, SW-5 to SW-13. DR-8 to DR-11, IP-8, LS-6 to LS-7, EQ-5 to EQ-9, FL-7 to FL-11, VE-4 to VE-6	X	
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Vol. I, pp 57-87; Vol. III, Appendix A, pp. 32-40	X	
B4. Does the Plan address (National Flood Insurance Program (NFIP) insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	There are no NFIP insured structures within Wallowa County that have been repetitively damaged by floods. Information on the NFIP program are found in Vol. 1, pp. 68-69; Vol. II, p.FL-6 to FL-7	X	
<u>ELEMENT B: REQUIRED REVISIONS</u>			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Vol. I, pp. 97-101; Multiple mitigation actions seek to expand and improve upon existing policies, plans or programs.	X	
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Vol. I, pp. 68-69 and pp. 98; Vol. II, pp. FL-6 to FL-7	X	
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Vol. I, p. 88	X	
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Vol. I, pp. 89-95; Vol. III, Appendix C, entirety	X	
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by	Vol. I, pp. 102-104; Vol. III, Appendix G, entirety	X	

each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))			
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Vol. I, pp. 90-95 identifies Lead Agencies and Partners for each action; Vol. I pp.105; Vol. III, Appendix C, entirety, identifies processes of integration into relevant planning mechanisms and plans	X	
<u>ELEMENT C: REQUIRED REVISIONS</u>			
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Vol. I, pp. 3, 18, 57, and 89; Vol. III, Appendix A, pp. A-18 and A-42	X	
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Vol. I, pp. 89-96	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Vol. I, pp. 88-89, 96; Vol. III, Appendix C, entirety	X	
<u>ELEMENT D: REQUIRED REVISIONS</u>			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	To be added upon adoption.	X	
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Vol. I, p. ix, 103; Vol. III, Appendix I, entirety		X
<u>ELEMENT E: REQUIRED REVISIONS</u>			
OPTIONAL: HIGH HAZARD POTENTIAL DAM (HHPD) RISKS			
HHPD1. Did Element A4 (planning process) describe the incorporation of existing plans, studies, reports, and technical information for high hazard potential dams?	Vol. I, pp.10-11; p. 99; Vol. III, Appendix C, pp. C-58 to C-60	X	
HHPD2. Did Element B3 (risk assessment) address HHPDs?	Vol. I, pp. 54-55, and pp.60-61	X	
HHPD3. Did Element C3 (mitigation goals) include mitigation goals to reduce long-term vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?	Vol. I, p. 88	X	
HHPD4. Did Element C4-C5 (mitigation actions) address HHPDs prioritize mitigation actions to reduce vulnerabilities from high hazard potential dams that pose an unacceptable risk to the public?	Vol. I, p. 95; Vol. III, Appendix C, pp. C-61 to C-64	X	
<u>REQUIRED REVISIONS</u>			

**ELEMENT F. ADDITIONAL STATE
REQUIREMENTS (OPTIONAL FOR STATE
REVIEWERS ONLY; NOT TO BE COMPLETED BY
FEMA)**

The State of Oregon imposes no additional requirements upon local mitigation plans.

SECTION 2: PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. *The Plan Assessment must be completed by FEMA.* The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

Plan Strengths

- A1 – The plan contains all the required documentation of the planning process. The plan lists the jurisdictions that took part. It lists who represented each community. It also identifies which jurisdictions took part in which meetings and activities during the process.
- A3 – The planning team incorporated public feedback in several ways. This gives the public a variety of chances to add to the planning process. These opportunities included a conservation district newsletter, county webpage and public survey. Survey questions and responses are in Appendix B.
- A6 – The plan describes a plan update toolkit that the Implementation Committee will use to review and update the NHMP. This toolkit is very thorough; it is a great way to keep up with the mitigation strategy's progress.

Opportunities for Improvement

- A2 – The plan does not identify any participating neighboring communities other than tribal nations, which did not choose to take part directly. In the future, the plan should reach out to more neighboring communities and relevant agencies. It should also explain who represented these entities and how they were invited to participate.
- A3 – The plan lists all of the survey questions and responses in the appendix. The plan could describe in more detail how the planning process and strategy development included public input. This would help show that the public was integral to the planning process.
- A6 – The plan does not explicitly state the process to monitor and evaluate the plan's progress. In the future, identify how, when, and by whom the plan will be monitored and evaluated. Monitoring means tracking the execution of the plan over time. Evaluating means assessing how effective the plan is at achieving its stated purpose and goals.

Element B: Hazard Identification and Risk Assessment

Plan Strengths

- B1 – The inclusion of maps in the hazard profiles for wildfire, earthquake and landslide helps show location, extent and history of the hazards. Landslide LiDAR imagery for each jurisdiction helps show differences in spatial vulnerability within the county. The use of FIRMs and SFHA maps to demonstrate flood risk shows that the jurisdictions are sufficiently involved in floodplain management programs.
- B2 – Most of the hazard profiles include historical hazard events as recent as 2021. Recent hazard trends will help to accurately predict the probability of future hazard events in the region.
- B2 – The plan incorporates future conditions into the hazard probability assessment. It uses the Oregon Climate Change Research Institute's Fifth Oregon Climate Assessment to assess future wildfire, extreme heat, drought and flood risk. Assessing how climate change affects hazard risk is above and beyond the requirements of a mitigation plan. It will be useful for future planning.
- B3 – The community vulnerability assessment discusses the specific vulnerabilities of certain groups of people, such as the elderly; people with disabilities; those located in isolated areas; and short-term visitors. This section highlights the importance of equitable hazard mitigation; different groups may experience hazards differently within the county. The population assessment further highlights the differences in people's vulnerabilities. It also recognizes veterans, children and low-income residents as socially vulnerable to hazards. Knowing the social vulnerabilities of a community's residents is a key step in an equitable mitigation planning process.
- B3 – The plan describes the vulnerability of the county's economy, environment, and critical facilities and infrastructure. Vulnerable critical facilities are analyzed by their risk of flood, wildfire, landslide and

earthquake via an Oregon Department of Geology and Mineral Industries risk report. This level of analysis will help the communities better mitigate and adapt to future conditions.

Opportunities for Improvement

Element C: Mitigation Strategy

Plan Strengths

- C1 – The plan thoroughly describes the county’s and cities’ capabilities and how they can assist the mitigation strategy. Appendix A, Community Profile, further explains how capabilities can be used for mitigation.
- C4 – The mitigation strategy has a wide range of actions that address each of the identified hazards. The actions cover both structural and non-structural mitigation. They also cover public education, regulation, data collection and analysis, and training. The mitigation action worksheets provide a high level of detail; each jurisdiction has at least one action.
- C6 – The plan describes how the strategy will be integrated into other planning mechanisms. These mechanisms include a wide range of programs, including comprehensive land use plans; community wildfire protection plans; natural resource management and conservation plans; continuity of operations plans; and emergency operations plans. The plan’s action worksheets also contain a section for aligning the mitigation actions to an existing planning mechanism.

Opportunities for Improvement

- C1 – The plan contains several mitigation actions that seek to expand or improve capabilities. However, the capabilities section of the plan does not document how to expand or improve the programs. In future plan updates, please discuss how to expand capabilities. Reference any mitigation actions that serve to improve capabilities.
- C6 – The plan does not describe each jurisdiction’s process to integrate the mitigation strategy into the planning mechanisms. However, it does identify what mechanisms may be used to carry out mitigation activities for jurisdiction-specific actions.

Element D: Plan Update, Evaluation, and Implementation (Plan Updates Only)

Plan Strengths

- D1 – The hazard annexes have thorough discussions on how changes in development have affected the region’s vulnerability to some of the hazards, like wildfire, landslide and flooding. These discussions include past and potential future development within the county. The community profile discusses urban and rural growth patterns in the region. It also analyzes how these changes affect their general hazard risk.
- D3 – The plan states that the planning team garnered public input to determine any changes in priorities that would help to create goals and actions. Incorporating public feedback here is a great way to capture the communities’ changing needs and risks.

Opportunities for Improvement

- D2 – The plan lists all of the previous mitigation actions and identifies their status as of the update. The plan does not explain why some of the actions were removed. The plan generally states that actions were removed due to resource constraints or other factors. In the future explain the removal of each previous action. If the action is no longer a priority, please state this.

B. Resources for Implementing Your Approved Plan

- **[Funding Resources](#)**

This comprehensive FEMA website provides a list of resources and information on key elements of the **Building Resilient Infrastructure and Communities (BRIC)** program. [Resource List for the BRIC Grant Program | FEMA.gov](#)

The **Region 10 Wildfire Mitigation Funding Opportunity Guides** provide state, tribes, and local officials with a wide range of application development resources for hazard mitigation grants. [Mitigation Funding Opportunity Guides | FEMA.gov](#)

This factsheet provides information on **[Planning related activities from the Hazard Mitigation Grant Program \(HMGP\)](#)**. State, Tribal, and/or local governments may use planning-related funding to reduce risk and include hazard mitigation with planning. Take a look at this guide for information on what types of mitigation activities may help you implement your projects.

Rehabilitation Of High Hazard Potential Dam (HHPD) Grant Program: The President signed the [Water Infrastructure Improvements for the Nation Act](#) or the “WIIN Act,” on December 16, 2016, which adds a new grant program under FEMA’s National Dam Safety Program ([33 U.S.C. 467f](#)). Section 5006 of the Act, Rehabilitation of High Hazard Potential Dams, provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. High Hazard Potential is a classification standard for any dam whose failure or mis-operation will cause loss of human life and significant property destruction. Learn more at - <https://www.fema.gov/emergency-managers/risk-management/dam-safety/grants>

- **[Plan Integration Resources](#)**

The **Region 10 Coffee Break Webinar on Integrating Natural Hazard Mitigation into Comprehensive Planning** is a resource specific to Region 10 states and provides examples of how communities are integrating natural hazard mitigation strategies into comprehensive planning. You can find it on FEMA’s youtube page at [Integrating Natural Hazard Mitigation Plans into Local Planning - YouTube](#) along with our other Mitigation Planning coffee break series webinars at [Natural Hazards Mitigation Planning Coffee Break Series - YouTube](#)

Plan Integration: Linking Local Planning Efforts (2015)- This step-by-step guide helps communities review local plans for possible integration and improve alignment efforts, including interagency coordination. [Plan Integration: Linking Local Planning Efforts](#) (2015)

The **Mitigation Planning and Community Rating System Bulletin** provides an overview of how to bring together planning efforts between the Community Rating System (CRS) and hazard mitigation plans. [Mitigation Planning and the Community Rating System: Key Topics Bulletin \(fema.gov\)](#)

- **[Mitigation Ideas/Best Practice Resources](#)**

The **Region 10 Seismic Mitigation Showcase Guides** highlight mitigation successes in earthquake and tsunami mitigation by documenting specific locations and communities, the decision-making process, path to funding, and how partnerships were developed. [Seismic Mitigation Showcase Guides | FEMA.gov](#)

The **Mitigation Ideas: A Resource for Reducing Risk from Natural Hazards** resource presents ideas for how to mitigate the impacts of different natural hazards, from drought and sea level rise, to severe winter weather and wildfire. The document also includes ideas for actions that communities can take to reduce risk to multiple hazards, such as incorporating a hazard risk assessment into the local development review process. You can find it in the FEMA Library at [Mitigation Ideas \(fema.gov\)](https://www.fema.gov/mitigation-ideas)

The **Local Mitigation Planning Handbook** provides guidance to local governments on developing or updating hazard mitigation plans to meet and go above the requirements. You can find it in the FEMA Library at [Local Mitigation Planning Handbook \(fema.gov\)](https://www.fema.gov/local-mitigation-planning-handbook).

The FEMA Region 10 **Risk Mapping, Analysis, and Planning program (Risk MAP)** releases a monthly newsletter that includes information about upcoming events and training opportunities, as well as hazard and risk related news from around the Region. Past newsletters can be viewed at [Newsletter \(starr-team.com\)](https://www.starr-team.com/newsletter) If you would like to receive future newsletters, email rxnewsletter@starr-team.com and ask to be included.

This Post Disaster Redevelopment Guide has guidance on how to integrate risk reduction strategies into existing local plans, policies, codes, and programs for community development or redevelopment patterns. [Planning for Post-Disaster Redevelopment \(fema.gov\)](https://www.fema.gov/planning-for-post-disaster-redevelopment)

The mitigation strategy may include eligible projects to be funded through FEMA's hazard mitigation grant programs (Building Resilient Infrastructure and Communities (BRIC), Hazard Mitigation Grant Program, and Flood Mitigation Assistance). Contact your State Hazard Mitigation Officer, Anna Feigum at anna.r.feigum@oem.oregon.gov, for more information.

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were ‘Met’ or ‘Not Met,’ and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

Line Number	Multi-Jurisdiction		Summary Sheet				Requirements:					F. State Requirements
	Jurisdiction Name	Jurisdiction Type (city/borough/township/village, etc.)	Plan Point of Contact	Mailing Address	Email	Phone	A. Planning Process	B. Hazard Identification and Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation and Implementation	E. Plan Adoption	
1	Wallowa County	County	Franz Goebel, Planning Director	101 S. River Street, Ste 105, Enterprise, OR 97828	plandir@co.wallowa.or.us	541-426-7768	X	X	X	X	X	
2	Enterprise	City	Lacey McQuaad, City Administrator	102 E. North St., Enterprise, OR 97828	lmcquaad@enterpriseoregon.org	541-426-4196	X	X	X	X	X	
3	Lostine	City	Toni M. Clary, City Recorder	PO Box 181, 128 Highway 82, Lostine, OR 97857	lostinecityhall@frontier.com	541-569-2415	X	X	X	X	X	

4	Joseph	City	Brock Eckstein, City Administrator pro tem	201 N. Main, Joseph, OR 97846	cityadmin@josephoregon.org	541-432-3832	X	X	X	X		
5	Wallowa	City	Scott McCrea, City Council member		scott.mccrea@yahoo.com	971-226-3223	X	X	X	X		
6	Enterprise School District #21	Special District	Tom Craine, Superintendent	201 SE 4th St, Enterprise, OR 97828	tcrane@enterprise.k12.or.us	541-426-3812 x3128	X	X	X	X		
7	Joseph School District #6	Special District	Lance Homan, Superintendent	400 E William's Ave, Joseph, OR 97846	lance.homan@staff.josephcharter.org	541-432-7311 x2101	X	X	X	X		
8	Wallowa School District #12	Special District	Tamera Jones, Superintendent	P.O. Box 425, Wallowa, Oregon 97885	tsjones@wallowa.k12.or.us	541-886-2061 x4331	X	X	X	X		
9	Wallowa County Soils and Water Conservation District	Special District	Cynthia Warnock, District Manager	401 NE First St., Suite E, Enterprise, OR 97828	cynthia.a.warnock@gmail.com	541-263-3049	X	X	X	X	X	
10	Wallowa Lake Irrigation District	Special District	Dan Butterfield, President	65196 Dobbin Rd Joseph OR 97846	butterfieldfarms@live.com	541-432-6355	X	X	X	X	X	
11	Wallowa Lake County	Special District	Dave Riley,	101 South River	WLCS D@co.	541-426-7754	X	X	X	X		

	Service District		Assistant Manager	Street, Enterprise, OR 97828	wallow a.or.us							
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**BEFORE THE BOARD OF COMMISSIONERS
IN AND FOR THE COUNTY OF WALLOWA
IN AND OF THE STATE OF OREGON**

In the Matter of Adopting the updated)
Wallowa County Multi-Jurisdictional Natural)
Hazards Mitigation Plan) **RESOLUTION 2022-028**

This matter came before the Board of Commissioners for Wallowa County, Oregon, on the 7th day of December, 2022. The Board finds as follows:

1. Natural hazards threaten life, businesses, property, and environmental systems throughout Wallowa County.
2. An understanding of the nature, extent, and potential impacts of natural hazards is the foundation for developing strategies to reduce or eliminate those impacts.
3. Natural hazards mitigation planning is the process through which such understanding and strategies are developed and a process for implementation is established throughout Wallowa County.
4. It is in the interest of Wallowa County and the cities and special districts located therein to undertake natural hazards mitigation planning and implementation together as coordinated planning strengthens communities and better serves all.
5. Wallowa County, Baker County, Union County, and Grant County previously prepared, implemented, and updated a regional multi-jurisdictional natural hazards mitigation plan in accordance with the Disaster Mitigation Act of 2000. This plan, and the subsequent update, were approved by the Federal Emergency Management Agency (FEMA) for a period of five years.
6. The 2014 Update to the 2007 Northeast Oregon Regional Natural Hazard Mitigation Plan is the most recent and expired on June 16, 2019.
7. Having a natural hazards mitigation plan developed in accordance with the Disaster Mitigation Act of 2000 and approved by FEMA is a prerequisite for local government eligibility for certain federal pre- and post-disaster mitigation funds.
8. Wallowa County, the Cities of Wallowa, Lostine, Enterprise and Joseph and other entities listed in the Plan, each participated in an update to the 2014 Northeast Oregon Regional Natural Hazard Mitigation Plan on sections pertaining to Wallowa County, in accordance with the Disaster Mitigation Act of 2000. The updated plan now addresses only those lands and jurisdictions within the boundary of Wallowa County and does not include

Baker, Grant, and Union Counties. The updated plan was retitled the Wallowa County, Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan.

9. As a result of coordinated planning, the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is an integrated plan, without an individual addendum for each participating jurisdiction but with the necessary information for each.
10. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is required for FEMA approval of the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan and restored eligibility for certain federal pre- and post-disaster mitigation funds.
11. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan demonstrates Wallowa County's commitment to reducing or eliminating the potential impacts of natural hazards and to achieving the Plan's goals.

NOW, THEREFORE, IT IS HEREBY RESOLVED that:

12. The Wallowa County Board of Commissioners adopts the findings set forth above in support of this resolution.
13. Wallowa County Board of Commissioners adopts the November 14, 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan, attached as Exhibit 1.

DONE AND DATED this 7th day of December, 2022.

WALLOWA COUNTY BOARD OF COMMISSIONERS


Commissioner Susan Roberts

Absent
Commissioner Todd Nash


Commissioner John Hillock


Attest: Tera Elliott, Exec. Asst

Resolution 2022-028 Exhibit 1 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan may be viewed at:

<https://co.wallowa.or.us/community-development/land-use-planning/natural-hazards-mitigation-plan/>



102 E. North St.
Enterprise, OR 97828

(541) 426-4196
Fax: (541) 426-3395
www.enterpriseoregon.org

RESOLUTION NO. 682

A RESOLUTION ADOPTING THE 2022 WALLOWA COUNTY MULTI-JURISDICTIONAL NATURAL HAZARDS MITIGATION PLAN

WHEREAS, natural hazards threaten life, businesses, property, and environmental systems in the City of Enterprise and throughout Wallowa County.

WHEREAS, an understanding of the nature, extent, and potential impacts of natural hazards is the foundation for developing strategies to reduce or eliminate those impacts.

WHEREAS, natural hazards mitigation planning is the process through which such understanding and strategies are developed and a process for implementation is established in the City of Enterprise and throughout Wallowa County.

WHEREAS, it is in the interest of Wallowa County and the cities and special districts located therein to undertake natural hazards mitigation planning and implementation together as coordinated planning strengthens communities and better serves all.

WHEREAS, having a natural hazards mitigation plan developed in accordance with the Disaster Mitigation Act of 2000 and approved by FEMA is a prerequisite for local government eligibility for certain federal pre- and post-disaster mitigation funds.

WHEREAS, Wallowa County, the Cities of Cities of Enterprise, Wallowa, Joseph, and Lostine each participated in completing the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan in accordance with the Disaster Mitigation Act of 2000.

WHEREAS, as a result of coordinated planning, the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is an integrated plan, without an individual addendum for each participating jurisdiction but with the necessary information for each.

WHEREAS, adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is required for FEMA approval of the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan and restored eligibility for certain federal pre- and post-disaster mitigation funds.

WHEREAS, adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan demonstrates the City of Enterprise's commitment to reducing or eliminating the potential impacts of natural hazards and to achieving the Plan's goals.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY OF ENTERPRISE:

Section 1. The City of Enterprise City Council hereby adopts the recitals above in support of this resolution.

Section 2. The City of Enterprise City Council hereby adopts the Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan.

DATED this 14th day of November 2022.

Handwritten signature of Ashley R. Sullivan in black ink, written over a horizontal line.

Ashley Sullivan, Mayor

ATTEST:

Handwritten signature of Lacey McQuead in black ink, written over a horizontal line.

Lacey McQuead, Administrator/Recorder



Wallowa Soil & Water Conservation District

401 NE 1st Street, Suite E

Enterprise, Oregon 97828

541 263-3049

**Resolution of the Wallowa Soil and Water Conservation District
Resolution # 2022-1**

A Resolution of Adopting the updated Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan

Whereas:

1. Natural hazards threaten life, businesses, property, and environmental systems throughout Wallowa County.
2. An understanding of the nature, extent, and potential impacts of natural hazards is the foundation for developing strategies to reduce or eliminate those impacts.
3. Natural hazards mitigation planning is the process through which such understanding and strategies are developed and a process for implementation is established throughout Wallowa County.
4. It is in the interest of Wallowa County and the cities and special districts located therein to undertake natural hazards mitigation planning and implementation together as coordinated planning strengthens communities and better serves all.
5. Wallowa County, Baker County, Union County, and Grant County previously prepared, implemented, and updated a regional multi-jurisdictional natural hazards mitigation plan in accordance with the Disaster Mitigation Act of 2000. This plan, and the subsequent update, were approved by the Federal Emergency Management Agency (FEMA) for a period of five years.
6. The 2014 Update to the 2007 Northeast Oregon Regional Natural Hazard Mitigation Plan is the most recent and expired on June 16, 2019.
7. Having a natural hazards mitigation plan developed in accordance with the Disaster Mitigation Act of 2000 and approved by FEMA is a prerequisite for local government eligibility for certain federal pre- and post-disaster mitigation funds.
8. Wallowa County, Wallowa SWCD, the Cities of Wallowa, Lostine, Enterprise and Joseph and other entities listed in the Plan, each participated in an update to the 2014 Northeast Oregon Regional Natural Hazard Mitigation Plan on sections pertaining to Wallowa County, in accordance with the Disaster Mitigation Act of 2000. The updated plan now addresses only those lands and jurisdictions within the boundary of Wallowa County and does not include Baker, Grant, and Union

Counties. The updated plan was retitled the Wallowa County, Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan.

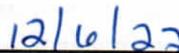
9. As a result of coordinated planning, the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is an integrated plan, without an individual addendum for each participating jurisdiction but with the necessary information for each.
10. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is required for FEMA approval of the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan and restored eligibility for certain federal pre- and post-disaster mitigation funds.
11. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan demonstrates Wallowa County's commitment to reducing or eliminating the potential impacts of natural hazards and to achieving the Plan's goals.

Be It Resolved that:

12. that the Wallowa Soil & Water Conservation District adopts the findings set forth above in support of this resolution.
13. Wallowa Soil & Water Conservation District adopts the November 14, 2022, Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan, attached as Exhibit 1.



Signature of District Chair



Date of Board Action

WALLOWA LAKE IRRIGATION DISTRICT
RESOLUTION TO ADOPT WALLOWA COUNTY MULTI-JURISDICTIONAL
NATURAL HAZARDS MITIGATION PLAN

RESOLUTION No. 03212023

WHEREAS, natural hazards threaten life, businesses, property, and environmental systems throughout Wallowa County.

WHEREAS, understanding the nature, extent, and potential impacts of natural hazards is the foundation for developing strategies to reduce or eliminate risk to loss of life or property.

WHEREAS, natural hazards mitigation planning is the process by which long and short term strategies are developed to permanently reduce or alleviate the losses described above.

WHEREAS, it is in the interest of Wallowa Lake irrigation District (the "District") to partner with Wallowa County, cities, and other organizations, groups and special districts to undertake natural hazards mitigation planning and implementation in a coordinated effort.

WHEREAS, Wallowa County, Baker County, Union County, and Grant County previously prepared, implemented, and updated a regional multi-jurisdictional natural hazards mitigation plan in accordance with the Disaster Mitigation Act of 2000. This plan, and the subsequent update, were approved by the Federal Emergency Management Agency (FEMA) for a period of five years.

WHEREAS, the 2014 update to the 2007 Northeast Oregon Regional Natural Hazard Mitigation Plan is the most recent plan, which expired on June 16, 2019.

WHEREAS, having a natural hazards mitigation plan developed in accordance with the Disaster Mitigation Act of 2000 and approved by FEMA is a prerequisite for local government eligibility for certain federal pre-disaster and post-disaster mitigation funds.

WHEREAS, the District, Wallowa County, the Cities of Wallowa, Lostine, Enterprise and Joseph and other entities listed in the plan, each participated in an update to the 2014 Northeast Oregon Regional Natural Hazard Mitigation Plan on sections pertaining to Wallowa County, in accordance with Disaster Mitigation Act of 2000. The updated plan now addresses only those lands and jurisdictions within the boundary of Wallowa County and does not include Baker, Grant, and Union Counties. The updated plan was retitled the Wallowa County, Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan.

WHEREAS, a result of coordinated planning, the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is an integrated plan, without an individual addendum for each participating jurisdiction, but with the necessary information for each.

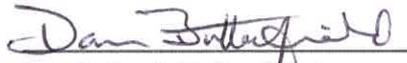
WHEREAS, adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is required for FEMA approval of the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan and restored eligibility for certain federal pre-disaster and post-disaster mitigation funds.

WHEREAS ADOPTION OF THE UPDATED 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan demonstrates the District's commitment to reducing or eliminating the potential impacts of natural hazards and to achieving the plan's goals.

IT IS HEREBY RESOLVED BY THE BOARD OF DIRECTORS OF THE DISTRICT THAT :

The District adopts the Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan with an effective date of November 11, 2022, through November 14, 2027.

ADOPTED AND APPROVED this 21 day of March, 2023, by a unanimous vote of the Board of Directors.


Dan Butterfield, President

From: [Lostine City Of](#)
To: [DANIEL Katherine * DLCD](#)
Subject: Re: Wallowa County MJ Natural Hazard Mitigation Plan approved
Date: Thursday, April 6, 2023 11:59:21 AM

Here is the resolution adopting the plan.



CITY OF LOSTINE

PO Box 181
Lostine OR 97857
541-569-2415

RESOLUTION #290

PURPOSE: Adopting the updated Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan

This matter came before the City Council for Lostine, Wallowa County, Oregon, on the 5th day of April, 2023. The Council finds as follows:

1. Natural hazards threaten life, businesses, property, and environmental systems throughout Wallowa County.
2. An understanding of the nature, extent, and potential impacts of natural hazards is the foundation for developing strategies to reduce or eliminate those impacts
3. Natural hazards mitigation planning is the process through which such understanding and strategies are developed and a process for implementation is established throughout Wallowa County.
4. It is in the interest of Wallowa County and the cities and special districts located therein to undertake natural hazards mitigation planning and implementation together as coordinated planning strengthens communities and better serves all.
5. Wallowa County, Baker County, Union County, and Grant County previously prepared, implemented, and updated a regional multi-jurisdictional natural hazards mitigation plan in accordance with the Disaster Mitigation Act of 2000. This plan, and the subsequent update, were approved by the Federal Emergency Management Agency (FEMA) for a period of five years.
6. The 2014 Update to the 2007 Northeast Oregon Regional Natural Hazard Mitigation Plan is the most recent and expired on June 16, 2019.
7. Having a natural hazards mitigation plan developed in accordance with the Disaster Mitigation Act of 2000 and approved by FEMA is a prerequisite for local government eligibility for certain federal pre- and post-disaster mitigation funds.
8. Wallowa County, the Cities of Wallowa, Lostine, Enterprise and Joseph and other entities listed in the Plan, each participated in an update to the 2014 Northeast Oregon Regional Natural Hazard Mitigation Plan on sections pertaining to Wallowa County, in accordance with the Disaster Mitigation Act of 2000. The updated plan now addresses only those lands and jurisdictions within the boundary of Wallowa County and does not include Baker, Grant, and Union Counties. The updated plan was retitled the Wallowa County, Oregon Multi-Jurisdictional Natural Hazards Mitigation Plan.
9. As a result of coordinated planning, the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is an integrated plan, without an individual addendum for each participating jurisdiction but with the necessary information for each.

City of Lostine is an Equal Opportunity Provider and Employer. Complaints should be sent to: City of Lostine, P.O. Box 181, Lostine, Oregon 97857



CITY OF LOSTINE

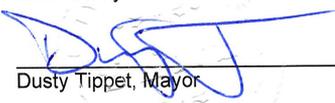
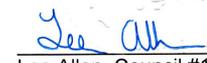
PO Box 181
Lostine OR 97857
541-569-2415

- 10. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan is required for FEMA approval of the 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan and restored eligibility for certain federal pre- and post-disaster mitigation funds.
- 11. Adoption of the updated 2022 Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan demonstrates Wallowa County's commitment to reducing or eliminating the potential impacts of natural hazards and to achieving the Plan's goals.

NOW, THEREFORE, IT IS HEREBY RESOLVED that:

- 12. The Lostine City Council adopts the findings set forth above in support of this resolution.
- 13. Lostine City Council adopts the November 14, 2022, Wallowa County Multi-Jurisdictional Natural Hazards Mitigation Plan, attached as Exhibit 1.

DATED this 5th day of April 2023.

Lostine City Council	Aye	Nay	Abstain/Absent
 _____ Dusty Tippet, Mayor	✓		/
 _____ Lee Allen, Council #1		✓	/
_____ Darci Calhoun, Council #2		✓	/
 _____ Rick Boyd, Council #3		✓	/
 _____ Daniel Wallace, Council #4		✓	/
ATTEST:  _____ Toni Clary, City Administrator			

City of Lostine is an Equal Opportunity Provider and Employer. Complaints should be sent to: City of Lostine, P.O. Box 181, Lostine, Oregon 97857

Toni M Clary

City Administrator, City of Lostine
541-569-2415 | lostinecityhall@frontier.com
cityoflostine.com