Hazard Mitigation Plan Update

Confederated Tribes of the Umatilla Indian Reservation (CTUIR)

October 12, 2021

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Section 1. Introduction

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Hazard Mitigation Plan (HMP) is a document intended to make the Umatilla Indian Reservation (UIR) more resistant to natural and human-caused hazards and more resilient in recovering from the effects of those disasters. A hazard is any situation that has the potential of causing damage to people, property, or the environment. Hazard mitigation is any action that is taken to reduce or eliminate long-term risk to human life and property.

In 2008, CTUIR completed an extensive evaluation of hazards that could impact the wellbeing of the UIR, its residents, and government facilities. The result of that evaluation was the CTUIR's first Hazard Mitigation Plan; developed with the assistance of consultants hired under a Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant.

Federally approved Hazard Mitigation Plans are effective for five years and must be maintained and updated within five-year intervals. The 2016 CTUIR Hazard Mitigation Plan that was approved by FEMA on February 27, 2016. This 2021 Plan will serve as CTUIR's updated Hazard Mitigation Plan meeting all current Federal requirements.

1.1 Why Prepare a Hazard Plan?

The purpose of the HMP is to assess the vulnerability of the UIR to hazards (risk assessment) and to identify projects or efforts that the CTUIR can take to minimize or eliminate the impacts from hazard events (mitigation).

Post disaster costs for repair and clean-up of homes, businesses, and government structures as well as community infrastructure has been steadily rising. Generally, these cost increases are expected to continue to rise due to many factors. As the community continues to grow, the costs of responding to a disaster and the process of recovering from a disaster will continue to rise even faster.

To reduce or slow the costs of responding to disasters, the concept of mitigating or taking action to reduce damages from hazards before they occur was added to the process of receiving federal grant dollars in response to a disaster. According to the United States Office of Management and Budget which serves the President of the United States, for every dollar spent on mitigating a disaster, four dollars are saved during the response and recovery phase after a disaster. In other words, it pays to implement measures that help lessen the effects of hazards that threaten an area. FEMA now requires that jurisdictions prepare hazard mitigation plans to be eligible for certain grant funds for this reason.

1.2 Robert T. Stafford Act and Disaster Mitigation Act of 2000

Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law (PL) 100-707, was signed into law November 23, 1988. This act amended the Disaster Relief Act of 1974. The Stafford Act constitutes the statutory authority for most Federal disaster response activities especially as they pertain to FEMA and FEMA programs[1].

The Disaster Mitigation Act of 2000 (DMA 2000) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the Act) by repealing the previous mitigation planning provisions (Section 409) and replacing them with a new set of mitigation plan requirements (Section 322). The current Robert T. Stafford Disaster Relief and Emergency Assistance Act was recently amended in 2013 as PL 93-288, 42 U.S.C. 5121 and emphasizes the need for state, Tribal, and local entities to closely coordinate mitigation planning and implementation efforts. This act also establishes minimum requirements for “mitigation plans” which are necessary if jurisdictions wish to be eligible for certain federal mitigation grant programs.

1.3 What Does It Mean to Be Disaster Resistant and Resilient?

Being disaster resistant means identifying which hazards present the greatest risks to people and assets and mitigating their effects as much as possible. Is it possible to be completely resistant to hazardous events? No. Certain hazards will continue to occur and cause power outages, traffic problems, disruption of daily activities and other complications. The key to being disaster resistant is keeping hazardous events from becoming disasters.

Resiliency is the ability to return to normal performance levels following a high impact/low probability disruption. Applying this notion of resiliency involves two things: mobilizing the means to reduce vulnerabilities and increasing the capacity to swiftly bounce back from major human-caused or natural disasters.

1.4 The Purpose of this Plan

The purpose of the CTUIR HMP is to:

- Analyze the natural and human-caused hazards that have the potential to cause death, injury and inflict damage to property within the current boundary of the UIR and determine the type and risks associated with each hazard analyzed;
- Provide measures that, if implemented, will prevent or minimize the effects of various hazards and help protect the people and assets within the boundaries of the Reservation;
- Satisfy the federal requirements for tribal hazard mitigation plans as stated in the 44 Code of Federal Regulations (CFR), Section 201.7 Tribal Mitigation Plans thus enabling the CTUIR to become eligible for all hazard mitigation grant programs and disaster assistance funding administered by the Federal Emergency Management Agency (FEMA);
- Provide a guide for all people living and working on the Reservation to help them make the UIR more disaster resistant and resilient and able to withstand the detrimental effects from all the natural and human-caused hazard events identified in this plan; and,
- Serve as a functional plan to implement the CTUIR Comprehensive Plan Goals and Objectives of the Public Safety Element.

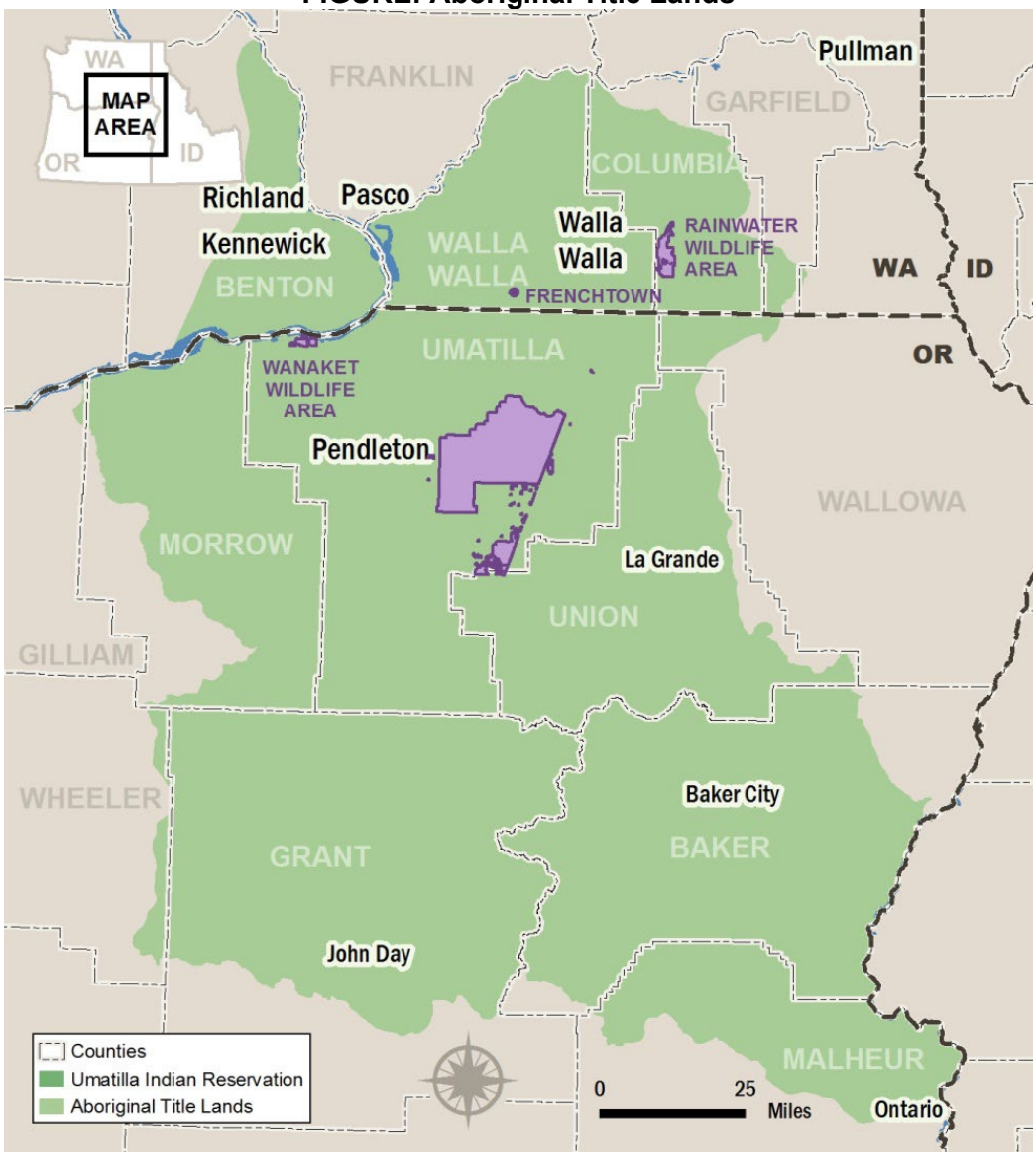
The CTUIR HMP will serve as the CTUIR Flood Mitigation Plan pursuant to 44 CFR. CTUIR assures that it will comply with Federal statutes and regulations and amend the plan when necessary to reflect changes in Tribal or Federal laws and statutes.

1.5 Scope

This single jurisdiction HMP applies to the approximately 172,000 acres of land within the "diminished boundary" of the UIR and off-Reservation trust lands, held for the CTUIR by the U.S. Department of Interior, that lie within the "aboriginal title" area. The trust lands identified as Wanaket Wildlife Area, Wanapa, and French Town, illustrated in purple on the map below, are included in this HMP. There are several small parcels of individual allotted and other trust lands within the aboriginal title area in Umatilla County that were not evaluated under this plan but are covered under the Umatilla County Natural Hazard Mitigation Plan.

CTUIR also owns substantial acreage in Columbia County, Washington known as the Rainwater Wildlife Area which is not in trust status at this time. The wildlife area was established in September 1998 when CTUIR purchased the Rainwater Ranch through Bonneville Power Administration (BPA) for purposes of fish and wildlife mitigation. In the future, when the Rainwater Wildlife Area is converted to trust status, this HMP will be amended to include those lands.

FIGURE: Aboriginal Title Lands



Goals and mitigation measures of this plan may apply to Indian Trust lands outside the aboriginal title area as they pertain to CTUIR interests including but not limited to Tribal rights to hunt, fish, and to gather food and medicines. Historically and traditionally, members of the Cayuse, Umatilla, and Walla Walla Tribes traveled beyond the aboriginal title area to hunt, fish, gather and trade. These traditional and culturally important locations have great significance today as the Tribes strive to pass on skills, stories, and knowledge generation after generation. These locations (trust, public and fee lands) outside the aboriginal title area fall under various other jurisdictions and their hazard mitigation plans which should be coordinated with the CTUIR to ensure protection of Treaty reserved rights. Today, these culturally significant places and "First Foods" are subject to hazards both natural and human-caused. The "First Foods" are also sensitive to environmental conditions including climate change.

Lands under the jurisdiction of Umatilla County surround the UIR. Umatilla County has a separate Natural Hazard Mitigation Plan, which was undergoing an update at the time of plan development, that does not address CTUIR-owned Trust lands within that jurisdiction. Therefore, these lands are included within the scope of the CTUIR Hazard Mitigation Plan to ensure that any pre-hazard mitigation measures or post-hazard assistance can be obtained for those lands.

1.6. Authority

CTUIR is comprised of the Cayuse, Walla Walla, and Umatilla Tribes, having retained the authority to self-government established in the Treaty of 1855. Through this authority, the Tribes have exercised the right to determine and plan for their future. CTUIR was formally established with the adoption of a Constitution and By-laws in 1949. The CTUIR governmental structure consists of a nine-member Board of Trustees elected by the Confederated Tribes enrolled membership (General Council).

In 1990, the Board of Trustees created a Memorandum of Understanding with Umatilla County that formally recognizes “that all land use planning and regulation of lands situated inside the boundaries of the UIR located within Umatilla County shall be administered by the CTUIR…” The Tribal Planning Office administers land use through the adopted CTUIR Comprehensive Plan, Mission Community Plan, and Land Development Code.

The CTUIR also retains certain reserved Treaty Rights regarding hunting, fishing, and gathering within a large area of aboriginal title lands surrounding the UIR. CTUIR does not have land use jurisdiction on those aboriginal title lands that it does not own but does coordinate with surrounding jurisdictions regarding impacts to these reserved Treaty Rights. This coordination also includes natural hazards. CTUIR has land use jurisdiction on lands being held in trust by the U. S. Department of Interior for the CTUIR that are located outside the diminished Reservation boundaries.

1.7. Funding

This plan was prepared by Integrated Solutions Consulting with the support and direction of the Public Safety Director and a CTUIR Planning Committee. No additional outside funding sources were used to support plan development.

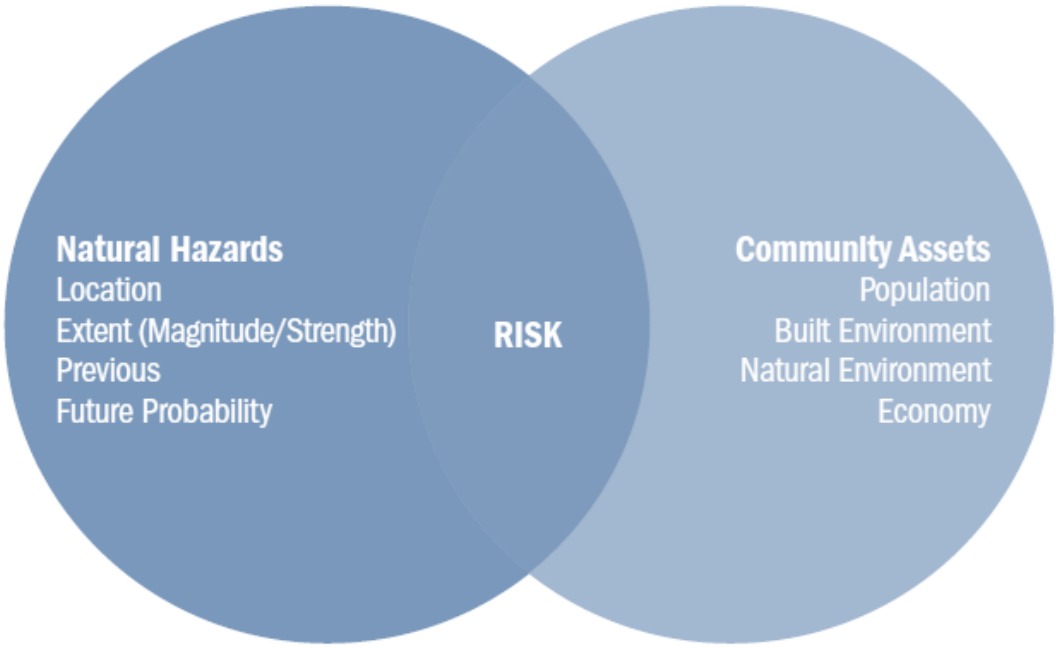
1.8. Planning Process

The 2021 CTUIR HMP update was organized into three distinct project phases, as described below. Detailed documentation of the planning process is available as **Appendix A.**

Phase 1: Risk Analysis (April – June 2021)

The planning team engaged residents, government officials, and subject matter experts to understand the unique assets in the community that should be protected, the type of hazards they face, and the risks that posed impacts on the most vulnerable assets and community members. This process is illustrated in the figure below, developed by the U.S. Geological Survey and Oregon Partnership for Disaster Resilience.

FIGURE: Risk Analysis



Note: Modified from the U.S. Geological Survey and Oregon Partnership for Disaster Resilience Models.

Phase 2: Mitigation Strategy (June – August 2021)

The planning team developed a strategy that advances shared mitigation goals identified through public involvement efforts. The strategy leveraged the community's existing plans, policies, and programs, and addressed the top priority hazards and identified risks from Phase 1. This strategy included a clear action plan that prioritized the different projects, plans, and policies that mitigate property damage and loss of life from a disaster. Each action was evaluated based on cost benefit, time frame, existing partnerships, and more.

Phase 3: Implementation & Monitoring (September 2021 through 2026)

With an action plan in hand, the planning team will work to identify local, state, and federal programs that can help advance the priority actions. The plan will be submitted to the Oregon Office of Emergency Management (OEM) and FEMA for approval, and then adopted by the CTUIR Board of Trustees. While state approval is not required for Tribal mitigation plans, their

approval allows the Tribe to seek mitigation funding managed by OEM. Every year, the planning team will meet to monitor and report on progress on identified mitigation actions. In 2026, the plan will be completely updated and submitted to FEMA for approval, continuing on a five-year cycle. Continued implementation of mitigation actions will help with steadily reducing the risks posed by hazards to our community.

Public Involvement

Residents, CTUIR members, and other community stakeholders were regularly engaged in the hazard mitigation planning process. Key roles for members of the public included:

- Shaping the mitigation goals that guide the focus of the entire plan.
- Informing priority community assets and vulnerable groups.
- Prioritizing mitigation actions for the community to implement over the life of the plan.

While neighboring communities and other community stakeholders were offered the opportunity for involvement and comment on the HMP, public involvement as defined for this plan includes the enrolled membership and employees of the CTUIR.

CTUIR invited representatives of federal and state agencies, Umatilla County, and the City of Pendleton to guide the development of the HMP and identify coordination efforts on the mitigation strategy. All stakeholders were also invited to a public meeting where the final HMP was presented. The following table summarizes efforts to involve neighboring jurisdictions and key stakeholders.

TABLE: Additional Stakeholders and Neighboring Jurisdictions

Name	Organization	Participated	Participation Details	Contact Dates
Joseph Murray Jason Gately Tim Seymour	Oregon Office of Emergency Management	Yes	OEM Plan Review Team; Participated in Mitigation Workshops	Notice of planning process (4/22); Invite to Mitigation Strategy Workshop (6/28 and 7/7); Notice of draft plan review (9/23)
Courtney Warner Crowell	Regional Solutions, Oregon Governor's Office	Yes	Participated in Mitigation Workshop	Notice of planning process (4/22); Invite to Mitigation Strategy Workshop (6/28 and 7/7)
Joshua Williams	Williams NW Pipeline	No		Invite to Mitigation Strategy Workshop (6/28 and 7/7)
Cozette Fink	Bonneville Power Authority - Tri-Cities District	No		Invite to Mitigation Strategy Workshop (6/28 and 7/7)
Thomas Roberts	Umatilla County Sheriff's Office	No		Notice of planning process (5/19); Invite to Mitigation Strategy Workshop (6/28 and 7/7); Notice of draft plan review (9/22)
Rob Corbett Julie Chase	City of Pendleton	No		Notice of planning process (5/19); Notice of draft plan review (9/22)

Public Meetings

The HMP Planning Committee leveraged monthly CTUIR general membership meetings for public involvement throughout plan development. The goal of these virtual meetings was to establish public priorities and offer opportunities to inform plan development. The focus of the first public meeting included the planning process, priority hazards, and mitigation goals. The final public meeting goal is to review the draft version of the plan and provide feedback on the mitigation strategy, specifically the priority action items. As the COVID-19 global pandemic was ongoing at the time of plan development, all meetings and public engagement were conducted virtually.

- Public Meeting #1 – Wednesday, May 27 at 2:00 PM
- Public Meeting #2 – Thursday, September 23 at 2:00 PM

No comments were received from the public as a result of either public meeting. Some participants had questions during the presentations, which were answered in real time by the planning team.

Community Preparedness Survey

In addition to public meetings, members of the public completed the Community Preparedness Survey. This survey helped to understand risk, vulnerability, and preparedness of community members. This survey was made available on Wednesday, May 19 through June 30, 2021. The survey was posted on the CTUIR Facebook page, shared online and in the monthly print newspaper the Confederated Umatilla Journal, and spread through email to all CTUIR employees. A total of 100 people completed the online survey. A complete summary of results is available as **Appendix B.**

CTUIR Hazard Mitigation Plan (HMP) Website

This public website was used to advertise HMP progress and allow for public and stakeholder participation and feedback to be shared.

CTUIR HMP Planning Committee

The HMP Planning Committee met monthly to assess plan development progress and provide feedback on key components. Two of these meetings served as “Mitigation Strategy Workshops” where additional stakeholders were invited to inform development of the mitigation strategy and action items. The goal of the virtual meetings was to find a clear action plan that prioritizes the different projects to mitigate property damage and loss of life from a disaster.

The following table provides a summary of Planning Committee and Mitigation Strategy Workshop participation.

TABLE: Planning Committee & Workshop Participation Tracking								
Name	**Role and Organization**	**Mtg.1 4/12/21**	**Mtg. 2 5/12/21**	**Mtg. 3 6/9/21**	**Mtg. 4 7/14/21**	**Mtg. 5 7/26/21**	**Mtg. 6 8/11/21**	**Mtg. 7 9/8/21**
CTUIR Planning Committee Members								
Frank Anderson	Public Works Director	X	X	X	X		X	X
Rob Burnside	Public Safety Director, HMP Project Coordinator	X	X	X	X	X	X	X
Eric Gabriel	Risk Management Quality Improvement Coordinator, Yellow Hawk Facilities Director	X						
J.R. Lieuallen	Finance Director	X	X		X			
Mason Murphy	Energy and Environmental Science Program Manager	X	X		X	X	X	X
Patty Perry	Senior Planner, Tribal Planning Manager	X	X	X	X	X		X
Stacy Schumacher	GIS Program Manager	X	X	X		X	X	X
Consultant Team								
Jacob Halley	Planner, Integrated Solutions Consulting		X	X	X	X	X	
Leah Rausch	Lead Planner, Integrated Solutions Consulting	X	X	X	X	X	X	X
Matt Stanley	Project Manager, Integrated Solutions Consulting	X	X	X	X	X	X	X
Cassandra Wolff	GIS Technician, Integrated Solutions Consulting		X	X	X		X	
Additional Stakeholders								
Joseph Murray	Mitigation Planner, Oregon Office of Emergency Management				X			
Courtney Warner Crowell	Governor's Regional Representative, Regional Solutions				X			
Caryn Appler	Energy Trust of Oregon			X	X		X	
Jeni Hall	Energy Trust of Oregon				X	X		
Colleen Sanders	Climate Change Adaptation Planner, CTUIR				X			
Paul Knox	Engineer, Akana Engineering + Design				X		X	
Erika Price	Principal Architect, Akana Engineering + Design				X			
Tim Seymour	Regional Liaison, Eastern Oregon, Oregon Office of Emergency Management					X		

Planning Process Detailed

The following section describes the six-step process of plan development in greater detail:

Preparation of the UIR Community Profile

A profile of the UIR was prepared to address topics such as the Reservation's population and economy, natural resources, disability, access, and functional needs populations, and future land use and development strategies. The information contained in the profile presents information that was useful in determining the level of risk presented by various hazards. The Oregon State Hazard Mitigation Plan, the CTUIR Hazard Mitigation Plan (2016), draft Umatilla County Natural Hazard Mitigation Plan (2021), relevant CTUIR plans, and American Community Survey/U.S. Census, and other relevant sources were used to create this profile.

Identification of UIR Critical Assets

The next step in the development of this plan involved the identification of critical assets on the UIR. A prepared list of assets important to the community was reviewed by the public during final plan review. Critical assets are described in more detail in Section 3.

Hazard Identification and Risk Assessment

The project team review survey results, plans, studies, reports, and newspapers to obtain information about various hazards that impact the UIR. This information was used to determine which natural and human-caused hazards have caused damage or have the potential to harm assets or disrupt activities on the Reservation in the future. Where possible, information on historic hazards was made specific to the UIR. For those hazards that generally affect all of Umatilla County (e.g., severe winter storms, drought, etc.), it was presumed that such hazards also affect the UIR in a similar manner. Hazards such as flooding, landslides and wildfire affect the Reservation directly and their specific affects were evaluated and considered by the Planning Committee.

The analysis of hazards was reviewed by the Planning Committee to identify which hazards present the greatest threats and which hazards present little or no actual threat to the Reservation. The analysis, contained in Section 3, categorizes all natural and human-caused hazards reviewed as high, medium, and low threats to the Reservation. Several existing studies, plans and reports were used in the development of the hazard identification and risk assessment for this plan, as cited throughout the document.

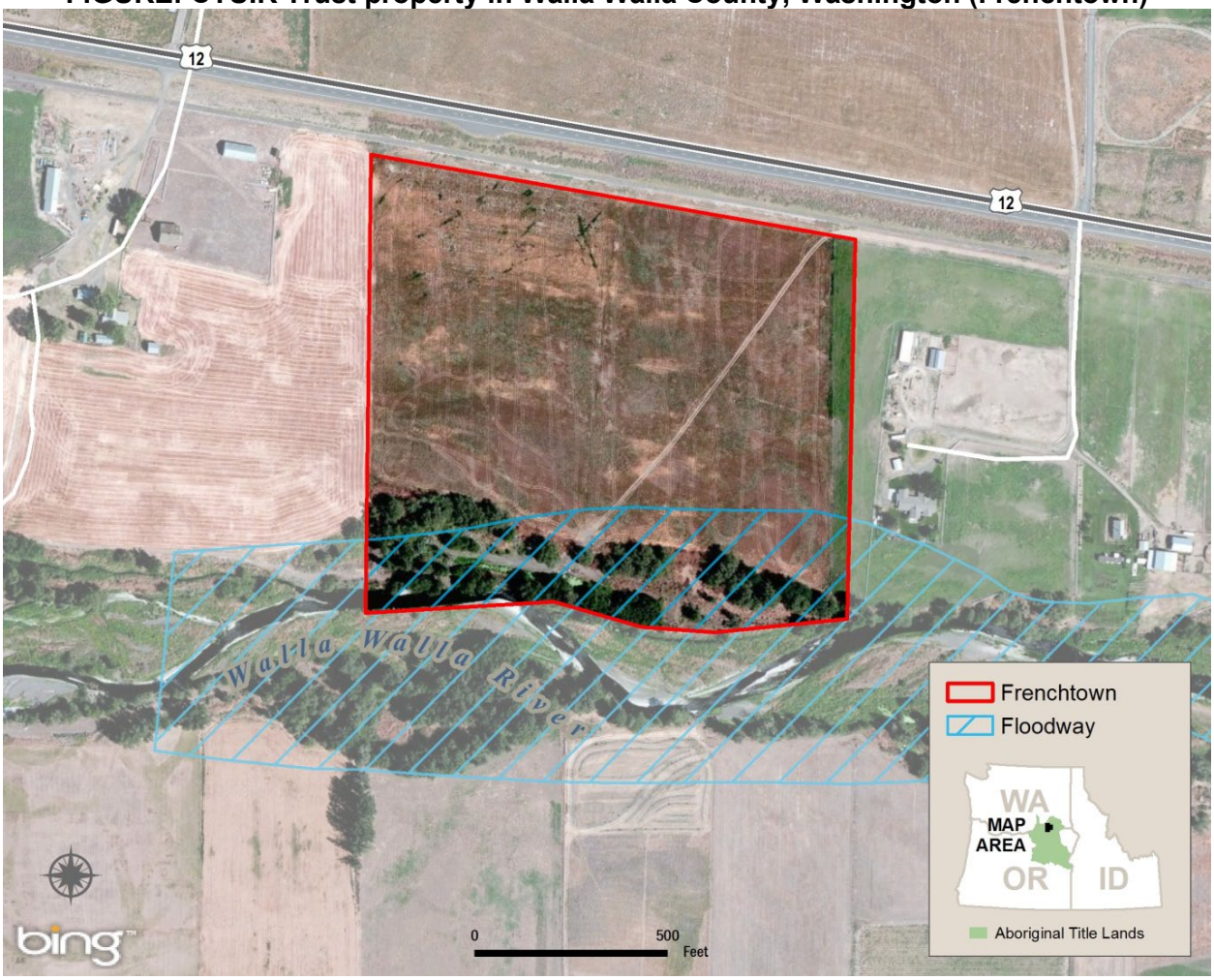
The Planning Committee then assessed the likely impacts from various hazards on CTUIR operations, human health and happiness, the local economy, critical assets, built infrastructure, and First Foods and water resources. Some hazards may not damage structures at all, but could interfere with the Tribal economy, damage natural resources, affect infrastructure and delay or prevent the delivery of services to Tribal members or other residents and visitors.

The Planning Committee reviewed the location of these lands and evaluated/assessed the hazards that could be associated with them by the same methodology used for lands and assets within the Reservation. These Aboriginal Title Area trust lands were generally included in their corresponding county jurisdictional plans although not specifically identified.

The Frenchtown property contains approximately 30 acres and is in Walla Walla County, Washington. This Tribal trust property is undeveloped and has cultural and historical significance to the CTUIR. The property is located adjacent to the Walla Walla River which flows east to west along its southern property line. An agricultural water diversion in the Walla Walla River and associated irrigation water system easement is located on this property and serves adjacent farmland. The principle natural hazard associated with this property would be flooding

and no human-caused hazards have been locally identified except as described in the Walla Walla County Hazard Mitigation Plan Risk Assessment.[2]

FIGURE: CTUIR Trust property in Walla Walla County, Washington (Frenchtown)



The Wanaket and Wanapa Tribal trust properties are located along the Columbia River in northwestern Umatilla County. Wanaket is a dedicated wildlife management area of approximately 2,768 acres. This property is undeveloped, containing many wetland areas and several ponds, except for a 165-foot Bonneville Power Association transmission line easement, which crosses Wanaket in an east-west direction parallel to and south of State Highway 730.

The Wanapa property is north of the Wanaket Wildlife Area and contains approximately 195 acres. Although currently undeveloped, the Wanapa property land use designation is industrial and will most likely be developed soon. Potential hazards that may be associated with the Wanaket and Wanapa properties are described and evaluated in the Umatilla County Hazard Mitigation Plan.

FIGURE: CTUIR Trust Property, Umatilla County, Oregon

Mitigation Strategy Development

The Planning Committee was presented with draft goals and many possible mitigation measures designed to reduce the impacts from natural and human-caused hazards that present risks to the Reservation, residents, and critical assets. The mission statement, goals, and mitigation measures from the previous 2016 CTUIR Hazard Mitigation Plan were considered and discussed, and the Committee decided to maintain the goals for the 2021 HMP. Completed mitigation measures were removed, new measures added, and all mitigation measures reprioritized using the FEMA recommended STAPLEE Method.

Through the prioritization process, Planning Committee members evaluated each mitigation measure using criteria that emphasizes the benefit and costs of projects while satisfying mitigation and disaster resilience objectives. This prioritization process is described in more detail in Section 4.

Mitigation Measure Implementation

Mitigation measures (action items) were evaluated based on the six categories of mitigation measures that can be used to reduce the impacts of identified hazards as recommended by FEMA. By coordinating the CTUIR measures with corresponding FEMA categories, the relationship of action items with FEMA funding programs is clearer. For each of the action items,

the principle internal department or program and the collaborating internal and external agencies were identified.

Additionally, the Planning Committee completed a capability assessment to describe mechanisms to successfully implement the mitigation strategy. This assessment included ongoing planning efforts, current policies and procedures, staff capability, and grant management capability, among others. The capability assessment is summarized in Section 5. Available funding for mitigation measures is included as Section 6.

Monitoring, Review and Plan Evaluation Process

Section 7 of the plan was prepared to describe the process used to monitor, review, and evaluate this Plan. It establishes the roles and responsibilities of the Public Safety Director and Planning Committee in the monitoring, review, and evaluation process as well as a schedule for the next review and Plan update.

1.9 Compliance with Federal Laws

Pursuant to 44 CFR 13.11(c), the CTUIR will continue to comply with all applicable Federal statutes and regulations during the periods for grant funds are received.

Pursuant to 44 CFR 13.11(d), the CTUIR agrees to amend the CTUIR Hazard Mitigation Plan when necessary to reflect changes in Tribal or Federal laws or statutes.

1.10 Person to Contact

The CTUIR Public Safety Director served as the HMP Project Coordinator and led the development of this Plan in collaboration with the consultant team and Planning Committee.

Rob Burnside, Director
CTUIR Public Safety Department
Email: RobBurnside@ctuir.org
Telephone: (541) 276-2126

Section 2. Profile of the Umatilla Indian Reservation

This section provides a summary of the planning area, including the Umatilla Indian Reservation and off-Reservation trust lands. The profile includes essential data that informs mitigation planning efforts, including geography, population characteristics, changes in development, planning for future development and land use, key elements of the local economy, cultural resources, and essential infrastructure to be protected.

2.1 Brief History and Governance

Adapted from the 2018 Update to the CTUIR Comprehensive Plan

The Cayuse, Umatilla, and Walla Walla Indian people form the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The Walla Walla Treaty of 1855 was negotiated at Fort Walla Walla between the United States government and the three tribes. Article 1 of the 11-article treaty established the Umatilla Indian Reservation. While the Cayuse, Umatilla, and Walla Walla people have intermingled economically, socially, and in language since the treaty was signed, there is a commitment from all three peoples to preserve the unique traditions, culture, and language representative of the people of each band.

As part of the treaty negotiations, the Cayuse, Umatilla, and Walla Walla peoples reserved the right to fish, hunt and gather food and medicines that sustain them. They also reserved the right to pasture livestock on unclaimed land. Implementing the treaty resulted in 6.4 million acres of land ceded to the United States, with a homeland of 250,000 acres reserved for the confederated tribes. The reserved area was further reduced by United States federal legislation in the 1800s to 172,000 acres.

Joined by their commitment to the land and the connection of the wellbeing of the people to the land, the tribes worked together in alliance to build a strong and resilient system of governance. The people have united to ensure their council and their leaders honor the common values of the Cayuse, Umatilla, and Walla Walla people, while maintaining mutual respect for the unique historic and cultural values of all three tribes.

Beginning in 1947, a committee of tribal members were authorized by the Tribal Council to begin researching ways to increase tribal authority over tribal affairs. In 1949, a constitution and by-laws were adopted by the Tribal Council. On December 7, 1949, the Constitution and By-Laws were endorsed by the Secretary of the Interior. This Constitution established the present tribal government known as the CTUIR. A Board of Trustees oversees policy matters and government operations through an Executive Director.

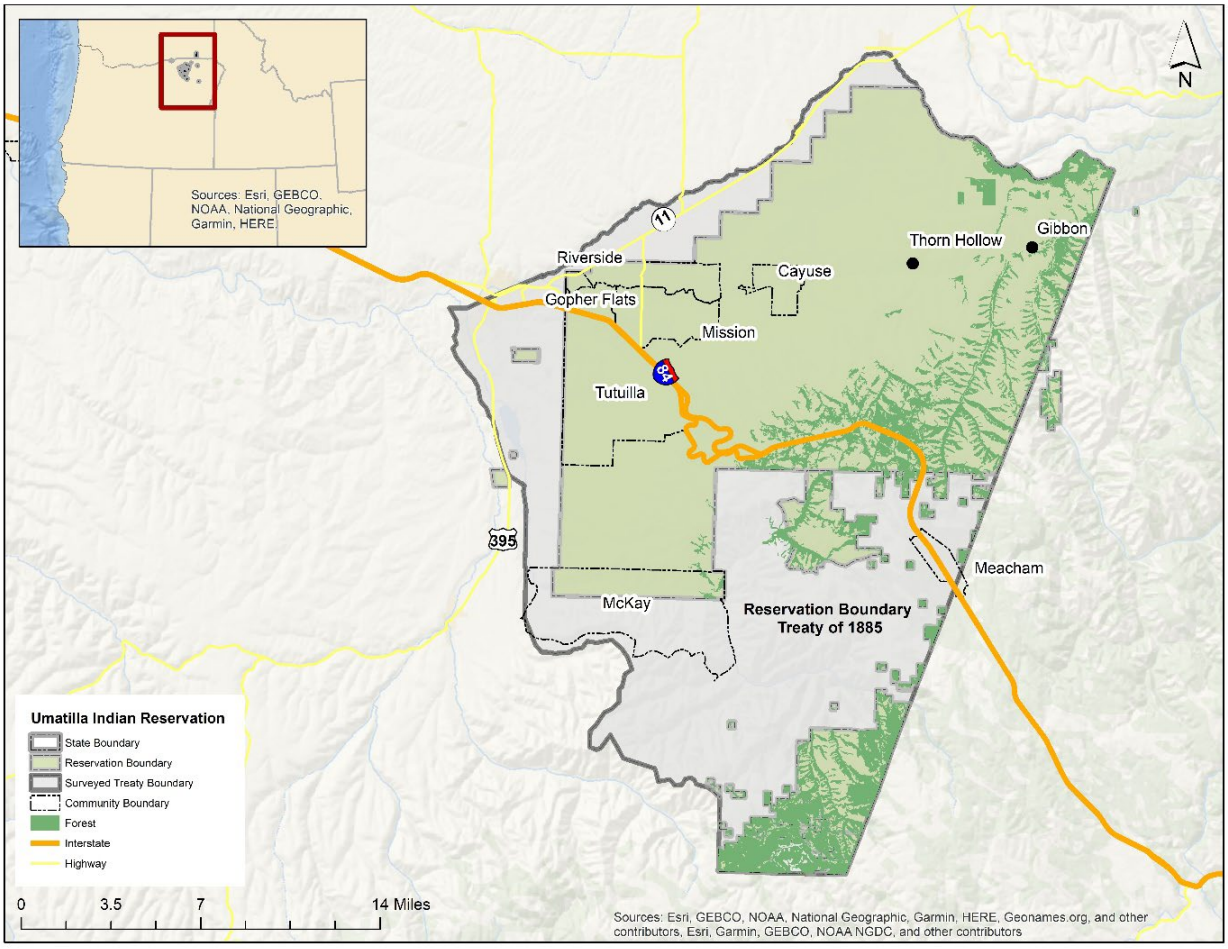
Today, the work of the Tribal government is carried out by a staff of over 450 employees working in over 16 different departments. There are an additional 1,791 employees that are also employed at CTUIR-owned enterprises: Yellowhawk Tribal Health Clinic, Wildhorse Resort and Casino, Cayuse Technologies, Arrowhead Travel Plaza, Mission Market, and Farming Enterprise. The combined total of 2,241 employees makes CTUIR government enterprise the largest source of jobs in the community.

2.2 Location

The Umatilla Indian Reservation (UIR) is in the northeastern region of Oregon and covers 172,172 acres of land. The UIR borders the jurisdictions of Umatilla County, the City of Pendleton, and federal lands managed by the Umatilla National Forest. Other cities close to the UIR are Adams, Athena, Weston, and Pilot Rock. The Reservation is situated primarily within the Umatilla River Basin and the Blue Mountains. The Tribal Governance Center is in the unincorporated community of Mission. The Umatilla River, Interstate 84, Union Pacific Railroad, and Oregon State Highway 331 are the predominant corridors that transect the Reservation. Three much smaller unincorporated communities located on the Reservation include Cayuse, Thornhollow, and Gibbon. These rural residential communities are located along the Umatilla River upriver from Mission. The UIR is encompassed by 158,00 acres just east of Pendleton and 14,000 acres in the McKay, Johnson, and McCoy Creek areas southeast of Pilot Rock. The map below provides a geographic overview of the CTUIR and its orientation to other jurisdictional boundaries.

Sited on the Columbia plateau, CTUIR lands have a diverse array of natural resources and the Tribes' connection with the land and those resources informs every element of history, culture, and community. The First Foods including water, salmon, elk, deer, cous and huckleberry have sustained the people for centuries. The ongoing commitment to preserving and maintaining access to those resources is integral to every element of public policy.

FIGURE: Umatilla Indian Reservation Map

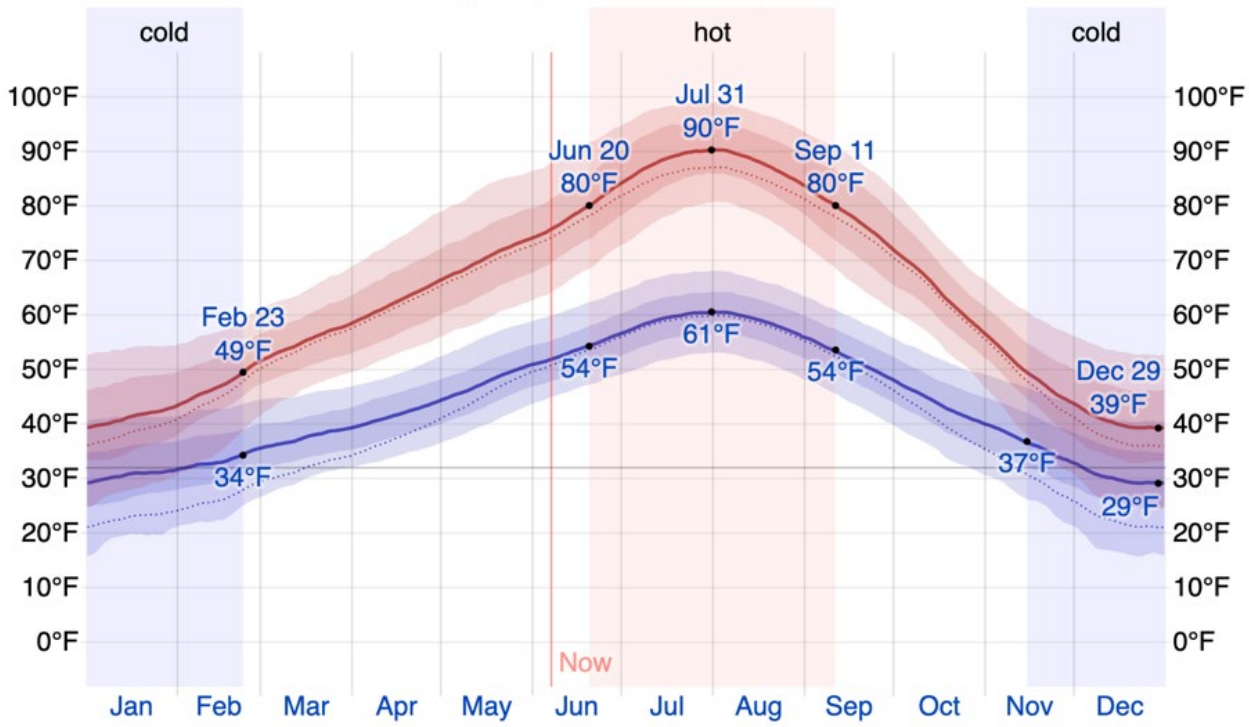


2.3 Climate and Geography

The topography of the UIR is gently rolling hills and valleys with elevations ranging from 1,120 feet above sea level at the western boundary to 4,000 feet at the eastern boundary in the Blue Mountains. Due to the elevation differences, the soil types vary from sandy loam well suited to growing alfalfa, and winter wheat to silt loam suitable for timber production.

The UIR has a semi-arid climate and is in the National Climatic Data Center's Climate Division 6. Air masses from the Pacific Ocean move across the Cascades which serve as an effective moisture barrier leaving areas to the east, including the Reservation, in a "rain shadow." In the areas around Mission where the CTUIR Governance Center is located, the summers are short, hot, dry, and mostly clear and the winters are very cold, windy, and partly cloudy. This climate supports shrub-steppe plant communities in the undisturbed areas. Over the course of the year, the temperature typically varies from 29°F to 90°F and is rarely below 16°F or above 99°F, as illustrated in the figure below.

FIGURE: Average High and Low Temperatures in Mission[3]

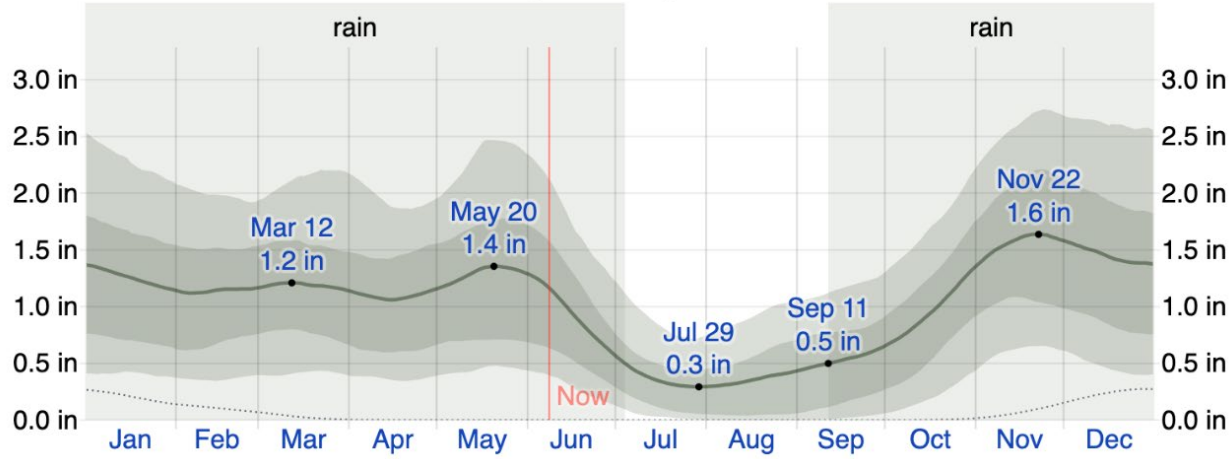


The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Precipitation in the geographical area is seasonal. Approximately 10% of the annual precipitation comes in the months of July to September. Most precipitation comes from intense Pacific storms occurring from October through April. This weather pattern supplies sufficient moisture for productive crops such as wheat, vegetables, and livestock and develops a snowpack in higher elevation areas. In years with above average winter precipitation levels, deeper snowpack at higher elevations can result in rapid melting and flooding at lower elevations during sudden warming events. The free-flowing Umatilla River, with headwaters located east of the Reservation in the Blue Mountains, flows east to west through the Reservation. Several of the river's tributaries are also subject to occasional flooding.

The figure below shows the rainfall accumulated over a sliding 31-day period centered around each day of the year to show variation within the months and not just the monthly totals. Mission experiences some seasonal variation in monthly rainfall. The rainy period of the year lasts for 9.8 months, from September 11 to July 4, with a sliding 31-day rainfall of at least 0.5 inches. The most rain falls during the 31 days centered around November 22, with an average total accumulation of 1.6 inches. The rainless period of the year lasts for 2.2 months, from July 4 to September 11. The least rain falls around July 29, with an average total accumulation of 0.3 inches.

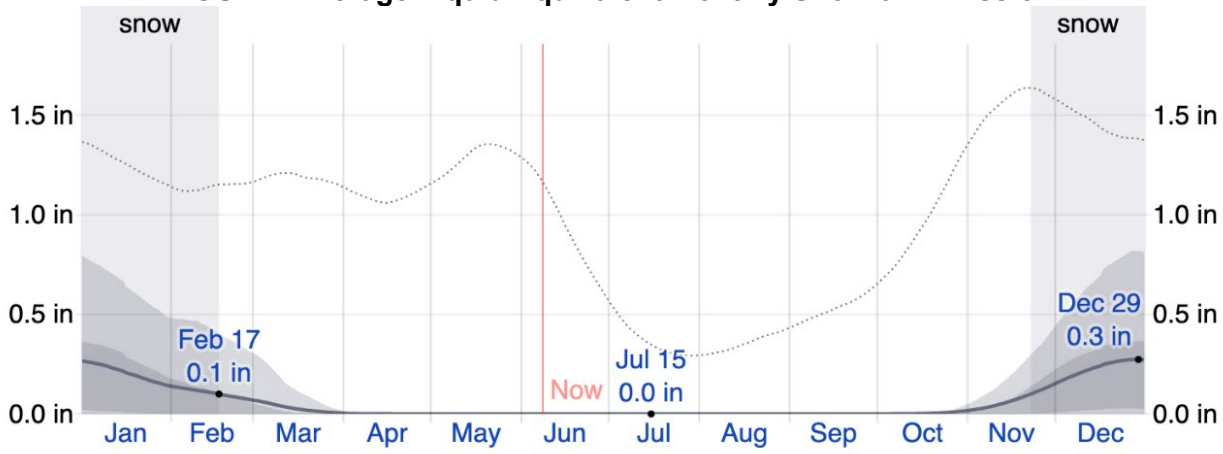
FIGURE: Average Monthly Rainfall – Mission[4]



The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average liquid-equivalent snowfall.

Snowfall is reported in liquid-equivalent terms. The actual depth of new snowfall is typically between 5 and 10 times the liquid-equivalent amount, assuming the ground is frozen. Colder, drier snow tends to be on the higher end of that range and warmer, wetter snow on the lower end. As with rainfall, the table below reflects the snowfall accumulated over a sliding 31-day period centered around each day of the year. Mission experiences some seasonal variation in monthly liquid-equivalent snowfall. The snowy period of the year lasts for 2.8 months, from November 22 to February 17, with a sliding 31-day liquid-equivalent snowfall of at least 0.1 inches. The most snow falls during the 31 days centered around December 29, with an average total liquid-equivalent accumulation of 0.3 inches. The snowless period of the year lasts for 9.2 months, from February 17 to November 22. The least snow falls around July 15, with an average total liquid-equivalent accumulation of 0.0 inches.

FIGURE: Average Liquid Equivalent Monthly Snowfall – Mission[5]



The average liquid-equivalent snowfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average rainfall.

Climate Change Planning

CTUIR has worked diligently to understand the impacts of climate change on the members way of life. Building on work that started in 2008, CTUIR completed a Climate Vulnerability and Resiliency Assessment in 2015. That assessment identifies impacts to elements of homeland security, at-risk elements identified in this Plan and Tamanwit (natural law). Understanding rising temperatures and the effects on water and the rest of the ecosystem, CTUIR undertook a whole community effort to develop an assessment of impacts. The Assessment established the prioritized list of key concerns shown in the table below and informed the ongoing development of the CTUIR Climate Adaptation Plan.

TABLE: CTUIR Vulnerability to Climate Change Key Concerns
Availability and Access to First Foods
Water
Fish
Game
Roots
Berries
Agriculture (Non-irrigated crops)
Winter Wheat
Dry land pes
Canola
Increases in Crime
Human Health
Wildfires
Heat Waves
Vector Borne Diseases
Population Dynamics
Forest Health and Welfare

The final draft of the CTUIR Climate Adaptation Plan was available online for public comment and final review during the HMP development period. The plan reflects the whole community strategies CTUIR will leverage to address the vulnerabilities affecting their prioritized list of concerns and serves as an invaluable resource in understanding the significance of the impacts that climate change could impose on the lives of the CTUIR.

Additionally, in response to the potential for the significant negative impacts of climate change on CTUIR lands and people, the draft highlights the following goals:

1. Center indigenous knowledge and environmental justice in climate crisis planning;
2. Identify, develop, and support interdisciplinary strategies to mitigate impacts from short term variability and long-term climatic shifts; and
3. Celebrate existing CTUIR adaptation strategies.

2.4 Soils

Soil types on the UIR vary, ranging from wet Xerofluvents along river and stream floodplains to the rocky outcrops of the Blue Mountains. Between these soil extremes are large expanses of silt loam soils, in the lower elevations of the Blue Mountain foothills, which are conducive to the production of grain crops and hay. The higher elevations of the Blue Mountains contain various soil associations which are conducive to Douglas Fir, ponderosa pine, and grand fir forest stands. Soils on the UIR were surveyed by the US Department of Agriculture Soil Conservation Service in 1988. This survey, *Soil Survey of Umatilla County Area, Oregon*, includes the UIR and continues to serve as the main source of information for soil identification; crop, rangeland, and woodland productivity; building suitability and sanitary facility (septic) evaluation. Survey data and soil maps have been digitized into a Geographic Information System (GIS) format.

The lower elevations of the Reservation, located in the western half, contain two core soil types that formed in loess, lacustrine sediment, and alluvium on hills, terraces, and piedmonts. Pilot Rock and McKay are the predominant soil types. Pilot Rock soils are moderately deep, well drained soils that formed in loess overlying cemented alluvium; on fan terraces. McKay soils are deep and well drained that formed in loess overlying alluvium; on fan piedmonts. These soils occur at elevations of 1,100 feet to 2,000 feet and are suitable for growing grain crops and hay.

The mid elevations also contain two core soil types that formed in loess, residuum, and colluvium on the foothills of the Blue Mountains; Gwin-Gurdane-Rockly and Gurdane-Gwiny. Both soil types are shallow to moderately deep, well-drained soils that formed on ridges and hill slopes at elevations of 2,000 feet to 4,500 feet. These soils are suitable for hay and pasture.

The higher elevation soils, located on the eastern edge of the reservation, include the Umatilla-Kahler-Gwin and Tolo-Klicker associations. These soil types are moderately deep soils that formed in loess, volcanic ash and residuum on plateaus and hills of the Blue Mountains at elevations of 3,000 feet to 5,000 feet. These forest soils are suitable for growing grand fir Douglas fir, ponderosa pine, and western larch.

The entire region is characterized by a thick sequence of flat-lying basalt flows belonging to the Miocene Columbia River Basalt Group. Individual basalt flows range in thickness from 5 to more than 100 feet and are laterally extensive. The thin zone between basalt flows is called the interflow zone. This interflow zone is where aquifers may occur, and it is characterized by vesicular and brecciated flow tops and bottoms that can store and transmit water. The basalt flow interiors, however, are typically dense and act as confining layers to aquifers. Although there may be as many as 300 basalt flows and interflow zones, very few interflow zones are aquifers. Basalt aquifers can be very permeable, allowing easy groundwater extraction; however, they also have limited storage. Recharge to basalt aquifers is thought to result from contact of the interflow zones with source waters at or near the surface or along fault avenues, aquifer mixing from leaky confining layers, or commingling of aquifers via an open well bore below casing that taps more than one aquifer. This has relevance given Umatilla County, the UIR, and much of the surrounding region are dependent on Basalt aquifers for community water supply.[6]

2.5 Population and Demographics

The American Community Survey (ACS) 2015-2019 5-Year Estimates show the current population of the UIR at 2,836. This represents a 6.3% decrease from the 2010 U.S. Census. The lack of a consistent methodology for recording Native Americans in the past few decades by the U.S. Census Bureau can present challenges in assessing the comparative data between the 2010 and 2019 data. The change in population between 1990 and 2000 was recorded at 17%, slightly less than Umatilla County's 19% change. Umatilla County's 19% change in population between 1990 and 2000 was consistent with the growth rate for the Mid-Columbia Region which includes Wasco, Sherman, Morrow, and Umatilla Counties.

The percentage of population change occurring between 2000 and 2010 was significantly less than the previous decade for both Umatilla County and the Reservation at 8% and 3%, respectively. In a broader context, population growth for this region is projected to likely grow at a slightly faster pace in the near-term (2019 to 2044) compared to the long term. Population growth is driven initially by a natural increase in the near-term and by a growing number of net in-migrants throughout the forecast.[7] Growth in Umatilla County may peripherally impact growth on the UIR. Current projections demonstrate a pattern that aligns with CTUIR goals to sustain moderate resource consumption with a focus on natural and cultural resource protection. The table below summarizes population growth between 1990 and 2019 on the UIR, Umatilla County, and Oregon as a whole.

TABLE: Population Growth[8]

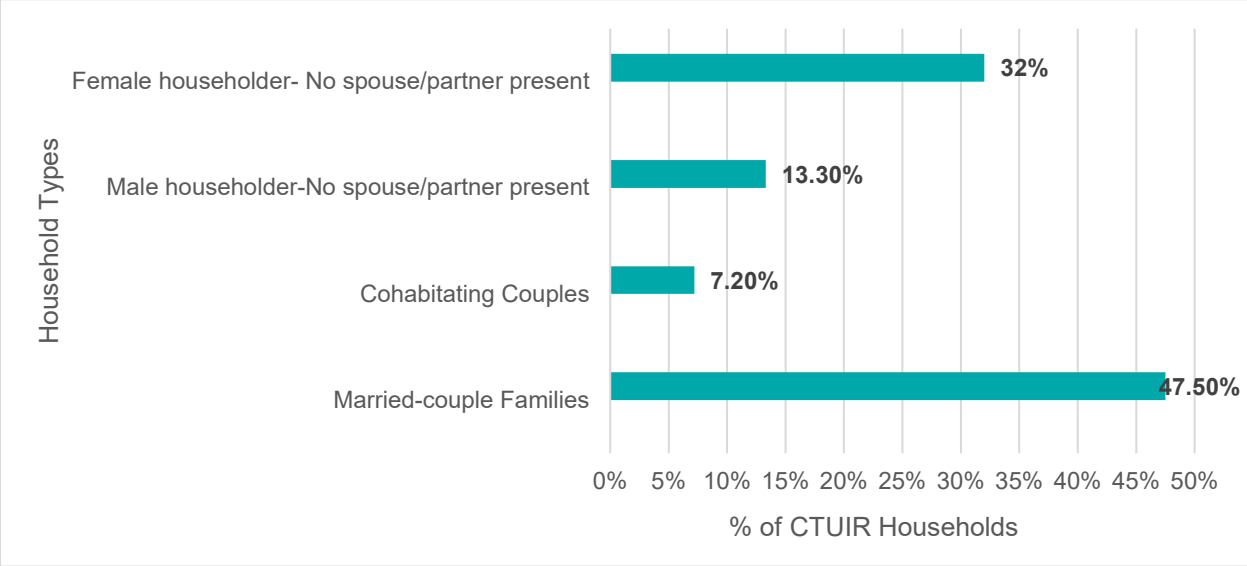
Geography	1990	2000	2010	2019
UIR	2,502	2,927	3,027	2,836
Change %		17%	3%	-6%
Umatilla CO	59,249	70,548	75,889	77,950
Change %		19%	8%	3%
Oregon	2,842,321	3,421,399	3,831,074	4,217,737
Change %		20%	12%	10%

2.6 Residential Population

The current CTUIR membership enrollee numbers are over 3,100. This represents a slight increase (just over 5 percent) from the 2014 reporting of 2,965. Nearly half of these Tribal members live on or near the UIR. The Reservation is also home to another 300 Indians who are members of other tribes. The total Reservation population had rapid growth in the 80s (43%) and 90s (17%). The development of Indian gaming enterprises on the Reservation brought more Indians back to their homeland due to increased job availability. The Native American population grew even faster off-Reservation than on-Reservation, due in part to the lack of housing and employment opportunities on the Reservation.

The 2015-2019 ACS Estimates recorded 1,033 households on Reservation and off-Reservation trust land. Average household size was estimated at 2.7 people per household. In 2019, 33.6% of all CTUIR households had one or more people under the age of 18; 36.6% of all households had one or more people 65 years and over. On the UIR, 87 grandparents lived with their grandchildren under 18 years old. Of those grandparents, 57.5% percent were responsible for the basic needs of their grandchildren. The figure below provides a breakdown of the types of households on UIR. Current projections anticipate growth in the portion of residents 65 and older, but minor change in populations between ages 25 to 59 (the prime wage-earning group).

FIGURE: Types of Households in Umatilla Reservation and Off-Reservation Trust Land[9]



2.7 Disability, Access, and Functional Needs Community

The ability to respond to and recover from disaster varies from community to community. One key factor for consideration before a hazardous event occurs is a complete understanding of the needs of all people living within a jurisdiction. While not a comprehensive list, three groups of people whose needs may require additional consideration are the elderly, people with disabilities, and people living below the poverty level. Other groups that may require additional consideration include infants and toddlers, those with limited access to transportation, non-English and English as a second language speakers, the precariously housed and the homeless. There may be individuals among these groups of people who may require additional consideration to identify resources and develop disaster plans that effectively manage safely avoiding injury or damage from a hazardous event and recovering from a disaster. This section provides information about some members of CTUIR whose needs may merit additional consideration along with population comparisons that demonstrate proportions CTUIR lands, in Umatilla County, and in the state of Oregon.

Elders

Depending on warning, type, and severity of an emergency or disaster, the elderly population may have challenges relocating before a disaster occurs or experience greater difficulty keeping safe during a disaster. Functional needs, higher risk for limited mobility, and a correlation between fixed incomes and old age, all contribute to elders experiencing difficulty preparing, mobilizing for, and recovering from an event. The table below reveals that the percentage of people living on the Reservation in 2019 that were older than 65 is slightly higher than the rates for older residents in Umatilla County and the state of Oregon. This information reaffirms that this is a segment of the population whose disaster needs may merit additional consideration as future disaster and community plans are developed.

TABLE: 2019 Population Comparison – Age[10]

	UIR		Umatilla County		Oregon		United States	
Population by Age	**Value**	**% of Total**	**Value**	**% of Total**	**Value**	**% of Total**	**Value**	**% of Total**
0 to 4	154	5.4%	5,186	6.7%	230,557	5.6%	19,767,670	6.1%
5 to 17	494	17.4%	14,432	18.7%	637,386	15.4%	53,661,722	16.5%
18 to 24	238	8.4%	6,967	9.0%	362,910	8.8%	30,646,327	9.4%
25 to 44	547	19.3%	20,324	26.4%	1,131,777	27.4%	86,009,246	26.5%
45 to 64	860	30.3%	18,400	23.9%	1,057,618	25.6%	83,829,034	25.8%
65 plus	543	19.1%	11,820	15.3%	709,555	17.2%	50,783,796	15.6%
Total	2,836		77,129		4,129,803		324,697,795	

People with Disabilities

It is critical for communities to consider the needs of all their residents when developing effective response plans and mitigation strategies. Among the civilian noninstitutionalized population on the UIR and off-Reservation trust lands, 21.3% reported a disability. The likelihood of having a disability varied by age - 8% of people under 18 years old; 18.7% of people 18 to 64 years old; and 45.1% of those 65 and over.[11] Any person in these groups may have unique needs that merit a community's additional focus and concern as plans to prepare for or mitigate the impact of disasters are developed.

People Living in Poverty

Individuals and families living at or below the poverty level may have greater challenges relocating before a disaster or finding safe haven during a disaster. Less disposable income typically correlates with a longer time frame for disaster recovery. These factors support evidence-based patterns of disproportionate negative impacts from disasters on economically fragile populations. Mitigation measures designed to help prevent or reduce impacts for the community members facing the greatest economic challenges may provide the greatest benefit to those who need it the most. From 2015-2019, 16.6% of people on the UIR were living in poverty. An estimated 21% of children under the age of 18 were living below the poverty level, compared with 12.5% of people 65 years old and over. An estimated 16.3% of people 18 to 64 years were living at or below the poverty level.

The table below reveals that the percentage of individuals living on the Reservation in 2010 and 2019 that were below the federal poverty level. These percentages were consistent with those reported in Umatilla County. Comparisons with rates for the state of Oregon and the U.S. rates were less favorable.

TABLE: Families and Individuals Living at or below the Poverty Threshold[12]

US Poverty Threshold	2010				2019			
	$22,314 for a family of four				$26,000 for a family of four			
Geography	Total Families	% of Families	Total Individuals	% Individuals	Total Families	% of Families	Total Individuals	% Individuals
UIR	92	12%	458	17.1%	85	11.6%	467	16.6%
Umatilla County	1,756	9.8%	8,524	15.8%	2,488	13.4%	12,926	17.9%
Oregon	70,032	7.9%	388,740	14%	85,409	8.4%	533,527	13.2%
USA	6,620,945	9.2%	33,899,812	12.4%	79,594,270	8.6%	42,510,843	13.4%

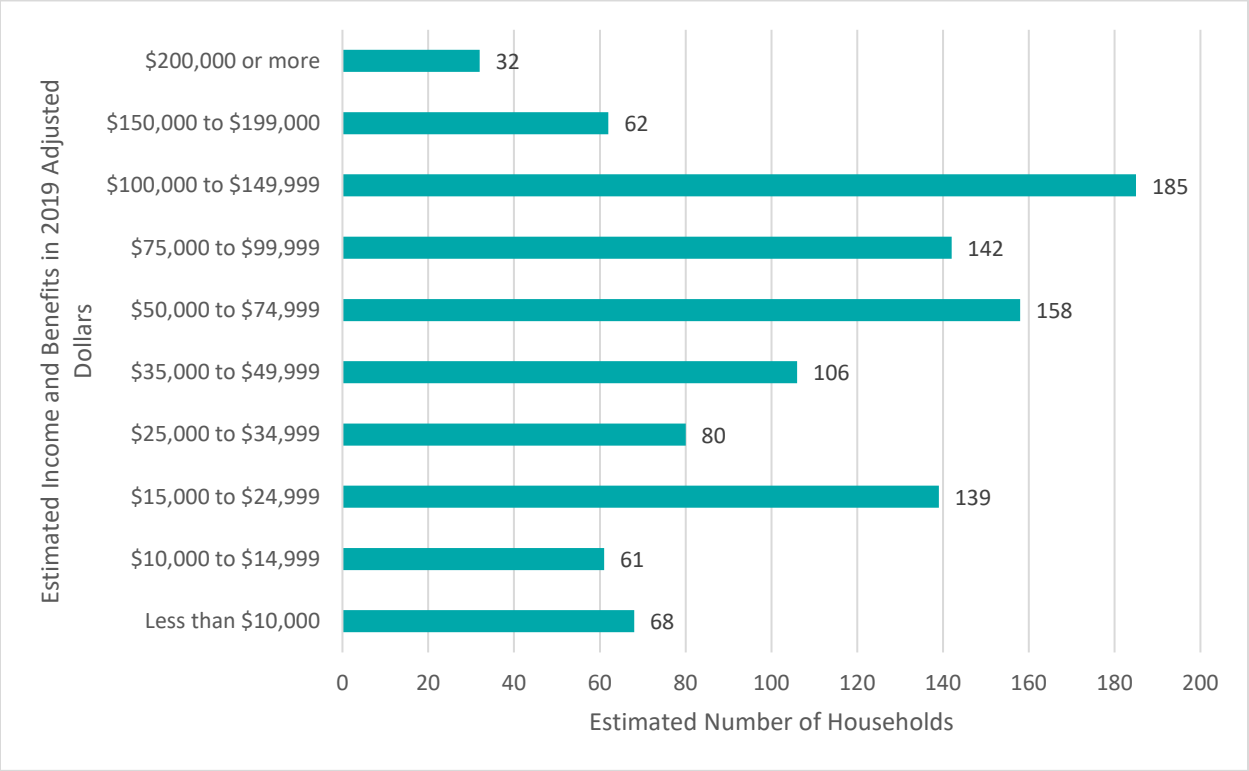
Another measure of economic status is income. The ACS assesses Median Household Income (everyone living in a residence) and the Median Family Income (all related people in a residence). Median Household Income is one indicator of the strength of a jurisdiction's economy. Median Household Income can be used to compare economic areas but does not reflect how the income is divided among area residents. The table below illustrates the Median Household Income for the Reservation and County compared to the state of Oregon. In 2019, as with the 2010 Census, Median Household Income in all three jurisdictions remains below the national average of $68,703.

TABLE: Median Household Income in 2010- and 2019[13]

Geography	2010			2019		
	Median Household Income	Mean Family Income	Individual Median Income	Median Household Income	Mean Family Income	Individual Median Income
UIR	$50,052	$55,256	$15,158	$57,102	$81,446	$23,370
Umatilla County	$45,861	$46,680	$16,410	$54,699	$78,397	$32,363
Oregon	$49,260	$48,680	$20,940	$62,818	$98,950	$38,669

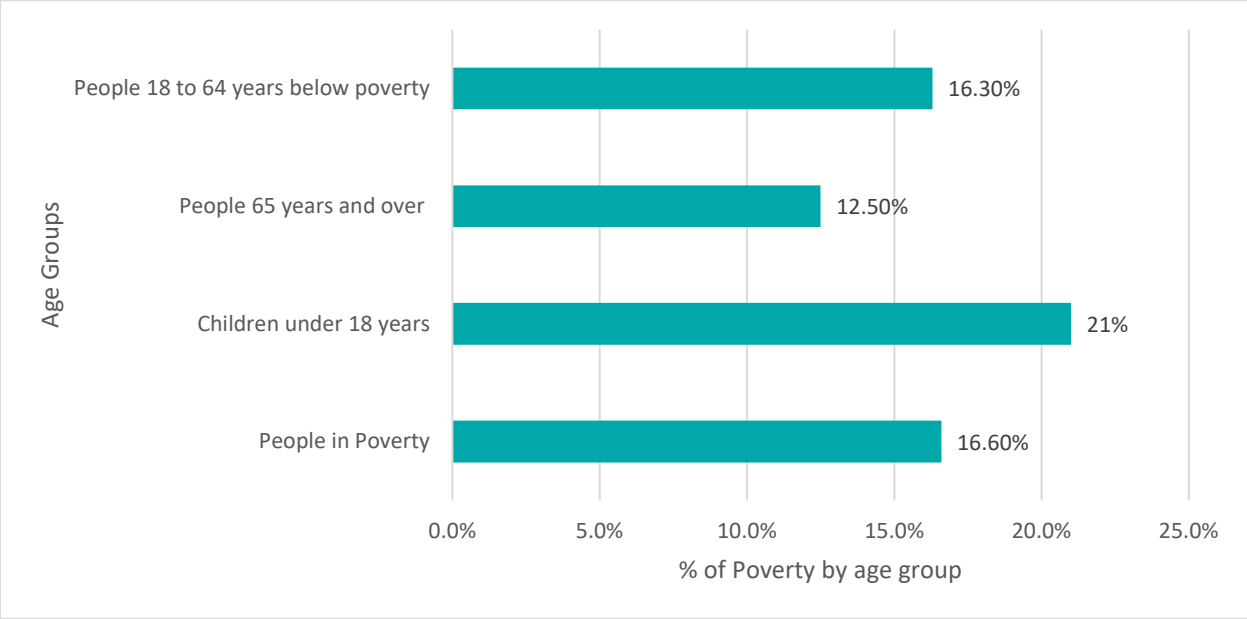
The chart below illustrates the distribution of income levels for households on the UIR.

FIGURE: Income and Benefits by Household on the UIR (n=1033)[14]



The chart below provides a visualization of the proportion of different demographic groups experiencing life in poverty.

FIGURE: Poverty Levels by Age Group[15]



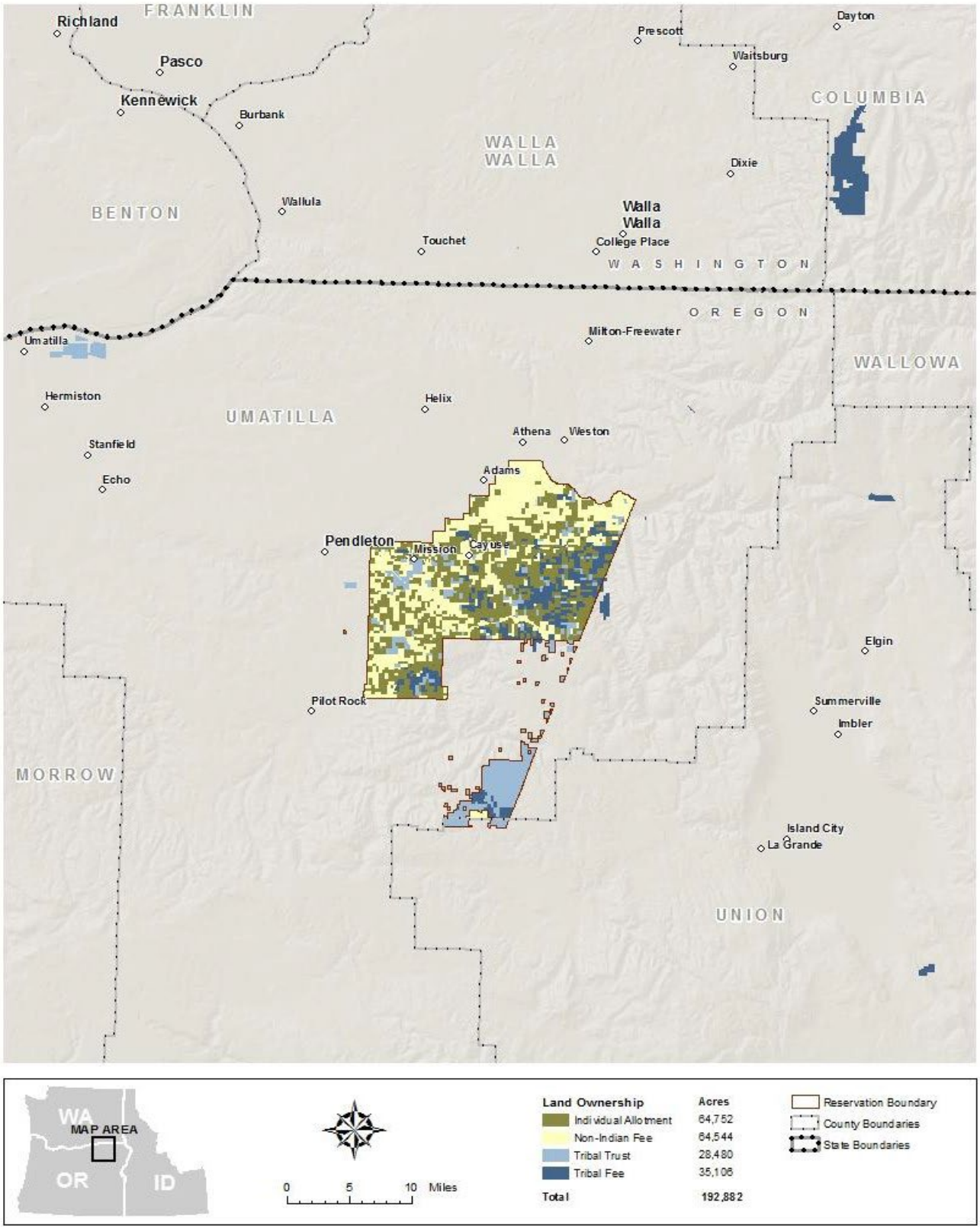
Finally, the needed government subsidized financial assistance measures to sustain individuals and families can be an indicator of some of the challenges that disaster may exacerbate for economically vulnerable individuals and households. The amount of assistance required for a family to meet their daily nutritional needs is one such indicator. In 2015-2019, 19.3% of UIR households received Supplemental Nutrition Assistance Program (SNAP) benefits. An estimated 47.2% of households that received SNAP had children under 18, and 44.2% of households that received SNAP had one or more people 60 years and over. An estimated 36.2% of all households receiving SNAP were families with a female householder and no husband present. Additionally, 41.2% of households receiving SNAP had two or more workers in the past 12 months. In the event of disaster, inability to access a stable food source given impacts to the supply chain may result in significant hardships for many families.

2.8 Land Ownership and Land Use

Land ownership on the UIR is a checkerboard of non-Indian and Indian ownership. Approximately 50.4%, or 87,456 acres, is land held in trust by the US Bureau of Indian Affairs. Included in this trust acreage are 65,020 acres held in trust under individual Indian allottee ownership, and 22,436 acres held in trust under CTUIR ownership. In May 2021, the Land Buy-Back Program reopened. The Department of the Interior administered program offers landowners the opportunity to sell land interests at fair market value. The program goal is to consolidate the maximum number of fractional land interests so that purchased interests can be returned into tribal trusts. The transfers increase tribal trust land bases for stewardship, economic development, or other uses deemed beneficial by sovereign tribal nations. CTUIR has gained national recognition for effectively leveraging the buy-back program to meet strategic land use planning goals. Approximately 49.6%, or 86,122 acres, within the diminished boundary is owned as “fee” land. Included in this “fee” land acreage are 64,401 acres under non-Indian ownership and 21,721 acres owned by CTUIR.

The figure below illustrates the current checkerboard of CTUIR land ownership.

FIGURE: CTUIR Land Ownership Map[16]

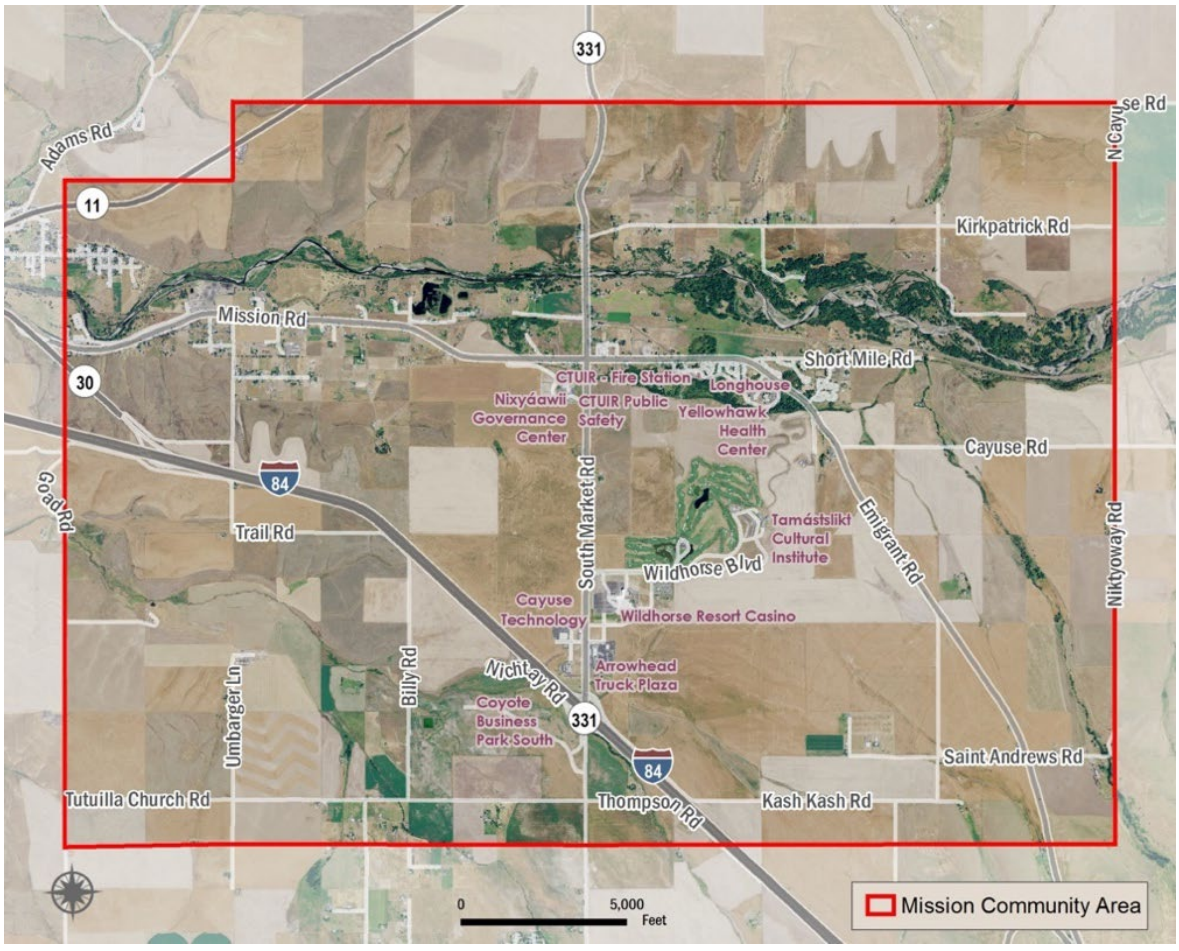


2.9 Existing Land Use

The general characteristic of the UIR for land use is rural. Most of the lands on the UIR are used for agriculture on lower elevation lands and forestry and grazing in the upland mountainous area. The topography within 2 miles of Mission contains only modest variations in elevation, with a maximum elevation change of 312 feet and an average elevation above sea level of 1,323 feet. Within 10 miles of Mission are only modest variations in elevation (2,940 feet) and within 50 miles contains large variations in elevation (6,696 feet). Total acreage of lands lying within the diminished boundary of the UIR are approximately 173,578 acres.

Mission, located near the Reservation's western boundary bordering the city of Pendleton, is the most developed area. Portions of the Mission Community area were developed prior to flood studies and portions of the developed area are located within the 500-year floodplain. The Mission Community Area contains residential, commercial, and light industrial development. The area (illustrated in the map below) contains most of the Reservation's housing, schools, and Tribal and Bureau of Indian Affairs administrative office buildings. This area also contains the Yellowhawk Tribal Health Clinic, CTUIR Government Complex, CTUIR Fire and Emergency Services, all of which are considered critical facilities**.** Critical facilities and assets are detailed further in the Hazard Identification and Risk Assessment (Section 3). Development along the Interstate 84/Highway 331 commercial – industrial corridor is likely to occur. The remainder of the Reservation is primarily and will continue to be farm and forest lands devoted to the sustainability of the First Foods and natural resources.

FIGURE: Mission Community Planning Area[17]



2.10 New and Future Development Trends

New and future development is guided by the comprehensive growth strategy and CTUIR Comprehensive Plan. Over the past decade, CTUIR completed several large capital improvement projects and established commercial and industrial shovel-ready development sites that have been partially developed (Coyote Industrial Park South and Coyote Business Park North and East). This new development is in the vicinity of the Interstate 84 and State Highway 331 interchange near the Wildhorse Casino and Resort and the Arrowhead Travel Plaza within the Mission Community Planning Area. The Nixyáawii Governance Center and Public Safety buildings were completed in 2009 and 2007, respectively, north of the commercial and industrial areas. All this development is located outside of designated flood hazard areas.

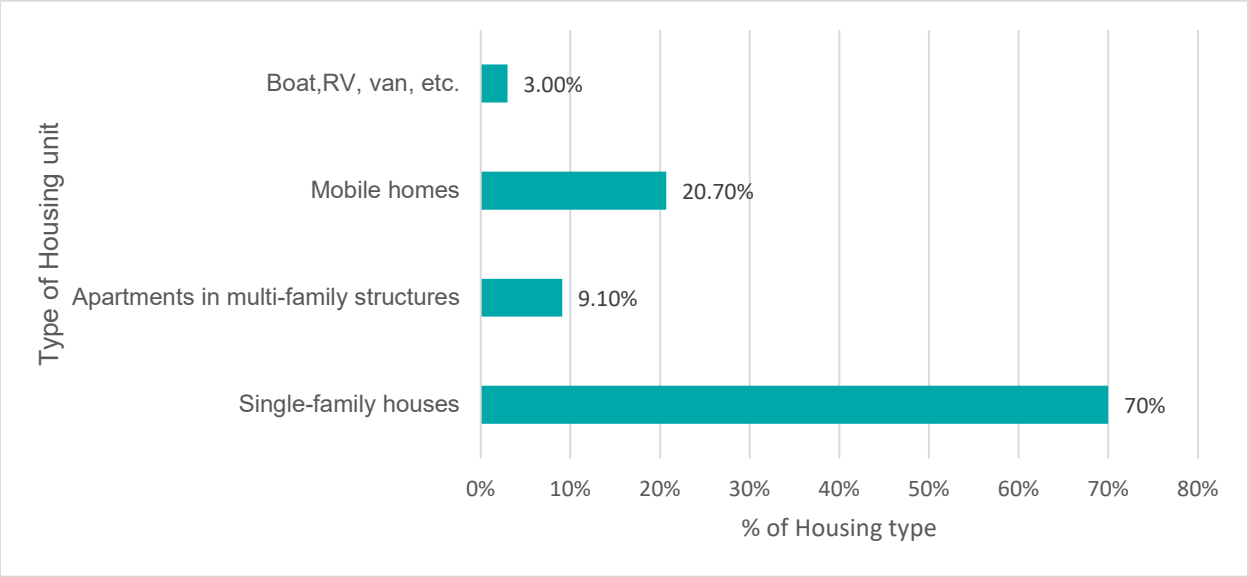
CTUIR completed expansion of the Wildhorse Resort and Casino, the Resort Hotel (added 10-story with 200-rooms) in 2011, as well as a Cineplex and Arrowhead Travel Plaza. New development in the Coyote Business Park North included the US Forest Service building and a three-business retail center added to the existing Cayuse Technologies and Davita Dialysis Center. The Yellowhawk Tribal Health Center was completed in 2018.

Future development identified in the CTUIR Capital Improvements Program include additional Tribal housing projects, community water system expansion, and continued development of the industrial and commercial business parks. Completion of the Mission Community Master Plan in 2018 identified future development plans that included improved transportation, pedestrian access, and residential development concepts within the area. In April 2019, CTUIR Department of Natural Resources published First Foods Upland Vision. This plan provides guidance for desired characteristics of upland ecosystems in support of preserving First Foods production and a basis for natural resource management and restoration activities. It is one tool that will inform stewardship of critical upland habit development by CTUIR.

2.11 Housing

The chart below illustrates the breakout of the types of housing units on the UIR. In 2015-2019, UIR and off-Reservation trust land had a total of 1,157 housing units. Of these housing units, 70% were single-family houses either not attached to any other structure or attached to one or more structures (commonly referred to as “townhouses” or “row houses”). Additionally, 9.1% of housing units were in multi-unit structures, or those buildings that contained two or more apartments. Mobile homes made up 20.7% of housing units, while any remaining housing units were classified as “other,” which included boats, recreational vehicles, vans, etc.

FIGURE: Types of Housing Units on the CTUIR[18]



Based on 2015-2019 ACS 5-Year Estimates of the 1,157 housing units located on the UIR, over 56% were constructed before 1979. The greatest concentration of development is around Mission. Most housing units on the UIR are stick frame, with a secondary concentration of manufactured homes. Older units and manufactured homes tend to be less disaster resistant and may warrant attention as mitigation plans are developed. Older manufactured homes are generally more prone to wind and water damage than standard stick-built homes. Additionally, homes built before 1974 in Oregon may be at greater risk from earthquakes than new homes which have incorporated earthquake safety into standard building design.

Houses built since 2010 comprised 2.1% of the housing inventory, while 6.1% of the houses were first built in 1939 or earlier. The median number of rooms in all housing units was 5.5 rooms, and of these housing units 69.6% had three or more bedrooms.

Housing Inventory Occupancy Characteristics

The table below provides a comparison of owner and rental occupied housing trends between 2010 and 2019. Owner occupancy decreased about 11% from the 2010 Census to the 2019 ACS. In the Pacific Northwest, 25% of households are cost burdened compared. As rents continue to outpace wage growth nationwide, that percentage of cost burdened households is only likely to increase. The table below summarizes owner-occupied and renter-occupied housing units on the UIR.

TABLE: CTUIR Owner Occupied and Renter-Occupied Rates (2010 to 2019)[19]

		Owner-occupied housing units	Renter-occupied housing	Owner-occupied housing with residents 65 and older	Renter-occupied housing with residents 65 and older
All Housing Units on UIR	**2010**	718	360	231	72
Housing units occupied by American Indian & Alaska Native / Tribal Member		263	206	75	32
Percentage of Category		36.6%	57.2%	28.5%	15.5%
All Housing Units on UIR	**2019**	729	304	271	80
Housing units occupied by American Indian & Alaska Native / Tribal Member		186	147		
Percentage of Category		25.5%	48.4%	37%	26%
Change from 2010 to 2019		**-11.1%**	**-8.8%**		

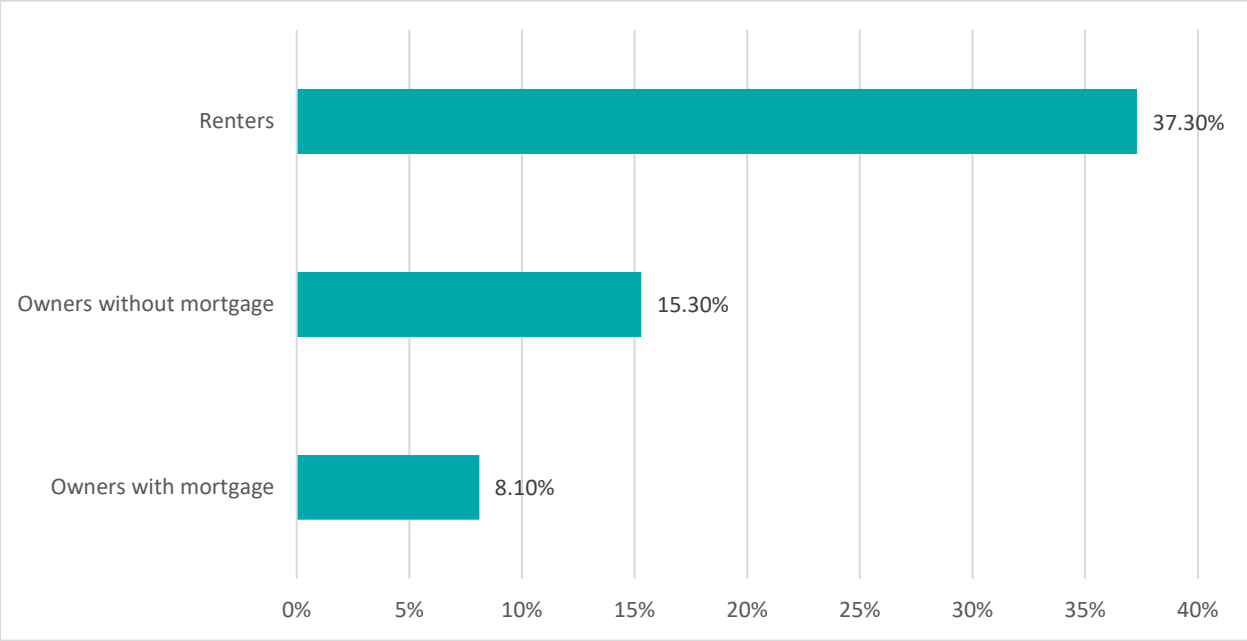
Financial Characteristics and Housing Costs

In 2015-2019, the median property value for owner-occupied houses on the UIR and off-Reservation trust land was $236,700. Of the owner-occupied households, 52.4% had a mortgage. An estimated 47.6% of residents owned their houses “free and clear,” that is without a mortgage or loan on the house. The median monthly housing costs for owners with a mortgage was $1,269 and for owners without a mortgage it was $328.

For renter-occupied houses, the median gross rent for the UIR and off-Reservation trust land was $613. Gross rent includes the monthly contract rent and any monthly payments made for electricity, gas, water and sewer, and any other fuels to heat the house.

Households that pay 30% or more of their income on housing costs are considered cost burdened. In 2015-2019, cost-burdened households accounted for 18.1% of owners with a mortgage, 15.3% of owners without a mortgage, and 37.3% of renters.

FIGURE: Households with a Housing Cost Burden in Umatilla Reservation and Off-Reservation Trust Land, OR in 2015-2019[20]



Housing remains a critical issue. Preliminary data from HUD's FY 22 Indian Housing Block Grant Program in the tables below highlight the severity of the housing challenges facing many tribal households.

HUD FY22 Indian Housing Summary - Umatilla Confederated Tribe	
AIAN Persons *(American Indian/Alaska Native includes all enrolled tribal members and all AIAN residents of the CTUIR)*	4,810
HHLT 30% *(AIAN Households with less than 30% Median Family Income)*	195
HH 30-50% *(AIAN Households between 30% and 50% of Median Family Income)*	209
HH 50-80% *(AIAN Households between 50% and 80% of Median Family Income)*	294
HH Overcrowded *(AIAN Households with more than 1 person per room or without kitchen or plumbing)*	124
HH Severe Cost *(AIAN Households with Housing Expenses greater than 50% of Income)*	174
Housing Shortage *(Number of AIAN Households with less than 80% of Median Family Income)*	566

According to CTUIR Planning Director, JD Tovey in March of 2021, a recent housing analysis showed CTUIR required an additional 350 units of housing over the next 20 years.[21] Proactively, in May of 2021, CTUIR announced plans to develop an area containing about 50 housing units south of the school in an area to be known as Nixyáawii. Plans to develop a market-rate rental project north of the charter school were also announced. That area is a planned mixed townhome and apartment complex ranging from 30 to 40 units. Finally, the Oregon Legislature committed about $1 million to the CTUIR to replace affordable housing that was lost during the February 2019 flooding along the Umatilla River.

2.12 Employment and Industry

Making a jurisdiction more resistant to impacts from disaster and emergency events and more resilient in its recovery starts with identifying critical sectors of the economy and developing an understanding of how various hazardous events might disrupt those sectors. According to the CTUIR 2017 -2021 Comprehensive Economic Development Strategy (CEDS), CTUIR has had a formal economic development plan since 1974. The Oregon Employment Department assessed that the Mid-Columbia Region experienced economic problems due to the downturn in the lumber, wood products, and aluminum industries during the 1990s. To some extent, the region was able to offset the loss of jobs in these industries by the addition of new manufacturing firms and regional distribution and service sector employment.

In 2019, 54.3% of the population 16 and over were employed, 4% were unemployed, and 41.6% were not currently in the labor force. An estimated 50.5% of the people employed were private wage and salary workers; 35.3% were federal, state, or local government workers; and 14.3% were self- employed in their own (not incorporated) business, as depicted in the table below.

TABLE: Class of Worker on the UIR (2015-2019)[22]

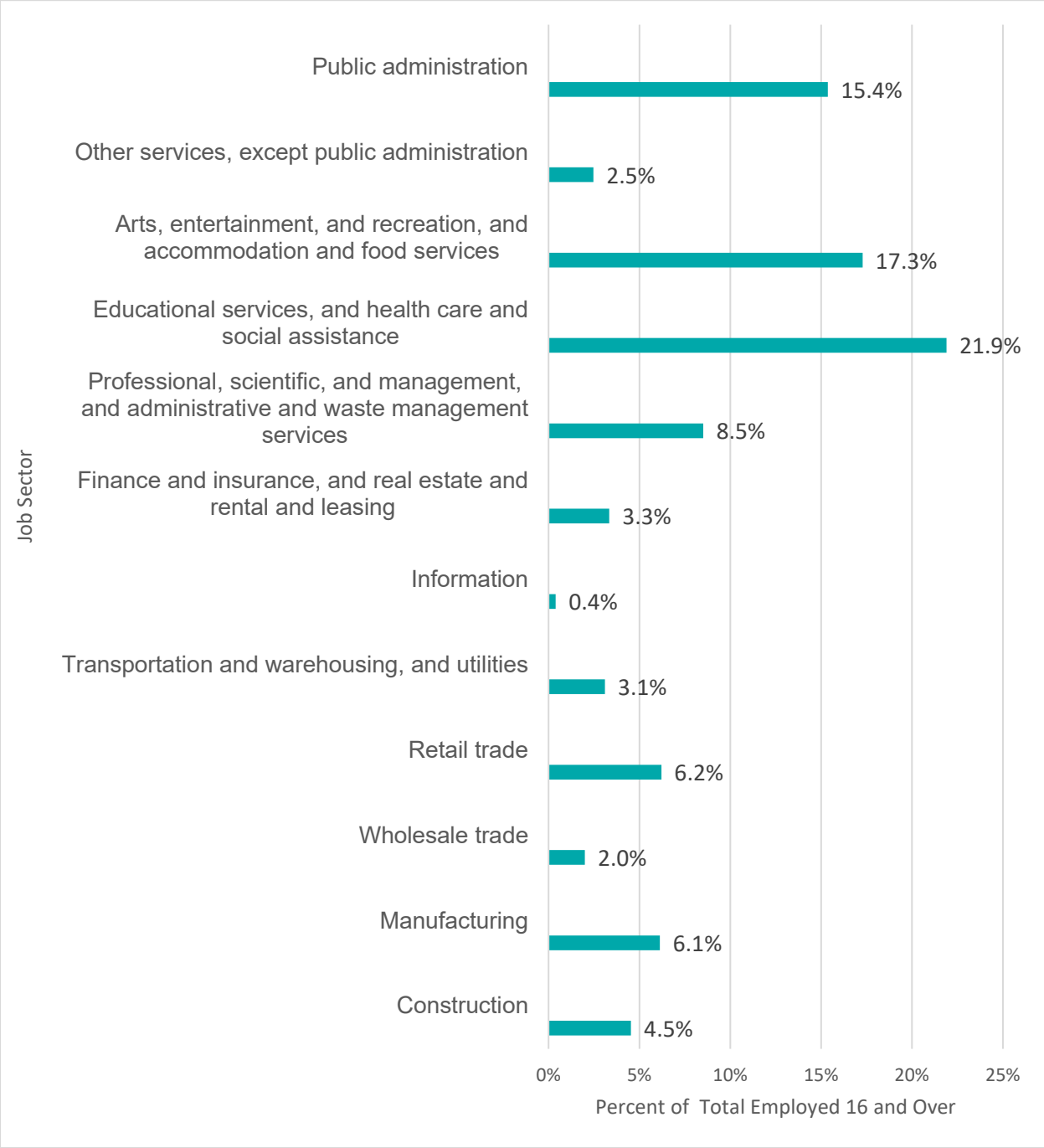
Class of Worker	Number	Percent
Private wage and salary workers	634	50.5%
Federal, state, or local government workers	443	35.3%
Self-employed workers in own not incorporated business	179	14.3%

According to the CEDS, CTUIR's economic development priority of effort between 2010 to 2015 was focused on increasing economic sovereignty. The region's proximity to the Portland area, the Southern Pacific, Union Pacific, and Burlington Northern railroad lines that run across the western edge of the region, and Interstate 84 provide good opportunities for the transportation of manufactured and agricultural goods. In addition, the region's proximity to the Columbia River, the Cascade Mountains and the high desert terrain provide year-round sporting and tourism activities.

In 2019, the economy reflects the efforts of the CTUIR in building a stable, independent economic base. The strong CTUIR agricultural enterprise is augmented by a highly successful casino resort, technology company with national and international clientele, large industrial properties both on and off the Reservation, and a variety of other economic interests spread across the greater Columbia Plateau region. The Wildhorse Resort and Casino complex is the largest employer within the UIR and the second largest employer in Umatilla County.

The figure below summarizes employment by industry on the UIR and illustrates this economic diversity.

Figure 13: CTUIR Percent of Employment by Industry



2.13 Importance of Cultural Resources

Maintaining and enhancing cultural resources is of paramount importance to the UIR and the Tribes that make up the CTUIR. The importance of certain cultural resources is expressed in the "**CTUIR Department of Natural Resources First Foods**" prepared by Eric J. Quaempts, Director of the CTUIR Department of Natural Resources. The First Foods strategy is significant to the CTUIR Hazard Mitigation Plan because it identifies the location of several important cultural resources scattered across the Reservation and to lands beyond.

The CTUIR Comprehensive Plan contains multiple elements with specific emphasis on cultural resources: Natural Resources, Cultural Heritage, and Treaty Rights. Comprehensive Plan objectives focus on tribal culture and resources. The following are a few example excerpts:

- *"*Protect and preserve culturally significant places and resources including the graves and sacred items of the CTUIR members and ancestors, on the Umatilla Indian Reservation and within the CTUIR's ceded lands and traditional use areas."
- "Protect and restore the First Foods and exercise associated rights reserved in the Treaty of 1855 for the perpetuation of tribal culture."
- "To protect, preserve, and perpetuate the CTUIR's culturally significant places and resources for the benefit of current and future generations."

The CTUIR has established a program within the Department of Natural Resources, the Cultural Resources Protection Program, which also includes a Tribal Historic Preservation Officer. Although this program is charged with promoting the protection, preservation, and perpetuation of CTUIR's culturally significant places and resources both on and off the UIR, all CTUIR governmental departments and programs are tasked with achievement of the Comprehensive Plan objectives. To that end, the impact of natural and human-caused hazards to cultural resources have been included for the evaluation of risks to these resources as reviewed in Section 3.

2.14 Importance of Energy

In 2009, CTUIR formally adopted an Energy Policy, which identifies energy related issues impacting the UIR and established goals. An Energy Policy Staff Team was created to provide oversight of the Policy and the implementation of its goals. Additionally, as part of the Columbia River Inter-Tribal Fish Commission, CTUIR has embraced the goals of the 2013 update to the Tribal Energy Vision for the Columbia River. As 2021 started, CTUIR was in the process updating the Strategic Energy Plan.

In 2019, there were an estimated 1,033 occupied homes on the UIR. Most homes were heated by electricity (41.9%), natural gas (16.8%), or wood (18.3%). Wood is the traditional energy source for Native Americans and many households on the UIR still prefer wood heat to other heat sources. There are forested lands on the UIR and in the nearby Umatilla, Wallowa-Whitman, and Malheur National Forests. Many residents of the Reservation gather their wood supply from these forests. The table and figure below summarize residential heating sources and the trends over time.

TABLE: UIR Residential Heating Sources Comparison (2000 to 2019)[23]

Heating Source	2000	2010	2019
Wood	21%	15.9%	18.3%
Fuel Oil	8%	9.5%	9.0%
Natural Gas	23%	14.1%	16.8%
Electricity	37%	46.6%	41.9%
LPG	10%	12.2%	11.2%
Other fuel	1%	1.8%	1.9%

Utility providers estimate residential electrical power needs on the UIR at 5-6 megawatts, 1-2 for households and 3-4 for UIR operations. Peak demand for UIR is reported to be 3 megawatts, reached in both January and August.

2.15 Infrastructure on the Umatilla Indian Reservation

This section provides a summary of the essential infrastructure located on the UIR and/or managed by CTUIR. This includes water, sewer, power, natural gas, fuel storage, transportation assets, and government energy use. A full list of critical assets on the Reservation can be found in Section 3 (Risk Assessment).

Water

As noted in Section 2.2 Location, basalt groundwater is the primary source of water for all UIR residents, supporting domestic, as well as, commercial, municipal and irrigation (DCMI) usage. The CTUIR owns and operates its own water system. The CTUIR municipal well system in the Mission Community consists of 5 wells: MW1 and 2 are 300- and 315- feet deep respectively, and MW 3,4, and 5 are 1,100-, 1,067-, and 975-feet, respectively. These wells serve approximately 725 households along with commercial developments like the Wildhorse Resort and Casino, business and industrial parks, Yellowhawk Tribal Health Clinic, and residential housing. Five wells located in or near the Mission Community Planning Area provide the water source for the system's service area. Wells 1 through 4 primarily serve the community of Mission, while Well 5 primarily serves the Wildhorse Resort and Casino complex (includes hotel, casino, Cineplex, golf course and RV Park) and Tamástslikt Cultural Institute. An intertie between the City of Pendleton water system and the CTUIR water system also exists. This allows water from the Pendleton system to be supply the CTUIR water system.

The completion of Well 6 with an additional water storage reservoir is essential to meet anticipated demands for Tribal housing as well as existing and future commercial and industrial development planned for the area. In February of 2021, a project was initiated to install new water pipe on the west side of South Market Road from Tokti Road to approximately 0.5 miles south of Lloyd Road. Additionally, construction the new pump station for Well 6 and the water storage reservoir began at the same time. Well 6, along with providing a redundant supply of water to the existing community will provide the quantity and pressure for reliable fire suppression for the Reservation. When complete, the well and water storage reservoir (tank) will provide a new water supply to the mission community while increasing water system reliability. In August of 2020, CTUIR in partnership with the US Geological Survey initiated a two-year groundwater recharge study of the CTUIR and surrounding area in the Upper Umatilla River Basin.

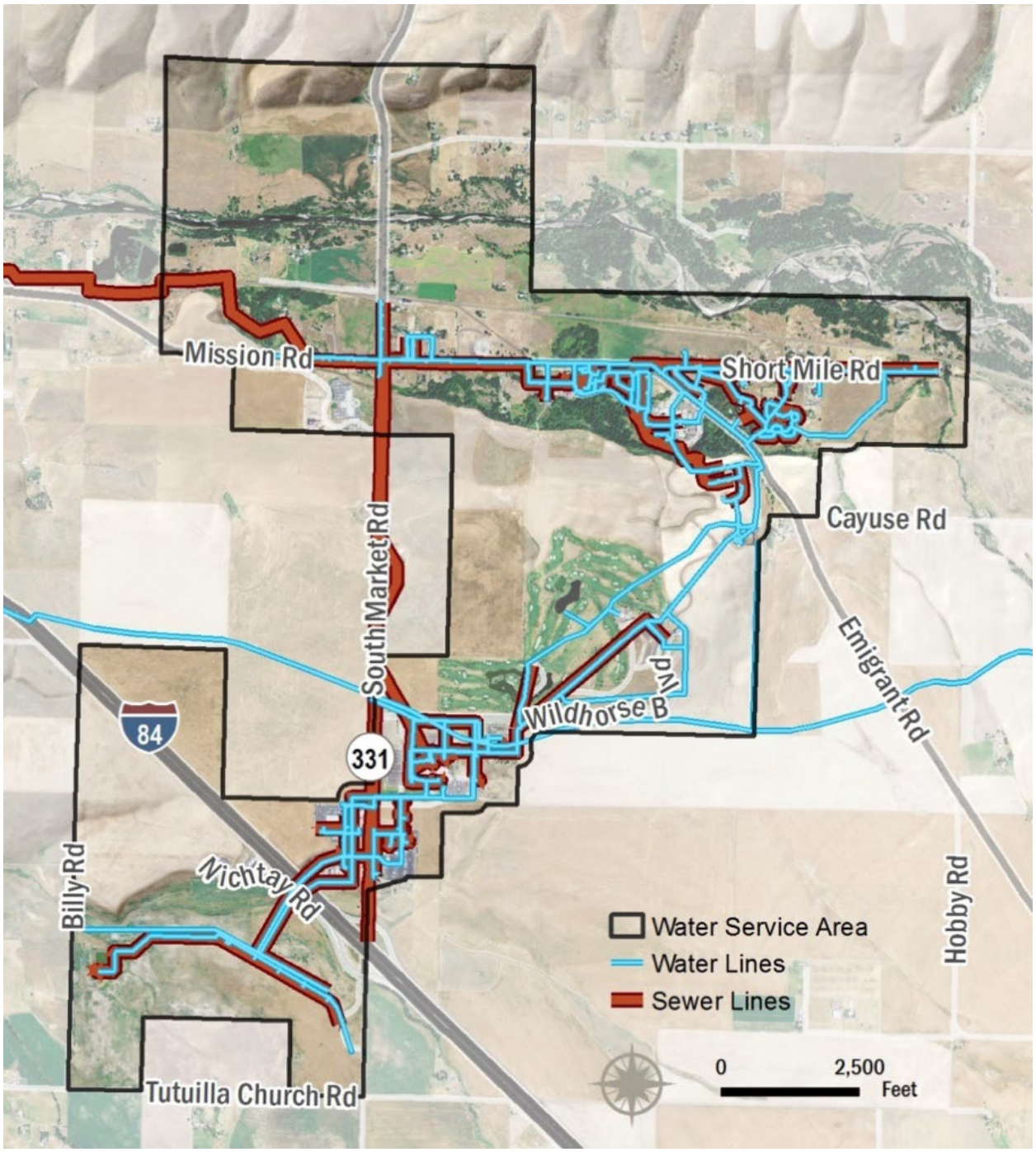
Water system storage is provided by two 550,000-gallon water reservoirs (bolted glass-fused-to-steel tanks) that are 24 feet tall and 65 feet in diameter at an elevation of 1,390 feet. These reservoirs were constructed in 1995.

Sewer

CTUIR operates and maintains a community sewer system within the Mission Community Planning Area. That system connects to the system that serves and is operated by the City of Pendleton. Since 1972, an existing sewer trunk line from the city of Pendleton to the community of Mission has been the primary source for wastewater disposal. Additional trunk lines help remove wastewater from the Wildhorse Resort and Casino, Coyote Business Parks and the Arrowhead Travel Plaza back to the main line serving the community of Mission was added in 2008.

The map below illustrates the water and sewer service lines in the Mission Community Planning Area.

FIGURE: UIR Water and Sewer Service Area



Electrical Power

The UIR has several electric utility companies that operate in either a transmission or local distribution capacity within the Reservation. The Bonneville Power Administration (BPA) has a 35 Mile 230 kV high voltage transmission line that crosses the Reservation in a 100-foot wide right of way. This line is a regional transmission line that runs east-west between the boundaries of the UIR. A long-term agreement between the CTUIR and BPA has been established to accommodate this line. The electricity being transmitted through this line does not directly serve the Reservation. Local distribution of electrical service is provided by both Umatilla Electric Cooperative and Pacific Power.

Umatilla Electric Cooperative (UEC) is a rural electric cooperative that has its headquarters located in Hermiston, OR. UEC has a substation located at Mission. UEC primarily serves residents and farms.

PacifiCorp (Pacific Power) is a large investor-owned integrated electric power company. PacifiCorp is a wholly owned subsidiary of Berkshire Hathaway Energy with headquarters located in Portland, OR. Pacific Power serves the UIR from the Round-Up Substation that tie into the Bonneville 230 kV line. Pacific Power serves the primary commercial load on the Reservation including the Wildhorse Resort and Casino, Hotel, Cineplex, RV Park, Arrowhead Travel Plaza, Gulf Course and Tamástslikt Culture Institute as well as many of the more densely populated residential areas.

Natural Gas

The UIR has several natural gas companies that operate in either a transmission or local distribution capacity within the Reservation. Cascade Natural Gas Corporation (Cascade) is the local natural gas distribution company within the Reservation with a local distribution system that includes ½ inch to 4-inch diameter pipes. Cascade is a wholly owned subsidiary of MDU Resources Group, Inc. with headquarters located in Kennewick, WA.

Two major natural gas transmission pipelines traverse the UIR in roughly a northwest - southeast direction. The Williams Companies owns Northwest Pipeline, LLC which owns and operates the northwest natural gas transmission system through the UIR comprised of 30-inch, 22-inch and 6-inch diameter steel pipes.

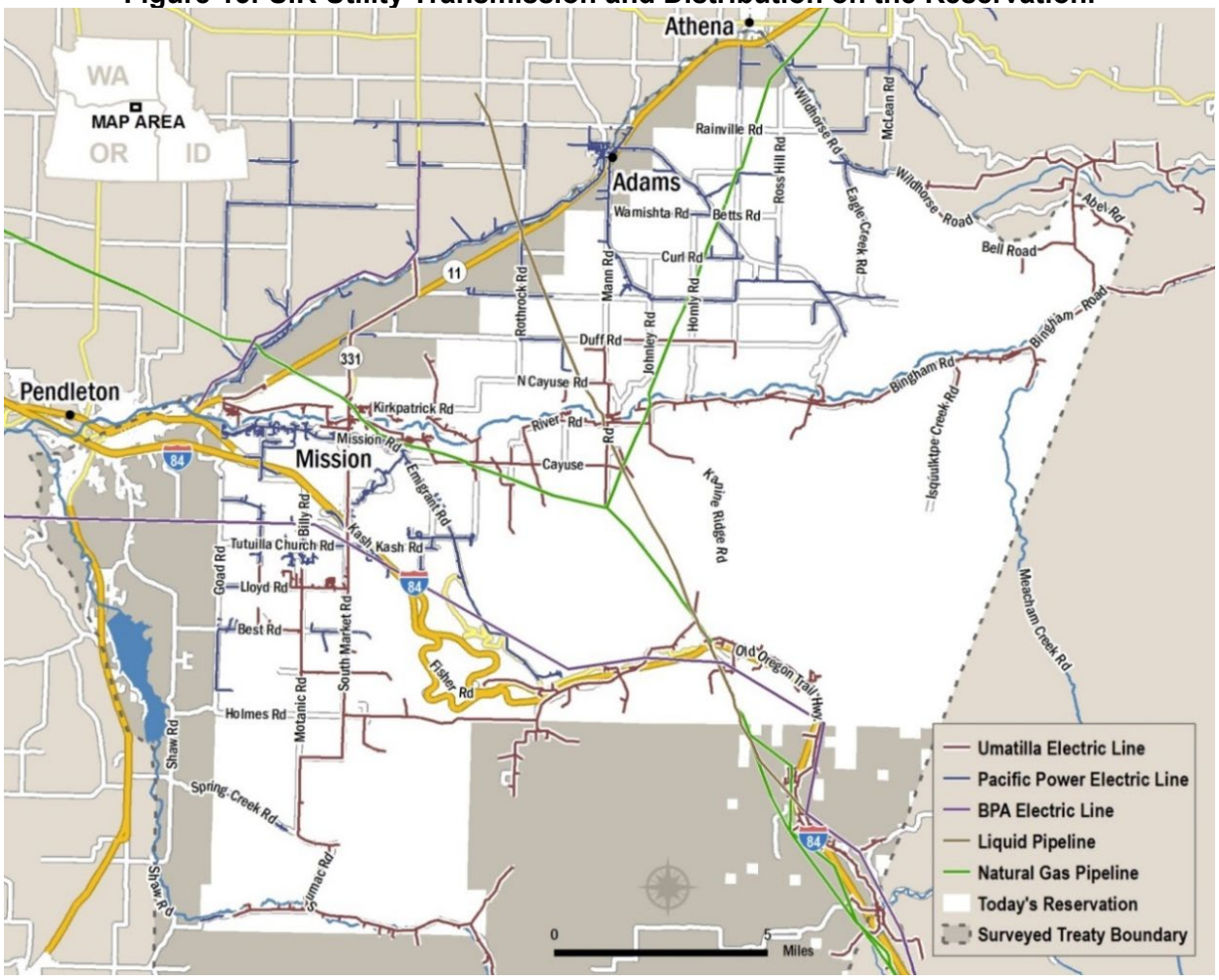
Tesoro Logistics Northwest Pipeline, LLC (San Antonio, TX) provides liquid petroleum products through two liquid fuel transmission lines of 6 and 8 inch and still owns a tank facility on the reservation that is currently not used due to environmental concerns.

Fuel Storage

There is only one commercial transportation fuel station on the Reservation, the Arrowhead Travel Plaza. The plaza is owned by the CTUIR, is located on the northeast quadrant of the Interstate I-84 interchange with Oregon Highway 331 and contains a fast-food chain restaurant, a mini-mart and services for truckers. The plaza provides gasoline, diesel and liquefied petroleum gas service and is diversifying to serve all travelers. A truck service/repair center is located adjacent to the Travel Plaza and is currently leased to Kenworth.

The map below illustrates the various utility transmission and distribution lines across the Reservation.

Figure 15: UIR Utility Transmission and Distribution on the Reservation.



CTUIR Governmental, Commercial and Industrial Energy Use

CTUIR is focusing on renewable energy development for its government resources. In 2018, CTUIR completed the LED Lighting Retrofit and Solar Power Generation for the CTUIR Science and Engineering Laboratory and Public Transit Center. The project successfully resulted in the facilities ability to fully sustain operations on energy produced by their own grid.[24]

Yellowhawk Tribal Health Center was highlighted as a path-breaking model of sustainability for Oregon within the Oregon Department of Energy 2020 Biennial Review. Yellowhawk is enrolled in Energy Trust of Oregon's Path to Net Zero. Not only is it the first emerging net zero energy health care building in Oregon, but it is the first tribal building to make this commitment as well. Designed to operate at an efficiency 60% greater than typical buildings of its type and achieve an estimated $58,000 in annual energy cost savings, the Health Center has potential to reach net zero energy operation in the future with installation of additional solar panels. The infrastructure necessary for this has already been constructed on the roof of the building, so achieving net zero certification is well within reach for. Energy saving features include efficient LED lighting, high-performance heating, ventilation and air-conditioning, and an improved building envelope.[25]

Wildhorse Resort and Casino is the largest energy user among UIR enterprises. The resort includes an 18-hole golf course, gambling casino, conference center, Cineplex Theater, RV Park, and 300-room 10-story hotel.

Tamástslikt Cultural Institute is the second largest energy user among UIR enterprises due to its climate control for archival holdings and architectural style. This facility has undergone an energy efficiency study through Energy Trust of Oregon and successfully reduced its energy consumption from 1,169,920 kWh in 2003 to 439,120 kWh in 2012, a usage reduction of 62%. In 2013, the Institute installed a 50 kW net metering wind turbine to offset an additional 25% of its current energy usage. The facility also reduced its use of natural gas from 38,464 BTU in 2003 to 9,425 BTU in 2012, a usage reduction of 75%. The CTUIR also has invested in the Rattlesnake Road Wind Farm (a 103 MW facility located along the Columbia River Gorge), and installed a 123 kW solar PV array and 50 MW wind turbine adjacent the Institute.

Nixyáawii Governance Center Complex was built in 2009. The main building's structural design includes energy efficiency and conservation. The Complex also includes a Public Safety Building (2007), the Department of Science and Engineering Field Station laboratory building (2012) and Kayak Public Transit maintenance building with bus barn (2013).

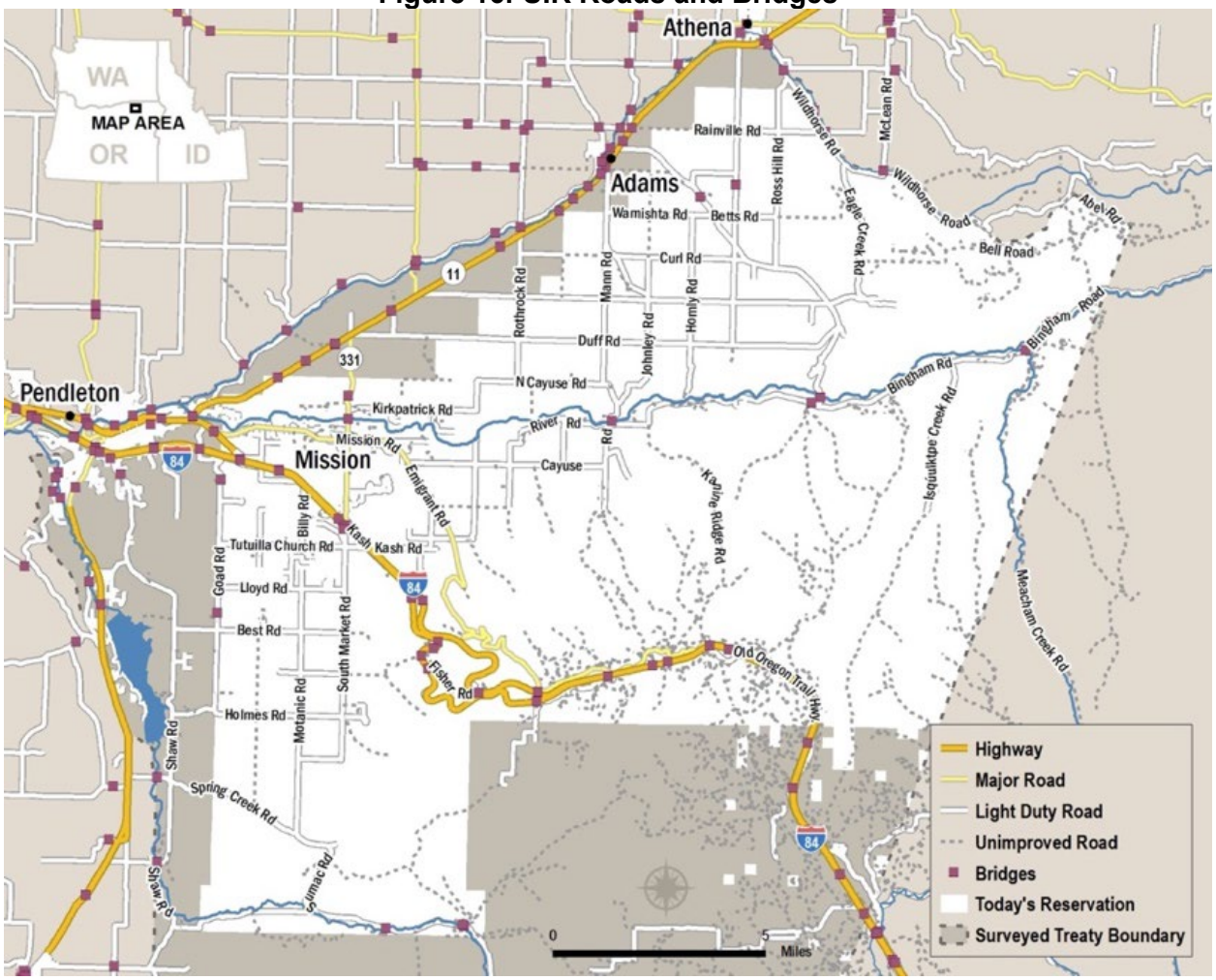
Coyote Business Parks (North, South and East completed in 2008):

- **Coyote Business Park South** is a shovel-ready 286-acre industrial park consisting of 14 developable lots for light industrial use. Located south of I-84 on the UIR, the site is currently undeveloped but water, sewer, gas and electric utilities have been installed.
- **Coyote Business Park North** is a shovel-ready 67-acre commercial park containing 15 developable lots. Three lots are developed: Cayuse Technologies (a computer software developer/call center), Davita Dialysis Center (medical), and a 3-unit retail building currently containing Subway and Dairy Queen restaurants.
- **Coyote Business Park East** is a proposed 82-acre commercial park that would contain 12 lots. The current acreage in Coyote East is developed with the Arrowhead Travel Center and Kenworth Truck Repair businesses.

Transportation

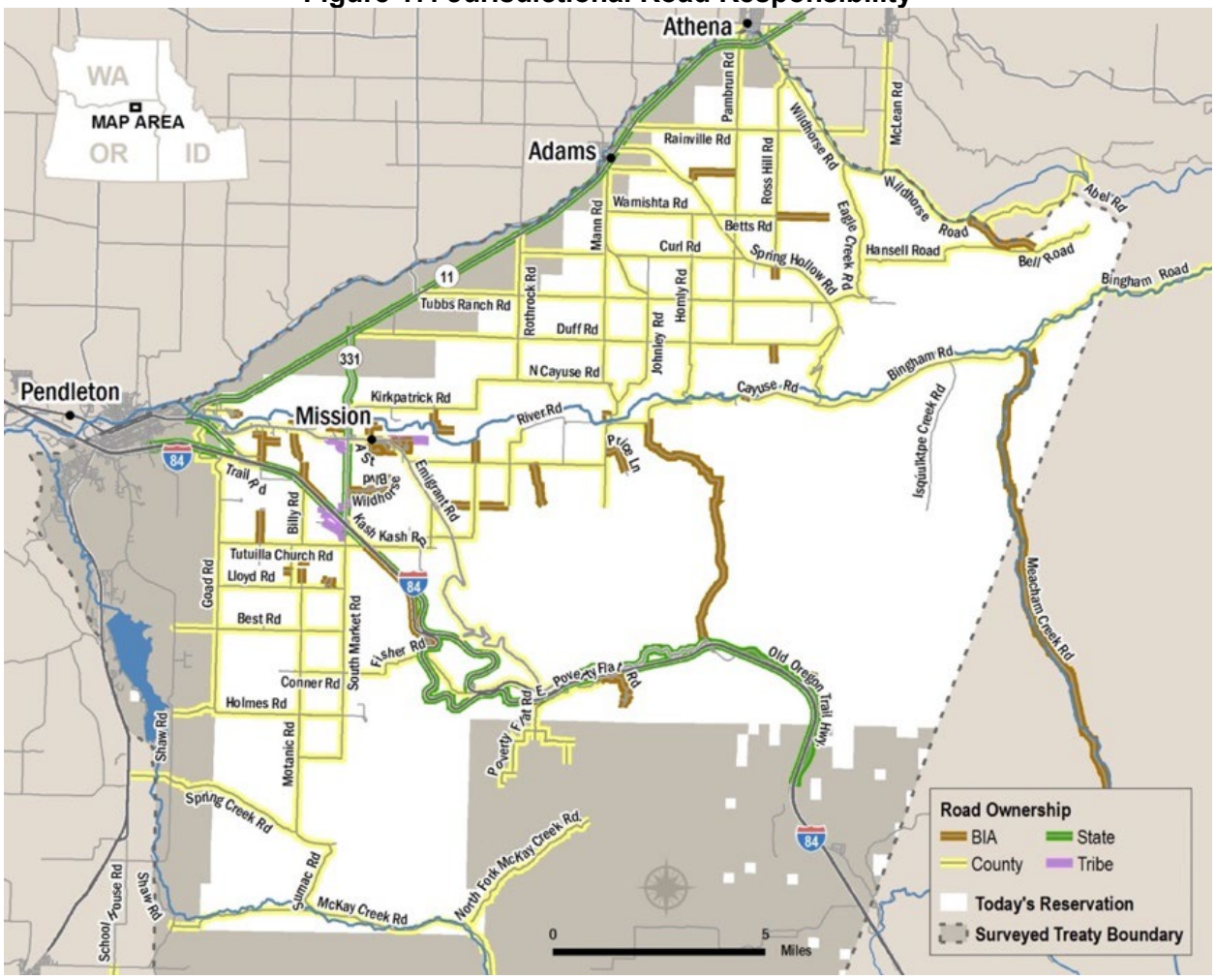
UIR and Umatilla County rely primarily on automobiles and trucks as the main sources of transportation. Maintaining the highway and road system to and within the Reservation is essential to the area economy and general welfare of UIR residents. Interstate 84 runs through the Reservation east-west and Oregon State Highway 331 runs through the reservation north-south. Most roads and bridges on the UIR are maintained and under the jurisdiction of Umatilla County with some roads and bridges under the jurisdiction and maintenance of the CTUIR Public Works Department. The closest regional airport is just outside of Pendleton. The map below shows roads and bridges within the UIR.

Figure 16: UIR Roads and Bridges



There are 20 bridges on or partially on the Reservation. Most bridges are not seismically retrofitted, creating significant risk to the commuting population, the region's economy, particularly in areas that may be at risk for earthquakes. Incapacitated bridges can disrupt traffic and exacerbate economic losses because of the inability of industries to transport services and products to clients. The bridges in the region are part of the interstate, state, and local highway system. Some bridges are maintained by the Oregon Department of Transportation, while others are maintained by the County. The map below illustrates both roads and bridges by jurisdictional responsibility.

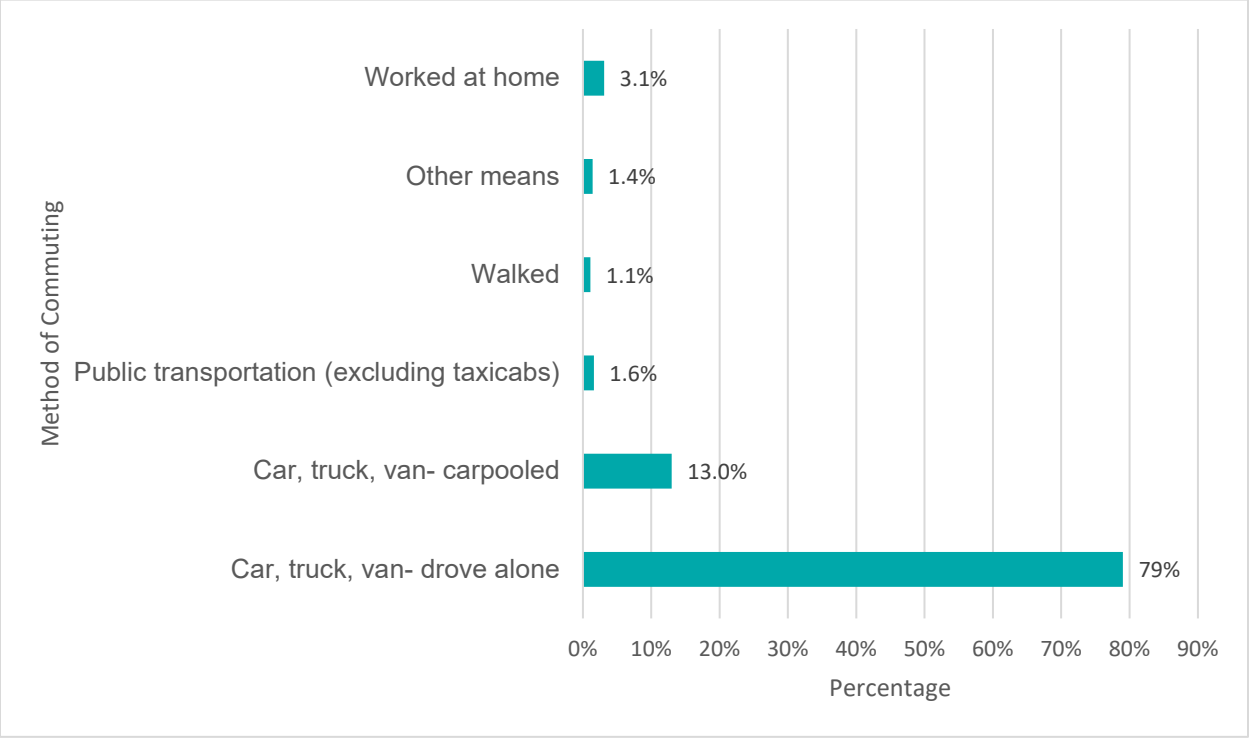
Figure 17: Jurisdictional Road Responsibility



As the area's population increases, automobile and truck traffic will also increase, placing additional stress on local roads, bridges, and infrastructure. The impact of an emergency may disrupt automobile traffic and the CTUIR transit system, making evacuations difficult. This is particularly important where hazardous materials are being transported along Interstate 84 and nearby railroad lines. An accident involving hazardous materials could result in a dangerous situation. In addition, weather related hazards, such as severe winter storms, freezing fog, and localized flooding can render roads unusable and stranding residents. A severe winter storm has the potential to disrupt the daily driving routines of the entire Reservation population as well as interrupt services provided regionally by CTUIR's Kayak Public Transit.

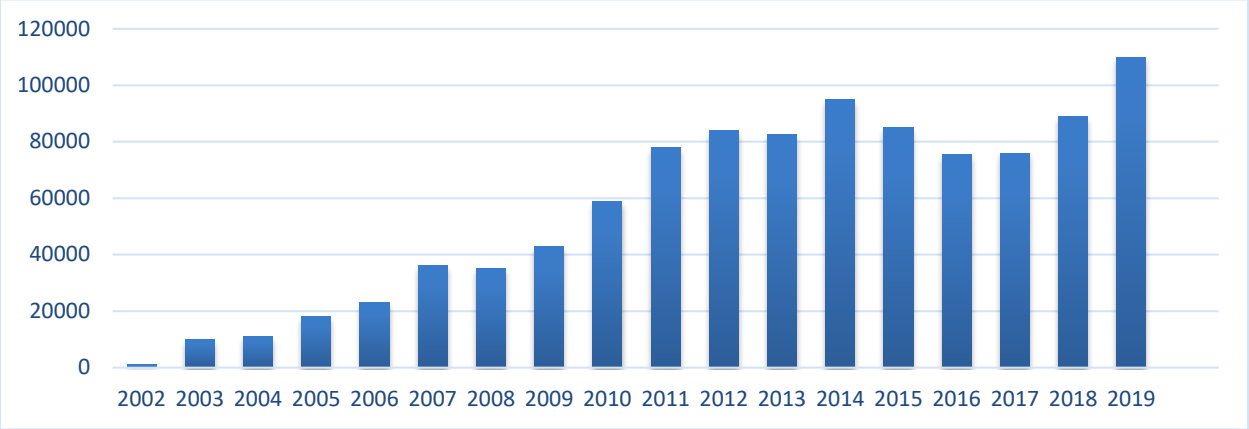
In 2019, an estimated 79% of UIR workers drove to work alone and 13.7% carpooled. Among those who commuted, it took them on average 17.7 minutes to get to work. The graph below illustrates the method of commuting to work by percentage for workers age 16 and over.

FIGURE: Method of Commuting by % of Workers Age 16 and Over



CTUIR began operating a fixed bus route regional public transit system (Kayak Public Transit) throughout the northeastern Oregon and southeast Washington region and a subsidized taxi voucher program. By 2015, Kayak ended all contracted service for bus routes and took over operations. The same year, CTUIR ended the taxi voucher program. Although a high percentage of workers drive alone to work, ridership has continued to increase each year as gasoline prices rise and population in the region increases. The figure below illustrates the consistent increased use of the transit system since it began operating.

FIGURE: CTUIR Ridership Fixed Route (2002 to 2019)



In 2019, Kayak Public Transit buses made 105,961 one-way bus trips. The Kayak bus system provides a significant cost savings to its users and the natural environment by reducing fuel consumption. The following table shows an estimated annual fuel cost savings the Kayak Public Transit bus service provided in 2019. The areas Kayak serves are ranked in order of their possible transit savings in miles, gallons of gasoline, and gasoline purchasing for fixed routes within our service area and factoring in average, local gasoline prices with average highway miles (27 miles per gallon).

FIGURE: Estimated Kayak Public Transit Areas Served and Rates of Potential Cost Savings[26]

City or Community	Round Trip Miles	Monthly Miles	Annual Miles	Gallons Saved	Monthly Savings	Annual Savings
Adams	21.2	424	5,088	188.4	$544.60	$6,535.25
Athena	31.8	636	7,632	282.7	$816.91	$9,802.88
Hermiston	72	1,440	17,280	640.0	$1,849.60	$22,195.20
Irrigon	107	2,140	25,680	951.1	$2,748.71	$32,984.53
La Grande	93.2	1,864	22,368	828.4	$2,394.20	$28,730.45
McNary	92	1,840	22,080	817.8	$2,363.38	$28,360.53
Meacham	51.6	1,032	12,384	458.7	$1,325.55	$15,906.56
Milton-Freewater	55.6	1,112	13,344	494.2	$1,428.30	$17,139.63
Pendleton	19.4	388	4656	172.4	$498.36	$5,980.37
Stanfield	60.8	1,216	14,592	540.4	$1,561.88	$18,742.61
Pilot Rock	44.2	884	10,608	392.9	$1,135.45	$13,625.39
Tutuilla	9	180	2160	80.0	$231.20	$2,774.40
Umatilla	97.6	1,952	23,424	867.6	$2,507.24	$30,086.83
Walla Walla	73.2	1,464	17,568	650.7	$1,880.43	$22,565.12
Weston	37.4	748	8976	332.4	$960.76	$11,529.17

Other modes of transportation for commuting on the UIR include the Wildhorse Resort and Casino Shuttle and Mid-Columbia Bus Company. The Casino Shuttle provides local service for patrons to and from the East Oregon Regional Airport and local hotels. The Bus Company contracts with area school districts providing school bus service only.

Section 3. Hazard Identification and Risk Assessment

An essential component of the Umatilla Indian Reservation (UIR) Hazard Mitigation Plan (HMP) is the identification of natural and human-caused hazards that present potential risks to lives, property, and the natural and cultural resources of the UIR. The Hazard Identification and Risk Assessment is the fundamental building block of the five pillars of emergency management: prevention, mitigation, preparedness, response, and recovery. In today's hazard environment, emergency management is the crux of solving the complex challenges that face communities during an emergency or following a disaster.

The purpose of this section is to identify hazards that have the potential to cause injury or damage and evaluate whether they present a realistic threat to the residents of the UIR. Each hazard was then analyzed to determine the level of risk it presents.

A summary table of the risk assessment findings for each hazard and the type and level of threat each hazard presents is provided in Section 3.3.

3.1 Hazard Identification

The 2021 HMP includes 11 natural and five human-caused hazards. Starting with the hazards included in the 2016 HMP, the Planning Committee reviewed the identified hazards and chose to revise one hazard and add three new hazards. This determination was based on recent events, hazards included in the 2020 Oregon HMP and draft 2021 Umatilla County HMP, and the results of the community survey. The hazards included in this plan are detailed in the table below.

TABLE: Hazard Identification Changes between 2016 and 2021 HMP

Section #	Hazard	Changes from 2016	Justification for Changes
Natural Hazards			
3.4	Communicable Disease	New Hazard in 2021	Added given the impacts of the COVID-19 pandemic. Considered a top hazard based on community survey results.
3.5	Drought	None	
3.6	Earthquake	None	
3.7	Extreme Heat	None	
3.8	Flooding	None	
3.9	Fog	None	
3.10	Landslide	None	
3.11	Severe Winter Storm	None	
3.12	Spring & Summer Storms	None	
3.13	Volcanic Activity	None	
3.14	Wildfire	None	
3.15	Wind Storm	Combined Wind Storm and Dust Storm	Impacts from wind and dust storms are similar and require coordinated mitigation.
Human-Caused Hazards			
3.16	Active Shooter Event	New Hazard in 2021	CTUIR conducts planning for active shooter events, and this is a growing hazard across the country.
3.17	Cyber Attack	New Hazard in 2021	Added to the plan given the increase in national trends of increased attacks on local governments and critical infrastructure.

3.18	Dam Failure	None	
3.19	Hazardous Materials Spill	None	
3.20	Natural Gas Pipeline Failure	None	

The Planning Committee also considered power failures and air quality events as potential hazards for inclusion. Electrical power and internet communication are essential to our society - economy, banking, emergency services, day-to-day living, and lifeline utility systems. Interference with the function of these devices, circuits, and systems has the potential of severely impacting the residents of the UIR. Power failure for a prolonged length of time can pose a threat to human health, especially for vulnerable populations living on the UIR. While an important consideration, the Planning Committee chose to reflect the potential impacts from prolonged power or communications disruptions within each relevant hazard, including winter storms, extreme heat, earthquake, cyber-attack, and others.

Similarly, air quality levels are an important consideration for vulnerable populations within the UIR, especially children, the elderly, and people with disabilities or underlying medical conditions. Air quality is a growing concern related to wildfire impacts across much of the West, as well as more localized dust storms. While air quality is not included in this plan as a distinct hazard, it is considered as an impact within these intersecting hazard events.

3.2 Assessing Risks from Natural and Human-Caused Hazards

Hazard events happen somewhere in the world every day. Whether such events become a disaster depends on whether there are injuries, deaths, or significant property, natural resource, or cultural damage. Therefore, it is important to recognize possible hazard events and their potential to cause damage and injuries to people living within the UIR. Based on the following risk assessment, the objective of this plan is to produce goals and mitigation measures designed to prevent injuries and reduce damage, making the UIR more disaster resistant.

At the most fundamental level, both DHS and FEMA recognize that:

Risk = Frequency of a Hazard X Consequence from that Hazard

To reach a certain level of **risk**, there must be a probability or likelihood for that event to occur (**frequency**). Likewise, if the event does happen, but there is no **impact or consequence**, the level of risk is negated or substantially reduced. To determine risk for each hazard, this assessment considers frequency of the hazard based on historic occurrence, as well as potential consequences, described as impacts to the UIR's infrastructure, economy, housing, transportation system, critical assets, natural and cultural resources, and CTUIR government operations. Sections 3.4 – 3.20 offer a profile of each identified hazard's frequency and impacts to determine overall risk to the UIR. Hazard profiles include:

- Definition, cause, and character of the hazard
- Hazard extent and intensity
- Geographic location where the hazard may occur
- History of occurrence on the UIR and in surrounding areas
- Future probability, with special consideration of climate change conditions
- Vulnerability of the UIR to the hazard
- Potential loss estimates based on the value of land, property, and resources
- Potential impacts to operations, human health, local and regional economy, infrastructure and built systems, and access and availability of First Foods and water resources.

Frequency and Future Probability Criteria

Some hazards can be expected on the UIR given regular climate and weather conditions. In eastern Oregon, cold winters and hot, dry summer months are normal conditions. As these conditions are generally predictable, the possibility of a winter storm, a thunder storm, or fog occurring is much greater than an earthquake or volcano. These types of hazards are "chronic" hazards as they occur with some regularity and can sometimes be predicted through historic evidence and scientific methods. Volcanoes and earthquakes are "catastrophic" hazards as they do not occur with the frequency of chronic hazards and can have devastating impacts on life, property, and the environment on entire regions when they do occur.

The criteria used for evaluating and analyzing the future probability of hazard events is based on historic frequency using the ranges described in the table below.

TABLE: Future Probability based on Historic Occurrence of Hazard Events

Historic Occurrence	200+ years	100-199 years	30-99 years	10-29 years	3-9 years	1-2 years
Future Probability	Unlikely		Somewhat Likely		Highly Likely	
Score	1	2	3	4	5	6

Consequence and Impact Criteria

Anticipated consequences or impacts to the UIR from various hazards are determined using several criteria described in the table below. By using these criteria, a comparison of each hazard can be made to determine which hazards are the greatest threats to the UIR. The assessment of each hazard is based on how they score using the criteria in the column on the left. The determination of which hazards present the greatest risk is based on the combined score assessed against each criterion. The impact score is then combined with the frequency score to generate a risk level of **High**, **Medium**, or **Low** for each hazard. A summary of hazard risk rankings is included in the following section (3.3) and in detail within each hazard profile.

TABLE: Consequence and Impact Criteria and Scoring

Criteria	Very Low	Low	Medium	High	Very High	Catastrophic
Deaths	0-1	2-3	4-5	6-7	8-10	10+
Injuries	0-3	4-7	8-11	12-15	16-19	20+
Critical Assets	Closed for <12 hours	Closed for 1-2 days	Closed for 3-6 days	Long-term disruption	Loss of 50% capacity	Destroyed
Lifelines	Interrupted for <12 hours	1-2 day loss of services	3-6 day Interruption	7-10 day Interruption	Long-term Interruption	Destroyed
Property Damage	Minimal	Localized repairable	Widespread repairable	Substantial damage – 25%	Substantial damage - 50%	Widespread non-repairable
Environm-ental Impact	Minimal	Localized minor	Widespread minor	Localized severe	Widespread severe	Long-term degradation
Economic/ Social Impact	Minimal	Temporary localized	Temporary widespread	1-2 Months	3-5 Months	Long-term disruption
Cultural Impact	Minimal	Localized	Temporary	Substantial	Irreversible damage	Destroyed
Score	1	2	3	4	5	6

Critical Asset Impacts

After determining which hazard events can impact the UIR, the Planning Committee inventoried Tribal assets, critical assets, and resources located on the UIR that could be impacted by the identified hazards. Asset data is managed by the CTUIR GIS Program, which maintains a database of assets including spatial data. The table below identifies CTUIR critical assets that would be impacted by natural or human-caused hazards – either economically, structurally, or culturally. In addition to the critical assets included in the Risk Assessment, each hazard profile includes expected impacts to critical assets.

Throughout the hazard identification and risk assessment, maps provide a visual summary of critical assets at risk to specific hazards. The table below indicates which critical assets are included in mapping, categorized by building type. Some assets, including First Foods habitat, culturally sensitive resources, and some infrastructure are not depicted in maps.

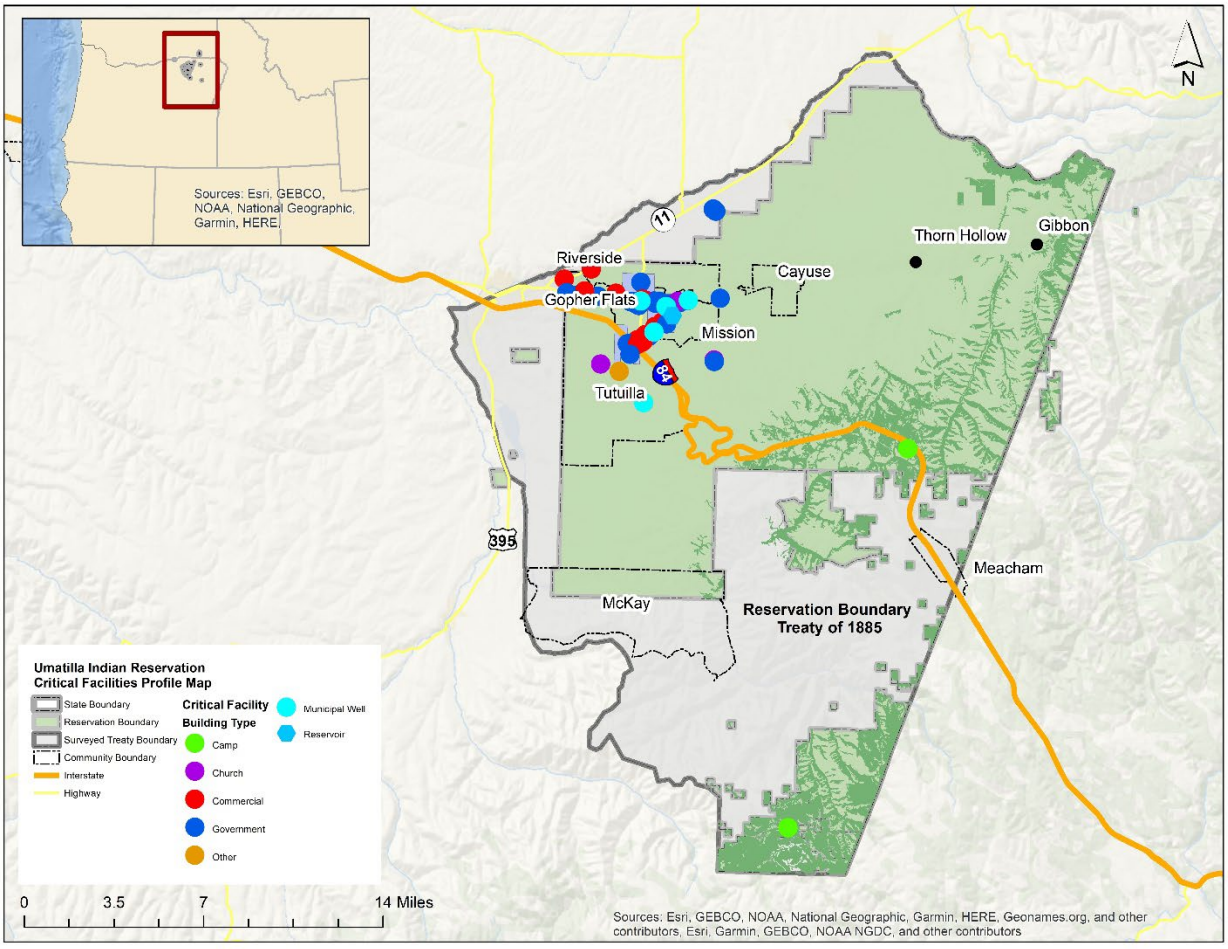
TABLE: CTUIR Critical Assets

Asset Type	Estimated Replacement Cost	Building Type	Included in Maps
Economic Assets			
Coyote Business Parks	$5,500,000	Government	X
Wildhorse Casino, warehouse, misc.	$71,324,466	Government	X
Wildhorse Cineplex	$8,315,888	Government	X
Wildhorse Golf Course-Pro Shop	$1,477,258	Government	X
Wildhorse RV Park	$2,018,097	Government	X
Wildhorse Hotel	$40,234,348	Government	X
Mission Market	$890,520	Government	X
Cayuse Technology	$3,000,000	Commercial	X
Native Plant Nursery	$656,069	Government	X
Arrowhead Travel Center	$9,101,484	Government	X
Davita Dialysis Center	$496,719	Commercial	X
US Forest Service (leased from CTUIR)	$3,000,000	Government	
Field Station Laboratory	$4,500,000	Science Research	
Kayak Public Transit	$2,900,000	Government	X
Tribal Environmental Recovery Center	$1,077,586	Government	X
Commercial Rentals; various sites	$4,763,339	Commercial	X
Farming Enterprises	$2,400,000	Commercial	
Cultural & Historic Resources			
Tamástslikt Cultural Institute	$12,279,230	Government	X
Nixyáawii Community School & Gym Cay-Uma-Wa Head Start	$24,888,000	Government	X
Longhouse	$1,200,000	Government	X
St. Andrews Mission	--	Cultural/Historic	X
Tutuilla Church	--	Cultural/Historic	X
Seventh Day Adventist Church and School	--	Church/School	X
Indian cemeteries and burial grounds	N/A	Cultural/Historic	
Veterans Memorial	$216,990	Cultural/Historic	
Identified and unidentified cultural resources and First Foods	--	Cultural/Historic	
Infrastructure & Critical Facilities			
Nixyáawii Governance Center and Tribal Office Buildings	$40,939,205	Government	X
Umatilla Tribal Fire Department	$1,964,843	Government	X
Yellowhawk Tribal Health Clinic	$7,061,148	Government	X

Public Safety Building (Police Station, Emergency Management)	$2,753,990	Government	X
Tribal Housing	$29,658,668	Housing	X
Transportation Corridor [I-84, Union Pacific Railroad]	--	Infrastructure	X
Water system; wells, tanks, lines *Wells and reservoirs are mapped*	$1,534,419	Government	X
Gas transmission pipelines	--	Infrastructure	
Sewer system lines	--	Infrastructure	
Electric transmission system	--	Infrastructure	
Environmental Assets			
Fish Hatchery and Acclimation Facilities	$8,000,000	Cultural	X
First Foods habitat	--	Cultural	
Wetlands Park	$202,809	Residential/Recreation	
Indian Lake	--	Recreation/Camp	X
Camp Da Kon Ya	--	Recreation/Camp	X

The following map illustrates the critical assets located within the UIR, including government facilities, commercial properties, camps, churches, water infrastructure, and housing units.

FIGURE: Critical Assets Profile Map



3.3 Risk Assessment Results

The Planning Committee analyzed each of the hazards using the Frequency and Consequence/Impact Criteria previously described. The total scores for each hazard event were further refined into three categories to better illustrate which hazards present the greatest threat to the UIR. The three categories and the point total that defines each category are as follows:

- **High = more than 20 points**
- **Medium = 16-20 points**
- **Low = 9-15 points**

The table below provides a summary of the risk assessment results, as well as a comparison to the 2016 HMP risk assessment. Each hazard profile provides more detailed scoring using the Frequency and Consequence/Impact Criteria. Major changes between 2016 and 2021 include:

- **Flooding:** The risk ranking for Flood events increased from Medium to High. The UIR experienced two major flooding events during the plan analysis period (2016-2021).
- **Fog:** The risk ranking for Fog events decreased from High to Medium. While a very frequent hazard, fog does not pose a significant consequence for most UIR residents and community members outside of the traveling public along Interstate 84.
- **Extreme Heat:** The risk ranking for Extreme Heat events increased from Low to Medium. Climate change projections show that eastern Oregon will experience 30+ more extremely hot days in the future, posing increased risk for heat-related impacts as well as drought and wildfire events.
- **Human-Caused Hazards:** All human-caused hazards were ranked collectively as Low risk in 2016. The 2021 plan breaks out each hazard individually, with both Hazardous Materials Spill and Cyber Attack posing a Medium risk.

TABLE: 2021 Risk Assessment Scores

2016 Rank	2021 Rank	Hazard	Total Score	2016 Risk Ranking	2021 Risk Ranking
4	1	Drought	25	High	High
1	2 (tie)	Winter Storms	22	High	High
5	2 (tie)	Flooding	22	Medium	High
2	2 (tie)	Wildfire	22	High	High
N/A	5	Communicable Disease	21	N/A	High
3	6	Fog	19	High	Medium
6 (Dust) and 9	7 (tie)	Wind Storms	17	Medium	Medium
8	7 (tie)	Earthquake	17	Medium	Medium
13	7 (tie)	Extreme Heat	17	Low	Medium
7	10	Spring/Summer Storm	16	Medium	Medium
10	11	Landslide	13	Low	Low
12	12	Volcanic Activity	9	Low	Low
	1	Hazardous Materials Spill	17	Low	Medium
	2	Cyber Attack	16	N/A	Medium
	3 (tie)	Active Shooter Incident	15	N/A	Low
	3 (tie)	Natural Gas Pipeline Break	15	Low	Low
	5	Dam Failure	12	Low	Low

3.4 Communicable Disease

A communicable disease spreads between people through contact with bodily fluids, an airborne virus, or insect bites. A widespread communicable disease can cause a public health emergency as either a more localized epidemic or a global pandemic.

A pandemic is a communicable disease that has spread around the world, causing illness on nearly every continent. Pandemics typically contribute to widespread economic and social impacts through long response and recovery periods.

Pandemic Influenza

Pandemic influenza represents one of the greatest threats within this hazard category and has had historic global impacts.[27]

Symptoms of pandemic influenza vary depending on the virulence of the strain but mirror typical seasonal symptoms including, fever, coughing, sore throat, congestion headaches, soreness in the muscles and joints, chills, and fatigue. During a pandemic, these symptoms can be severe, resulting in hospitalizations and death. The infection rate and mortality rate, two indicators of severity, can vary between influenza strains. The mortality rate and the emergence of severe complications are higher for certain populations, including infants, the elderly, and people with pre-existing health conditions or compromised immune systems. That said, healthy young adults can also be affected by certain strains, including COVID-19.

The most effective strategy for combating pandemic influenza is vaccination. However, since a pandemic is caused by a novel strain, it is likely vaccine will not be available for the first wave and sometimes not until the middle of the second wave. Alternate strategies for mitigation include the use of antiviral medication, antibiotics for bacterial pneumonia often associated with influenza, social distancing, and public health hygienic practices.

COVID-19

Coronavirus disease 2019, commonly called COVID-19, is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease was first identified in December 2019 in Wuhan, Hubei, China, and has since been traced back to an open animal market.[28] COVID-19 is an ongoing pandemic at the time of this plan update. In 2020, there were nearly 80 million cases reported, with more than 1.5 million deaths globally. In the United States alone, there were nearly 20 million cases and 344,000 deaths. Reflecting a significant surge in cases through the winter of 2020-2021, the United States reached nearly 32 million cases and 568,000 deaths by the end of April 2021. The United States has the most cases of any country in the world, followed by India and Brazil.[29]

COVID-19 is spread through close contact, typically through respiratory droplets produced through coughing, sneezing, talking, or breathing. Transmission occurs through droplets that remain in the air for some amount of time. People infected with COVID-19 are most contagious during the early stages of the disease, including before symptom onset through the first three days after symptoms appear. Many people appear to be asymptomatic carriers of the disease, complicating efforts to reduce transmission and track cases.[30]

Public health professionals have recommended safe behaviors to reduce spread, including wearing a mask when in close contact with people outside the household, frequent handwashing, and quarantine after exposure to someone carrying the virus.

COVID-19 on the UIR

Native American communities reacted quickly to the COVID-19 pandemic, in many cases taking stronger precautions than state or local governments. As one article stated, “epidemics have

been part of colonialism since settlers arrived." Emerging research demonstrates that many tribal nations have implemented guidelines and policies that are more effective than those at the state level.[31]

The first case of COVID-19 was detected on the UIR in June 2020. As of the end of April 2021, CTUIR's Yellowhawk Tribal Health Center recorded 254 cases and one death from COVID-19.[32] In the same period, Umatilla County had just over 8,000 cumulative cases of COVID-19 with 84 deaths, a 1% mortality rate.[33] Yellowhawk Tribal Health Center has led response efforts locally, providing vaccination clinics, testing, and contract tracing to community members both within and outside of the UIR.

Outside of influenza and COVID-19, other communicable diseases of concern include foodborne and waterborne infections like E. coli, hepatitis, and HIV and other sexually transmitted diseases.

Extent and Intensity

Pandemics generally occur in multiple waves that last a week to months. Generally, for pandemic influenza, each wave will occur approximately 12 weeks apart. Once a novel strain of influenza can achieve human to human transmission, the pandemic is expected to spread rapidly and across geographic barriers. COVID-19 is still being studied to determine timing and frequency of waves, but data shows waves associated with variant strains and periods of greater human interaction (e.g. holidays and travel/vacation seasons).

Although the likelihood of pandemic is a certainty, their frequency is difficult to predict. In the 20th century, there were three pandemics. In the 21st century, there have already been two - the ongoing COVID-19 pandemic, and the 2009 H1N1 pandemic. Pandemics are characterized by its ability to spread, not their virulence. Pandemics in the past have ranged from severe to mild.

Geographic Location

Communicable disease can affect residents living in all areas of the UIR, and its spread does not respect the boundaries of the Reservation.

History of Disease in the UIR and Surrounding Areas

Since the era of early colonialism, indigenous communities have been vulnerable to disease outbreaks, resulting in catastrophic loss of life and the decimation of communities. Epidemics caused by measles, smallpox, and other diseases led to the death of some 70% of the Native population in the Americas. Through the 19th century, Native Americans contracted deadly diseases such as dysentery, whooping cough, malaria, and others due to often violent displacement and re-location to areas without adequate shelter, clean water, or food.[34]

In addition to this long history of disease outbreaks within local populations, there have been five pandemics during the 20th and 21st centuries: 1918, 1957, 1968, 2009, and 2020. Historically, there is a pandemic every 30 years, although there have already been two pandemics as declared by the World Health Organization in the 21st century, including H1N1 in June 2009 and COVID-19 in March 2020.

- **1918 (Spanish Flu):** The 1918-1919 influenza pandemic was the most severe and deadliest in history. An estimated 500 million people, or 30% of the world's population, were infected with the virus. Approximately 675,000 Americans and at least 50 million people worldwide died from the virus. The virus was first identified in military personnel

returning from World War I in the spring of 1918. There is no agreed-upon origin point for the virus, as mass troop movements likely contributed to its rapid spread. The pandemic was characterized by three distinct waves, peaking in the U.S. during the second wave in the fall of 1918.[35]

- **1957 (Asian Pandemic Flu-H2N2):** This new influenza virus first emerged in Singapore in February 1957, followed by Hong Kong, and U.S. coastal cities by the summer of that year. An estimated 116,000 Americans and 1.1 million people worldwide died from the virus.[36]
- **1968 (Hong Kong Flu-H3N2):** The strain of influenza leading to the 1968 pandemic led to more significant deaths in people 65 and older. First reaching the U.S. in September 1968 from returning soldiers in Vietnam, the virus led to 1 million deaths worldwide and about 100,000 in the U.S.[37]
- **2009 (Swine Flu-H1N1):** H1N1 was first detected in the United States in April 2009. Nearly one-third of older people in the U.S. were found to have antibodies to this strain of H1N1, likely due to exposure to similar strains. The CDC estimates there were over 60 million cases and nearly a quarter-million hospitalizations in the U.S. Approximately 12,000 people died from the virus in the U.S., and between 151,000-575,000 worldwide, of which an estimated 80% were under the age of 65.[38]
- **2020 (COVID-19):** As an ongoing pandemic at the time of this plan update, COVID-19 is described in-depth at the beginning of this profile. Oregon received a Presidential Disaster Declaration on March 28, 2020, after the Governor declared a state of emergency on February 7, 2020. The state of emergency was still in place at the time of plan development.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely.** The 2020 Oregon Hazard Mitigation Plan does not include communicable disease as a hazard; no probability ranking is available for comparison.

Climate Change Impacts

Mosquito-related (e.g., West Nile) and tick-related (e.g., Lyme disease) vector-borne diseases may be influenced by a changing climate. Increasing winter temperatures could decrease the die off of these vectors, increasing exposure. Additionally, drought conditions and diminished natural water sources can lead to increase transmission of vector borne illnesses by birds and mosquitos. These vectors concentrate in developed areas where humans provide water and food, increasing interactions and breeding within storage areas.[39]

Similarly, as human-caused climate change and loss of animal habitat influences animal migration, humans and animals are more often coming into contact, increasing the risk for pathogens to spread.

Vulnerability of the UIR to Disease

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **High Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include communicable disease as a hazard; no vulnerability ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Communicable Disease		
Criteria	**Score**	**Description**
Deaths	3	4-5 deaths expected
Injuries	6	Catastrophic, 20+ injuries (serious illness) expected
Critical Assets	1	Interrupted for <12 hours
Lifelines	1	Interrupted for <12 hours
Property Damage	1	Minimal
Environmental Impact	1	Minimal
Economic and Social Impact	5	3-5 month disruption
Cultural Impact	4	Substantial
Frequency Score	3	Somewhat Likely; expected every 30-99 years
Total Impact Score	**25**	**High Risk**

Public health emergencies, especially those of longer duration, introduce stress to the healthcare system and can have rippling impacts on the local and national economy. Influenza and other communicable diseases can also lead to increases in health complications and pose a greater risk to older individuals and those with underlying health conditions. The actual impacts of an event will be highly dependent on the duration, scale, and location of the incident.

COVID-19 also exposed challenges in the United States with successfully introducing interventions to slow the spread of the virus. Inconsistent messaging at the local, state, and federal levels leaves residents confused or distrustful of public health recommendations. As mass-vaccination efforts are underway in the U.S. and UIR, there is lingering concern about how vaccine hesitancy will hinder the goal of “herd immunity.”

Loss Estimates

Global pandemic events can contribute to significant economic losses across all sectors and communities. Other communicable diseases can have an extensive impact on livestock operations which may be subject to disease outbreaks. Livestock and animal products account for 22% of agricultural sales in Umatilla County – mostly cattle.[40]

Impacts on CTUIR Operations

A public health emergency can have significant impacts on the availability of first responders, healthcare personnel, and other emergency operations staff. These professionals can be easily exposed to pathogens or individuals carrying a virus, especially if there is not sufficient personal protective equipment (PPE) available or PPE protocols in place. Local hospitals and care facilities may experience a rapid increase in patients seeking care, potentially overwhelming capabilities. CTUIR is served by Yellowhawk Tribal Health Clinic.

Impacts on Human Health and Happiness, Economics & Community

Public health emergencies tend to have widespread impacts on many populations, but some residents are more at risk of complications than others. At-risk populations may include:

- Adults 65 years and older
- Pregnant women and women up to 2 weeks from the end of pregnancy
- People with chronic medical conditions (i.e. asthma, heart failure, chronic lung disease, obesity, etc.)
- People with compromised immune systems (i.e. diabetes, HIV, cancer, etc.)

Some communicable diseases may also pose a greater risk to children under 2 years old or people receiving certain medications or therapies. It is important to note that there are significant racial and ethnic disparities in the potential impact of a public health emergency. Inequities in the social determinants of health put some groups at increased risk of getting sick or dying, as was the case during the global COVID-19 pandemic.[41] Some factors influencing this risk include:

- **Healthcare access and utilization:** those without access to adequate insurance, or those with limited access due to a lack of transportation, child care, the ability to take time off work, or language and cultural barriers.
- **Occupation:** people in "essential work settings" such as healthcare facilities, emergency operations, farms, factories, grocery stores, and public transportation will be in close contact with the public during a public health emergency. Additionally, individuals with limited paid sick days may feel pressured to come to work even if they are symptomatic or live with some showing symptoms.
- **Education, income, and wealth gaps:** people with limited job options, due to lower school completion rates or barriers to college, have less flexibility to leave jobs that put them at greater risk of exposure. Individuals with lower incomes cannot afford to miss work and/or do not have adequate savings.
- **Housing:** people living in more crowded housing may find it more difficult to avoid close contact or exposure. Additionally, people with lower incomes are at risk of eviction, shared housing, or homelessness.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

The greatest risk to critical infrastructure is the availability of personnel to properly maintain and operate infrastructure. The staff themselves may become ill or need to attend to family members or others who are ill. Additionally, jurisdictions and companies responsible for managing critical infrastructure will need to have adequate protocols in place to protect workers from exposure while at work.

Impacts on Water and First Foods

While a public health emergency does not have immediate effects on the environment, a prolonged event like that of COVID-19 can lead to more limited resources and staffing for important environmental management activities. Public agencies responsible for water quality testing, parks and open space management, and other essential services may face resource limitations or budget cuts that restrict these activities.

3.5 Drought

Drought is a period of prolonged dryness resulting from a lack of precipitation or diversion of available water supplies. Droughts can be characterized by either a short-term (seasonal) or long-term (several years) deficiency. They appear to be cyclic and can have a profound effect on the economy, particularly the hydro-power and agricultural sectors.

Drought is a part of an expected cycle between more wet and more dry periods in any given region. There are several common types of droughts, including:

- **Meteorological:** Defined by the degree of dryness (as compared to an average) and the duration of the dry period. These are region-specific and only appropriate for regions characterized by year-round precipitation.
- **Hydrological:** Associated with the effects of periods of precipitation shortfalls (including snow) on the surface or subsurface water supply (e.g., streamflow, reservoir, and lake levels, and groundwater). Impacts of hydrological droughts do not emerge as quickly as meteorological and agricultural droughts. For example, a deficiency of reservoir levels may not affect hydroelectric power production or recreational uses for many months.
- **Agricultural:** Links characteristics of meteorological or hydrological drought to agricultural impacts. An agricultural drought accounts for the variable susceptibility of crops during different stages of crop development from emergence to maturity.
- **Socioeconomic:** Links the supply and demand of some economic good (e.g., water, forage, food grains, and fish), with elements of meteorological, hydrological, or agricultural droughts. This type of drought occurs when demand for an economic good exceeds supply because of a weather-related shortfall in the water supply.

Extent and Intensity

The severity of a drought depends on many factors, including the moisture deficiency, duration of drought, and the size of the affected area. The United States Drought Monitor (USDM) classifies drought by intensity, with D1 as the least intense level, and D4 the most intense. The figure below illustrates the details and key indicators behind these classifications.

FIGURE: U.S. Drought Monitor Drought Classification[42]

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Geographic Location

Drought can affect the entirety of the UIR. Much of Oregon faces challenges with drought and water scarcity, especially the arid and dry areas east of the Cascades. Areas that rely on snowpack for runoff and soil moisture, including the UIR, can experience "snow drought" as was the case in 2015.[43]

History of Drought in the UIR and Surrounding Areas

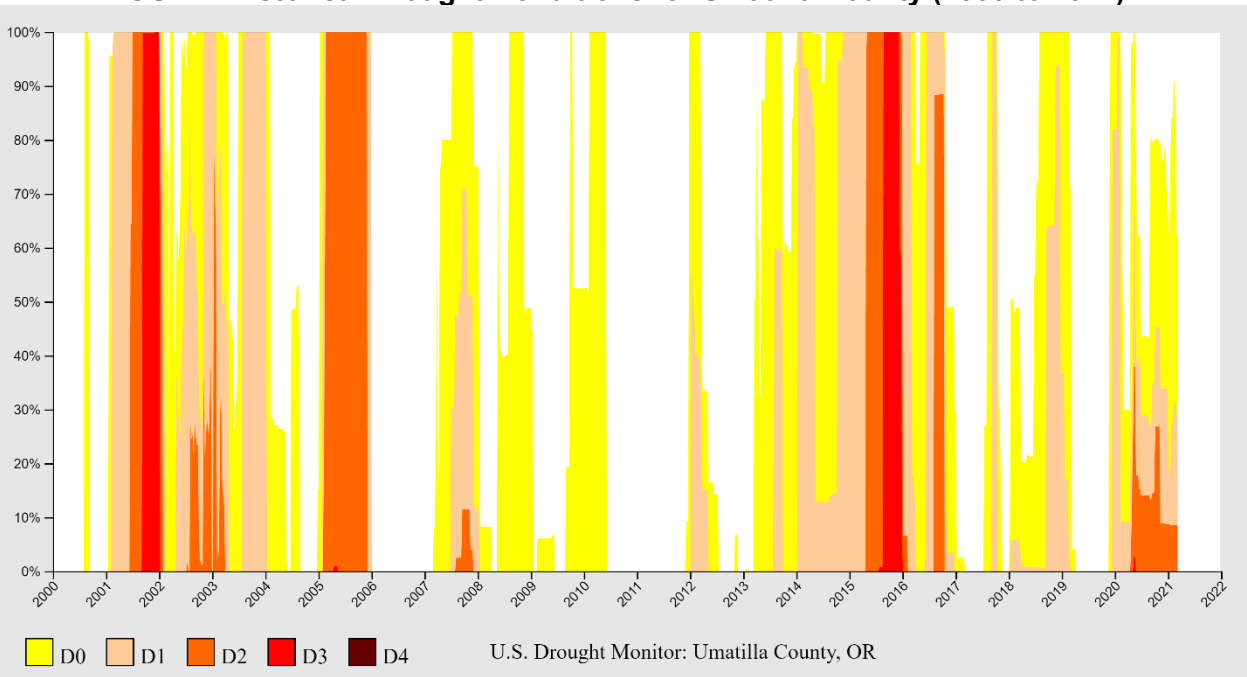
Oregon's drought history reveals many short-term and a few long-term events. The table below includes significant drought events affecting the UIR since 1900.

TABLE: Significant Drought events in Oregon, the UIR, and Surrounding Areas[44]

Date	Location	Description
1939-1941	Statewide	The 1920s and 1930s, known more commonly as the Dust Bowl, were a period of prolonged mostly drier than normal conditions across much of the state and country. Three years of extreme drought in Region 5.
1959-1964	Eastern Oregon	No description available.
1976-1977	Eastern Oregon	The 1976-1977 drought was the most severe drought in the region, with significant agricultural impacts. Nineteen counties, including Umatilla County received a federal disaster declaration in 1977.
1994	Eastern Oregon	Governor's drought declaration covered 11 counties, including Region 5 and Umatilla County.
1999	Region 5	$2,260,000 in crop damage was reported in the region due to drought.[45]
2001-2005	Eastern Oregon	2001-2002: Governor declared drought in 23 counties including Umatilla County. Declarations continued for many counties through 2003. Umatilla County and the rest of the region were declared again in 2005.
2007	Umatilla County	USDA declared Umatilla County a primary disaster designation for crop losses.[46]
2015	Statewide	All 36 Oregon Counties received federal drought declarations, including 25 under Governor's drought declaration. USDA declared Umatilla County a primary disaster designation for crop losses in 2015 and 2016.[47]
2020	Statewide	USDA declared Umatilla County, and most of Oregon, a primary disaster designation for crop losses.[48]

The figure below illustrates historical drought conditions in Umatilla County from 2000 to present, based on the USDM drought classification. Umatilla County has reached D2 – Severe Drought five times over the last twenty years (2001-2003, 2005, 2007, 2015-2016, 2020), and reached D3 – Extreme Drought at least twice, in 2001 and 2015.

FIGURE: Historical Drought Conditions for Umatilla County (2000 to 2021)[49]



Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **Medium Probability** of drought.[50] According to the Oregon HMP, the average recurrence interval for severe droughts in Oregon is somewhere between 8 and 12 years.[51]

Based on Precipitation-Evapotranspiration Index for Region 5 (including Umatilla County), there have been 19 moderate-extreme drought events since 1895, a recurrence interval of about 6.5 years. Umatilla County has received drought declarations in 21% of the years since 1992, a recurrence interval of about 5 years. [52]

Given the incidence of drought since 2000, as demonstrated in the USDM figure above, this recurrence interval is likely shrinking due to factors of human-caused climate change, leading to more frequent and potentially more severe drought events.

Climate Change Impacts

Projections show one of the primary impacts of a changing climate on the Pacific Northwest will be more severe summer droughts, leading to more conflict over water rights, management, and conditions. With more precipitation falling as heavy rain or rain-on-snow events, groundwater stored in shallow and deep aquifers will be reduced. Surface water is more subject to summer heat, leading to adverse effects on aquatic ecosystems. Climate change projections also point to increase extreme heat events and increased wildfire risk.[53]

Vulnerability of the UIR to Drought

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **High Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Risk** of this hazard, driven by high social vulnerability, high frequency, and potential impacts to the agricultural economy.[54] According to the FEMA National Risk Index, the UIR census tract has a **Relatively High Risk** rating to drought.

TABLE: Impact and Consequence Assessment Results – Drought		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted less than 12 hours
Property Damage	3	Widespread repairable
Environmental Impact	5	Widespread severe
Economic and Social Impact	4	1-2 months
Culture Impact	4	Substantial (First Foods)
Frequency Score	5	Highly Likely; expected every 3-9 years
Total Impact Score	**25**	**High Risk**

According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a "**Very High" Vulnerability** to drought.[55] Many of Umatilla County's neighbors, including Gilliam and Morrow counties, are considered the most vulnerable jurisdictions in Oregon to future drought, based on the frequency of disaster declarations. This assessment is mostly driven by high levels of social vulnerability in Umatilla County.

Loss Estimates

Communities that rely on agriculture are most at risk of short-term droughts and rainfall or snow shortages. Dry periods, and the associated evapotranspiration, can lead to loss of moisture in soil and impact vegetation and crops. Agricultural industries in the region are very vulnerable to drought, as well as the associated impacts of land disturbance and loss of productive soils.

Economic losses due to drought are difficult to estimate since its impact would principally be felt in the agricultural community and is generally more short term in nature. According to the FEMA National Risk Index, the UIR census tract has a "Relatively Moderate" expected annual loss rating, with all the total of $71,317 annual loss contributed to agriculture.

Impacts on CTUIR Operations

A prolonged drought is expected to have minimal impact on operations. Medical facilities may experience an increase in residents in need of medical care in the most extreme cases. Most operations impacts could be related to associated wildfire impacts. Prolonged drought could impact groundwater capacity for the UIR, impacting Tribal and enterprise operations as detailed below in the First Foods and Water section.

Impacts on Human Health and Happiness, Economics & Community

People and livestock suffer most from droughts. In a drought, community water supplies can be affected sometimes forcing water conservation measures. Potable water to the Mission Community Planning area is dependent on ground water wells to provide service to residents and enterprises. Ground water travels slowly and originates in the Blue Mountains located on the eastern side of the Reservation. Although a drought may not have an immediate impact on domestic alluvial ground water wells, a sustained drought period could cause more declines in the availability of ground water long term. The CTUIR community water system is completely dependent on multiple deep wells to supply the water necessary to the sustainability of Reservation residents and economy.

Impacts on Infrastructure, Built Systems, and Energy Production & Use

Drought does not affect buildings or infrastructure, but an extreme drought can reduce power generation from hydroelectric dams in Oregon. Most impacts on critical infrastructure are minimal and related to secondary hazards such as increased wildfire risk.

Impacts on Water and First Foods

When a drought occurs, it affects everyone living and working on the UIR and Tribal interests beyond the Reservation boundaries. Droughts cause surface water as well as groundwater declines. Surface and groundwater declines can directly impact fisheries, the aquatic environment, economic development, and long-term rural and urban economic security.

Droughts can affect the Tribes' interests in other ways. When a drought occurs, the desire to find other water sources increases. Droughts can force the execution of water rights which implements irrigation restrictions. This in turn can ruin agricultural crops. Accompanying this action can be pressure to change existing water allocations for fisheries, agriculture, and other uses. Groundwater declines in western Umatilla County have directly impacted fisheries, the aquatic environment, economic development, and long-term rural and urban economic security.[56]

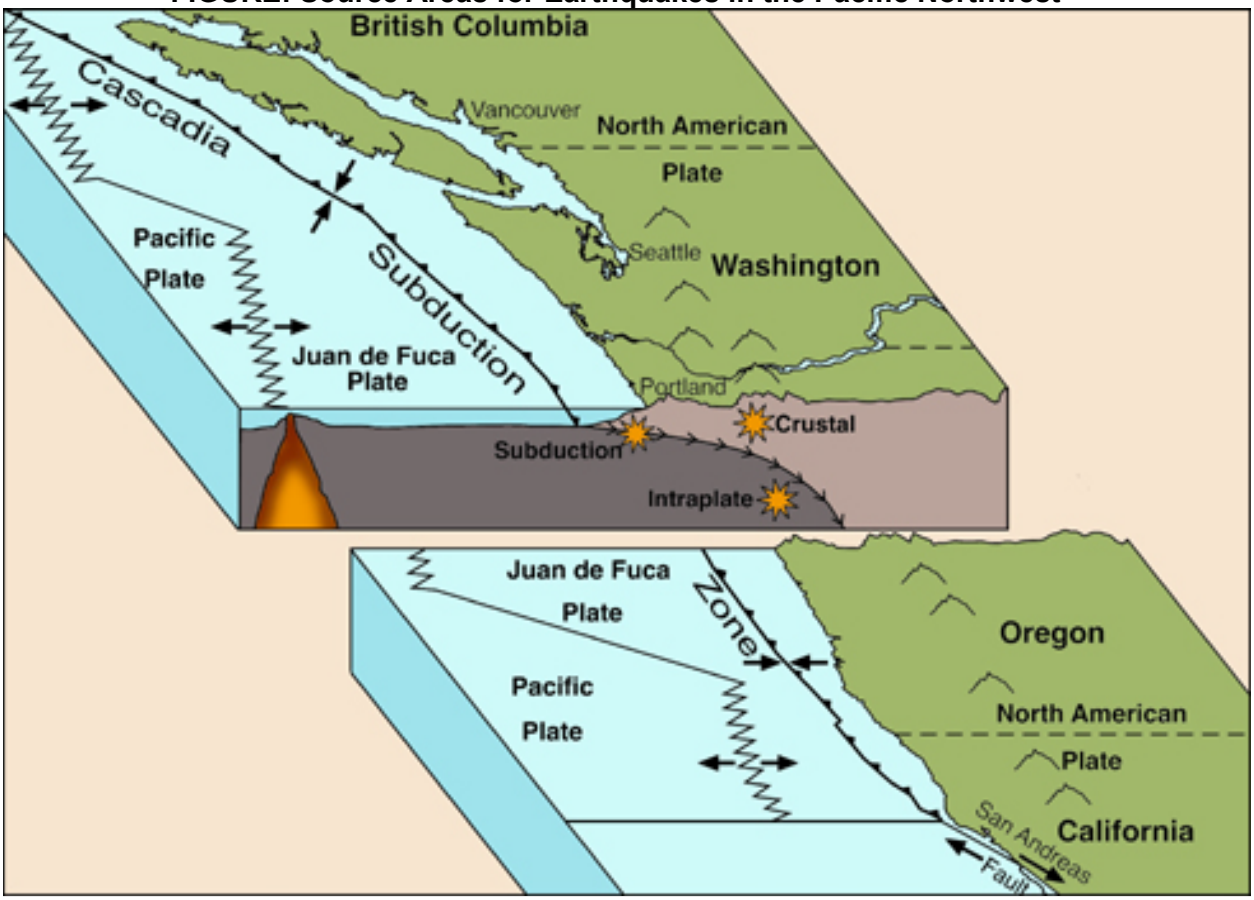
Additionally, droughts can significantly impact First Foods on the Reservation. Root crops will not be as robust and are more difficult to harvest in dry conditions. For example, roots such as lúukš are very difficult to dig out of dry ground. Tribal members may need to travel to higher elevations to find foods that were once more prevalent at lower elevations, creating a shorter window to harvest important cultural foods and medicines.

3.6 Earthquakes

Earthquakes are sudden releases of energy that usually occur along existing fractures in the Earth's surface, called a fault or fault line. The U.S. Geological Survey (USGS) defines earthquakes as "a sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth." Tectonic plates are always slowly moving, but they get stuck at their edges due to friction. When the stress on the edge overcomes the friction, there is an earthquake that releases energy in waves that travel through the earth's crust and cause shaking. Most earthquakes are small and virtually unnoticeable. Major earthquake can be catastrophic.

The UIR is susceptible to damage and shaking from earthquakes from various sources, including megathrust earthquakes on the Cascadia Subduction Zone and smaller crustal events along faults. Intraplate earthquakes are also possible in the Pacific Northwest, although there is no historic record of damage from these events in Oregon. The graphic below shows the three different types of earthquake events (Subduction Zone, Crustal, and Intraplate) in the Pacific Northwest.

FIGURE: Source Areas for Earthquakes in the Pacific Northwest[57]



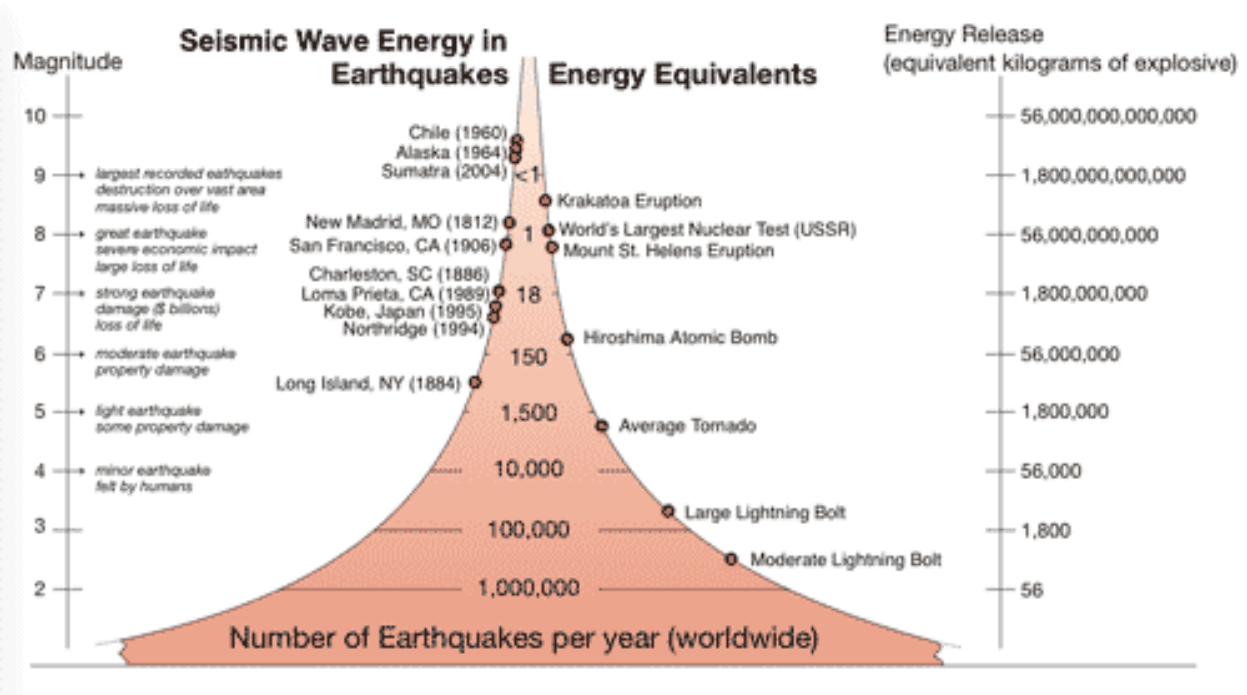
Extent and Intensity

There are several ways to measure the severity of an earthquake event, including magnitude, energy release, and shaking intensity.

Magnitude is the physical size of an earthquake, and is expressed on a logarithmic scale, meaning each number increase in magnitude is a tenfold increase (i.e., a 6.3 earthquake has a 10x greater magnitude than a 5.3 earthquake). The Richter Scale is a commonly referenced scale for measuring magnitude but is not actually used by seismologists today.

Energy Release is the amount of energy radiated by an earthquake and creating potential damage to buildings and structures, averaged over the entire event. The figure below illustrates the magnitude and energy release of earthquake events, organized by their frequency.[58]

FIGURE: Seismic Magnitude and Energy Release



Intensity is the measurement of shaking from an earthquake event at a particular geographic location. The intensity is dependent on the distance from the fault rupture area, as well as geologic factors of the ground beneath you. Intensity is generally measured using the Modified Mercalli Intensity Scale in the United States, described in the figure below.[59]

TABLE: Modified Mercalli Intensity Scale				
CIIM Intensity	**People's Reaction**	**Furnishings**	**Built Environment**	**Natural Environment**
I	Not felt			Changes in level and clarity of well water are occasionally associated with great earthquakes with distances beyond which the earthquakes are felt by people.
II	Felt by a few.	Delicately suspended objects may swing.		
III	Felt by several; vibration like passing of truck.	Hanging objects may swing appreciably.		
IV	Felt by many; sensation like heavy body striking building.	Dishes rattle.	Walls creak; window rattle.	
V	Felt by nearly all; frightens a few.	Pictures swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of cracked paster and cracked windows within the community.	Trees and bushes shaken noticeably.
VI	Frightens many; people move unsteadily.	Many objects fall from shelves.	A few instances of fallen plaster, broken windows, and	Some fall of tree limbs and tops, isolated rockfalls

TABLE: Modified Mercalli Intensity Scale				
CIIM Intensity	**People's Reaction**	**Furnishings**	**Built Environment**	**Natural Environment**
			damaged chimneys within the community.	and landslides, and isolated liquefaction.
VII	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly build or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread with increasing intensity.
VIII	Many find it difficult to stand.	Very heavy furniture moves conspicuously.	Damage slight in buildings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	Some forcibly thrown to ground.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X			Most ordinary masonry structures collapse; damage moderate to severe in many buildings designed to be earthquake resistant.	

Geographic Location

The UIR is most likely to experience crustal faults, earthquakes ranging in magnitudes from 5-7, more like a “California-style” earthquake than a catastrophic Cascadia Subduction Zone event. When close to population centers, crustal earthquakes can create intense shaking and damage. The map below shows the seismic hazard for the UIR and surrounding areas, using the Oregon Department of Geology and Mineral Industries (DOGAMI) HazVu Statewide Geohazards Viewer. Two active fault lines cross through the UIR as indicated in purple. Much of the UIR will experience strong ground shaking during an earthquake event as indicated in orange.

FIGURE: Earthquake Hazard Map[60]

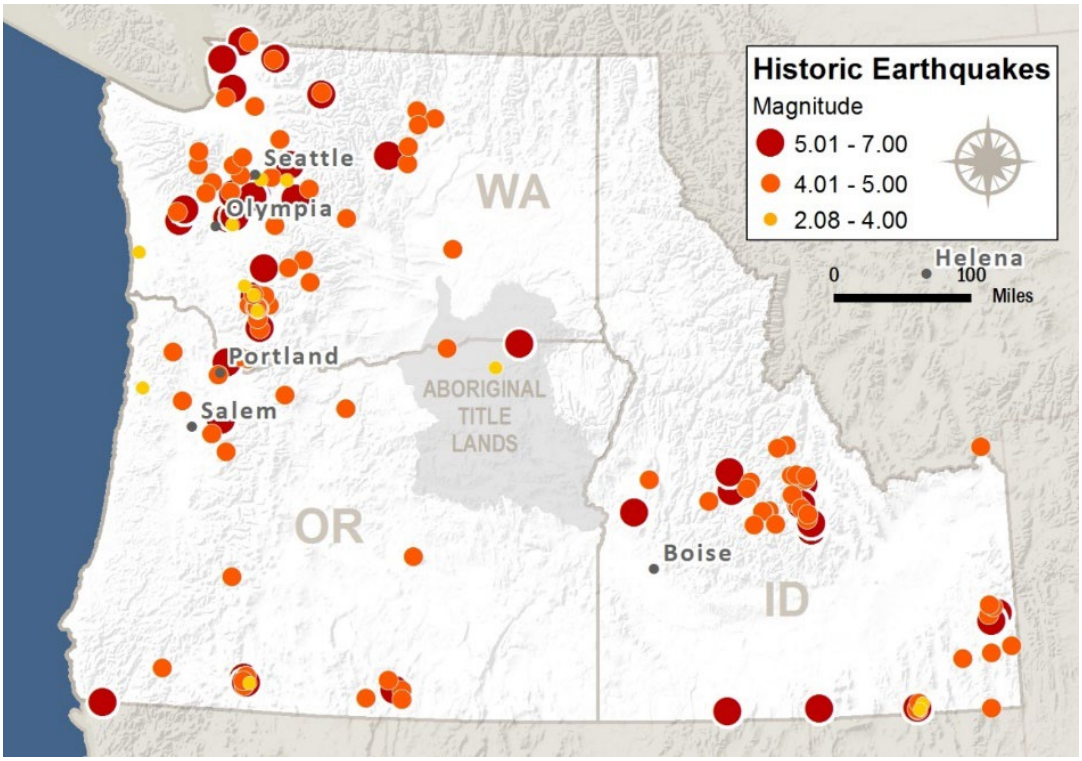
History of Earthquakes in the UIR and Surrounding Areas

Multiple small and some relatively moderate earthquakes have occurred near the UIR. However, the intensity of many previous earthquakes was not recorded because instruments able to record earth movement were not available for eastern Oregon until the mid-2000s. Faults have been active in northeast Oregon for more than 20,000 years, and the UIR has been affected by crustal and intraplate earthquakes, as well as prehistoric Cascadia Subduction Zone events. Three historic earthquakes of significance were centered in and around the UIR, all of which were shallow crustal events.

TABLE: Significant Earthquakes affecting the UIR and Surrounding Areas[61]			
Date	**Location**	**Magnitude**	**Description**
March 1893	Umatilla	VI-VII (MMI)	Damage unknown
July 1936	Milton-Freewater	6.4 M	Eastern Oregon's largest event which included two foreshocks and several aftershocks resulted in $100,000 in damages based on 1936 dollars. Damages included school buildings, chimneys, and houses shifted off foundations.
January 1951	Hermiston	V (MMI)	Damage unknown

The earthquake that occurred closest to the UIR happened at 11:08 PM PST on July 15, 1936, near the state border between Milton-Freewater, Oregon, and Walla Walla, Washington. The event affected an area of about 272,000 square kilometers in the two states and adjacent Idaho. Ground cracking was observed about 6.5 kilometers west of Milton-Freewater, and there were marked changes in the flow of well water (VII). Chimneys were damaged, plaster was broken, and walls cracked. Similar damage was reported in the unincorporated community of Umapine. There were numerous aftershocks up to November 17; more than 20 moderate shocks occurred during the night, and stronger ones were felt (V) on July 18 and August 4 and 27.[62]

FIGURE: Historic Earthquakes in the Pacific Northwest



Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely.**

DOGAMI developed a 100-year probability ranking for Oregon counties to experience damaging shaking, outlined below. Umatilla County was assigned a 15% probability of damaging shaking due to an earthquake event in the next 100-years (Category 2).

TABLE: DOGAMI 100-Year Probability Ranking	
Category	**100-year Probability**
1	Less than 10%
2	10-20%
3	21-31%
4	32-45%
5	Greater than 45%

Vulnerability of the UIR to Earthquakes

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan (HMP), Umatilla County has a **High Risk** Rating when combining probability with potential for property damage and loss of life.[63] This rating is driven by very high social vulnerability.

According to the FEMA Nation Risk Index, the UIR census tract has a **Relatively Low Risk** Rating based on limited historic losses and expected annual losses.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Earthquake		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	2	1 to 2 days loss of service
Property Damage	3	Widespread repairable
Environmental Impact	1	Minimal
Economic and Social Impact	3	Temporary but widespread disruption
Culture Impact	1	Minimal
Frequency Score	4	Somewhat Likely; expected once every 30-99 years
Total Impact Score	**17**	**Medium Risk**

Loss Estimates

To estimate possible damages to the UIR from earthquakes, an extrapolation of DOGAMI's latest available HAZUS findings for Umatilla County was prepared (2016). The Tribal population and their total number of households as a portion of Umatilla County's population and households is about 4%. Applying that percentage to DOGAMI's results reveals that some damage can be expected on the UIR if a major earthquake were to occur. The results of applying the 4% estimate to the total damage for Umatilla County, as estimated by DOGAMI's HAZUS analysis, are described below:

DOGAMI has prepared two HAZUS analyses for earthquakes affecting Umatilla County: the *2500yr Probable Scenario M6.5 Driving* and *the 2500 year Umatilla Arbitrary Crustal*.

Earthquake Damage

A summary of findings from the ***2500yr Probable Scenario M6.5 Driving*** and ***the 2500 year Umatilla Arbitrary Crustal*** are as follows:

Highways

- No major damage is expected to occur to highways from earthquakes in the County including those on the UIR.

Bridges

- There are 20 bridges located on or connecting to the UIR.
- Only 22 out of 280 bridge segments in the entire County are expected to receive moderate damage from an earthquake in the *2500yr Probable Scenario M6.5 Driving* and 6 bridges in the *2500 year Umatilla Arbitrary Crustal* scenario.
- Applying the 4% factor to the DOGAMI HAZUS analysis for the two scenarios, only one bridge on the UIR would incur damage in *2500yr Probable Scenario M6.5 Driving* and no bridges would incur damage from the *2500 year Umatilla Arbitrary Crustal* scenario.

Utilities and Pipelines

The HAZUS 2500-year Probable Scenario M6.5 Driving Analysis indicates the following:

TABLE: Utility and Pipeline Damage (2500-year Probable Scenario M6.5)				
System	**Number of Leaks-County**	**Number of Breaks-County**	**Number of Leaks - UIR**	**Number of Breaks - UIR**
Potable Water	343	648	14	26
Waste Water	271	512	11	20
Natural Gas*	290	547	12	22
Oil	0	0	0	0

The HAZUS 2500-year Umatilla Arbitrary Crustal analysis indicates the following:

TABLE: Utility and Pipeline Damage (2500-year Umatilla Arbitrary Crustal)				
System	**Number of Leaks-County**	**Number of Breaks-County**	**Number of Leaks - UIR**	**Number of Breaks - UIR**
Potable Water	89	131	4	5
Waste Water	70	103	3	4
Natural Gas*	75	111	3	4
Oil	0	0	0	0

As the UIR has major gas and liquefied natural gas pipelines crossing the Reservation at several locations, the actual risks associated with earthquake damage to natural gas pipelines may be greater than the extrapolated figure (4%) used to estimate overall damage from an earthquake.

Building Damage

- The HAZUS M6.5 Driving analysis indicated that 2,663 would likely be damaged in Umatilla County with 925 damaged beyond repair. Four percent of the County total would mean 107 buildings on the UIR would likely receive moderate damage from an earthquake with 37 damaged beyond repair.
- The HAZUS 2500-year Umatilla Arbitrary Crustal analysis indicated that 6,809 buildings would likely suffer damage in Umatilla County with 2600 damaged beyond repair. Four percent of the county total would mean 272 buildings on the UIR could be moderately damaged with 104 damaged beyond repair.

People Needing Shelter

- The HAZUS M6.5 Driving analysis indicated that 2,957 would likely be displaced and 740 people in Umatilla County would need shelter because of this type of earthquake. Four percent of the county total would mean 118 people from the UIR would likely be displaced and 30 people would seek shelter.
- The HAZUS 2500 year Umatilla Arbitrary Crustal analysis indicated that 1,048 would likely be displaced and 42 people in Umatilla County would need shelter as a result of this type of earthquake. Four percent of the county total would mean 118 people from the UIR would likely be displaced and five people would seek shelter.

TABLE: Projected Economic Losses

System	2500 yr Driving - County	2500 yr Crustal - County	2500 yr Driving - UIR	2500 yr Crustal - UIR
Potable Water	12,190,000	5,340,000	487,600	21,360
Waste Water	64,460,000	32,880,000	2,578,400	1,315,200
Natural Gas	6,290,000	1,410,000	251,600	56,400
Electrical Power	52,300,000	10,140,000	2,092,000	405,600
Communications	240,000	5,000	9,600	200
Transportation	200,600,000	96,800,000	7,168,000	3,392,000
Income Losses	61,590,000	19,890,000	2,463,600	795,600
Capital Stock Losses	675,050,000	228,800,000	27,000,200	9,152,000
UIR Projected Losses			**42,051,000**	**15,138,360**

Impacts on CTUIR Operations

A Cascadia earthquake event in Oregon will lead to significant disruptions to transportation and communication infrastructure, including highways, ports, freight and rail lines, cell towers, and more. I-84 is classified by ODOT as a Tier 1 Seismic Lifeline Route, one of the most essential to serve response and rescue operations, reach the most people, and support economic recovery. While the UIR is not expected to see significant ground shaking or cascading landslide and rockfalls, the significant impacts to statewide infrastructure would lead to limited services locally.

CTUIR operations would be significantly impacted by a Cascadia earthquake, but experience less disruption to a smaller, localized event. As noted above in the loss estimates section, a 2,500-year event would cause greater impacts to CTUIR operations. A major earthquake event will lead to a disruption in emergency response services. A severe event would place significant stress on state and regional emergency operations, requiring most police, fire, and emergency medical personnel, overwhelming or potentially disabling disaster services.

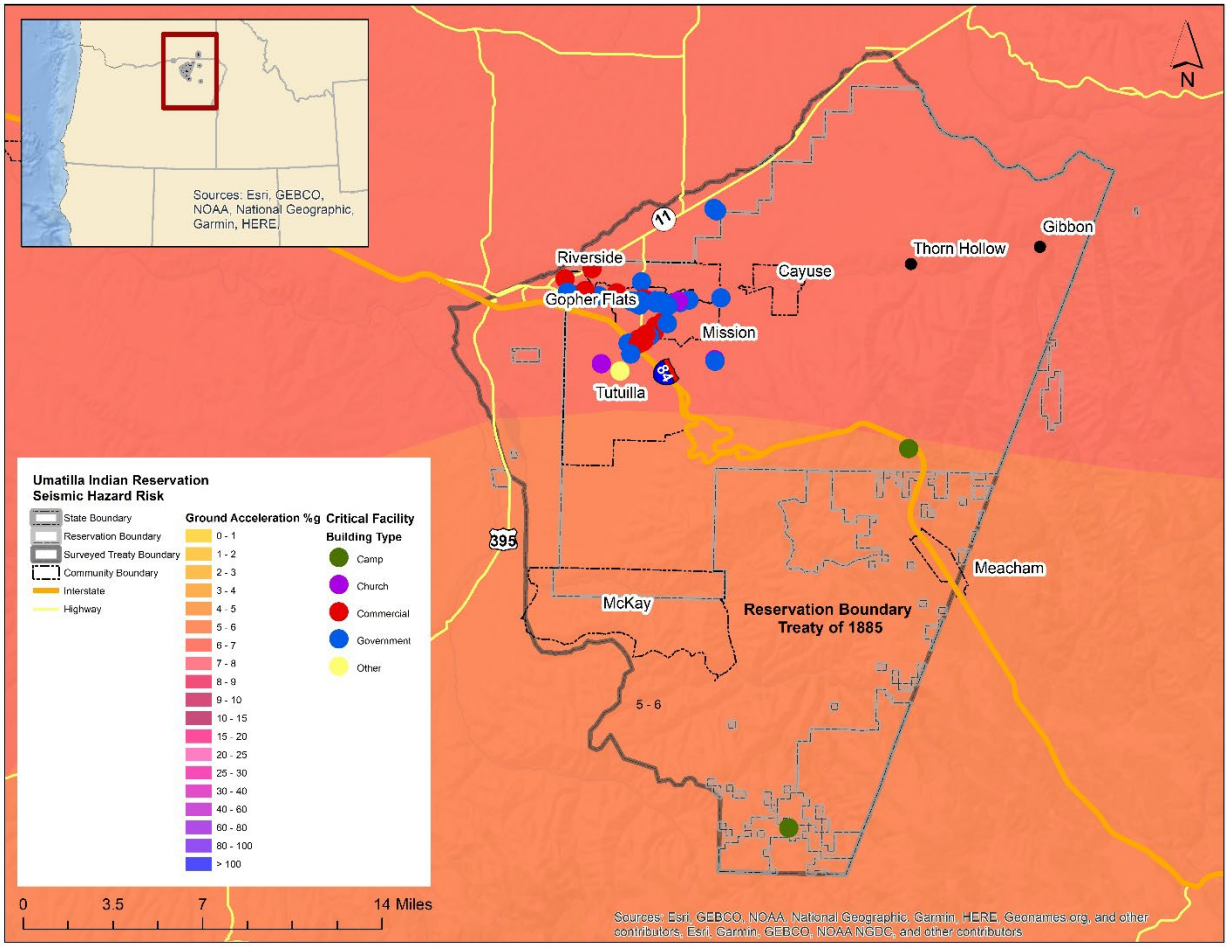
Impacts on Human Health and Happiness, Economics & Community

The main concern from earthquakes on the UIR is possible injuries from falling objects including toppled shelving and articles falling from shelves. While the UIR would experience minimal ground shaking from a Cascadia event, it would have significant impacts on the state and region. A major earthquake in Oregon will lead to disruptions in supply chains and access to markets and services. This could lead to shortages and significant economic impacts for the UIR and surrounding communities. Additionally, damage to shipping channels and facilities along the Columbia River could contribute to long-term supply chain impacts in the region.

Impacts on Infrastructure, Built Systems, and Energy Production & Use

The severity of an earthquake is based on site-specific factors, including distance from the epicenter, soil type, and more. Buildings in low probability earthquake regions are often not designed to withstand a moderate or significant earthquake event. The map below illustrates the peak ground acceleration, which is measured in %g (percentage of gravity) showing the acceleration of gravity both horizontally and vertically. This acceleration assessing the intensity and frequency of seismic events.

FIGURE: Critical Assets and Seismic Hazard Risk on the UIR



As shown in the map, the northern part of the Reservation, where most critical assets are located, has a low-moderate intensity of ground shaking. Potential impacts could include damage to utility infrastructure, aquifer fracturing and marked changes in the flow of well water, buildings, and the resultant negative economic impact to the CTUIR governmental assets and therefore its residents. Historical buildings that could suffer damage include St. Andrews Mission, old Bureau of Indian Affairs office building, and Tutuilla Church. All other critical assets were built or renovated after 1979.

Possible impacts from a relatively severe earthquake could result in: (1) breakage to sewer and water lines; (2) cracks in tribal and municipals wells allowing contamination to infiltrate into wells located on the reservation; (3) breaks to natural gas and oil pipelines; and (4) cracks or destruction to older buildings depending on the construction material and whether the building was designed to withstand earthquakes.

The Wildhorse Casino and Resort, 10-story Hotel, Tamástslikt Cultural Institute, the Public Safety Building (2007), Cayuse Business Park (2007), and Nixyáawii Governance Center (2009) were constructed to meet the International Building Code. It is not expected that these buildings would suffer significant damage from a moderate earthquake and hopefully, would withstand the shaking that would result from liquefaction. Liquefaction is caused when "earthquake waves cause water pressures to increase in the sediment and the sand grains to lose contact with each other, leading the sediment to lose strength and behave like a liquid. The soil can lose its ability to support structures, flow down even very gentle slopes, and erupt to the ground surface to form sand boils. Many of these phenomena are accompanied by settlement of the ground surface — usually in uneven patterns that damage buildings, roads and pipelines."[64]

Impacts on Water and First Foods

In the event of an earthquake, environmental impacts would most likely stem from secondary hazards such as hazardous materials spills or broken utility lines. Major earthquakes can cause significant land and vegetation deformation, but a mild earthquake will cause minimal environmental damage.

3.7 Extreme Heat

Generally, temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation. At certain levels, the human body cannot maintain proper internal temperatures and may experience heat stroke.

Oregon's hottest weather occurs when strong high pressure over Oregon brings descending, warming air and clear skies. Winds from the east or south are customary during such periods. Sometimes heat waves in Oregon are very short-lived; in other cases, hot weather can persist for many days.

Extent and Intensity

The National Weather Service's Heat Index provides a threshold to measure the subjective experience of how hot it feels to the human body by combining temperature and relative humidity. Eastern Oregon does not often experience very high temperatures in combination with high humidity, resulting in very infrequent extreme heat conditions. Typically, extreme high temperatures that occur during the summer months last only a few days.

FIGURE: NOAA National Weather Service Heat Index[65]

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Geographic Location

Eastern Oregon experiences much greater temperature variations than western Oregon, and higher temperatures are likely to last longer and be more intense than west of the Cascades. Much of the marine air that keeps western Oregon cooler in the summer is blocked by the Cascades and prevented from reaching the east side, and any air which does cross the Cascades is greatly modified, becoming warmer and drier. As a result, air temperatures typically decrease with increasing elevation, with the highest air temperatures at low elevations.

Most of eastern Oregon is above 4,000 feet so high temperatures are considerably lower than in the low elevation deserts of the southwestern U.S. In some places, however, deep river valleys have much lower elevations, producing Oregon's hottest summer temperatures. Pendleton, Ontario, and Hermiston are examples of places which frequently experience hot temperatures in summer. In turn, lower elevation communities in the UIR, including the Mission area, are more likely to experience extreme heat events than higher elevation communities in the Blue Mountains.

History of Extreme Heat in the UIR and Surrounding Areas

Many of the highest single-day temperatures were recorded at Umatilla, on the Columbia River not far from Pendleton. Before the Umatilla weather station closed in 1965, it had reported temperatures of 117°, 115° (three times), and 114° (four times). The table below provides a summary of temperature records experienced in Pendleton, just outside of the UIR. Pendleton has an average of 31 days per year above 90°.[66]

TABLE: Temperature Records for UIR and Surrounding Areas[67]

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Normal Daily Maximum	39.7	46.9	54.2	61.3	70.0	79.5	87.8	86.2	76.3	63.7	48.9	40.5	62.9
Mean Daily Maximum	39.5	46.3	53.7	61.5	70.1	78.5	87.7	85.9	76.9	63.4	48.9	40.9	62.8
Highest Daily Maximum	70	75	79	91	100	108	110	113	102	92	80	67	113
Year of Occurrence	1995	1996	1964	1977	1986	1961	1939	1961	1955	1980	1999	1980	1961
Mean of Extreme Maximums	58.4	62.2	68.1	77.7	88.0	94.6	101.4	99.7	92.4	79.9	65.9	59.3	79.0
Normal Daily Minimums	27.2	31.6	35.4	39.4	45.8	52.9	58.0	57.7	49.9	41.0	34.1	27.9	41.7

While high temperatures can occur in eastern Oregon between May and September, these conditions occur without the high humidity that characterize heat waves in other regions. Additionally, most heat waves in Oregon are short lived.

The following table lists historic heat events in Region 5, including Umatilla County and the UIR, from the 2020 Oregon Hazard Mitigation Plan. Recent hot summers in Oregon (2015, 2017, and 2018) did not impact eastern Oregon to the extent of the western and more populated parts of the state. No extreme heat events have been recorded in eastern Oregon since 2011, although at the time of plan development extreme heat events were ongoing across the state.

TABLE: Historic Heat and Excessive Heat Events in Region 5 (Oregon)[68]	
Date	**Description**
July 10-14, 2002	A record-breaking heat wave shattered many daily record high temperatures across the state, with a few locations breaking all-time records.
June 24-26, 2006	A broad upper ridge of unusually high height coupled with a thermally induced surface trough of low pressure lingered over the Pacific Northwest for several days. This pattern resulted in persistent offshore flow, and therefore many days of record smashing high temperatures. Many cities in Oregon saw record-breaking daily high temperatures for multiple days in a row.
July 20-24, 2006	An unusually strong ridge of high pressure brought several days of record breaking hot and humid weather to NW Oregon. Many cities in Oregon saw record-breaking daily high temperatures for multiple days in a row. Many daily maximums were between 10 and 20 degrees above normal. A few sites reported record high minimum temperatures during this very humid event; a couple broke record high minimums as well. 4500 homes lost power during this event. In north central and eastern Oregon, daily maximum temperatures between 100 and 113 degrees were observed at lower elevations, with temperatures 90 to 100 degrees at elevations up to 4000 feet. Several people were treated for heat related illness
June 28-30, 2008	An upper-level ridge and thermal trough across the Pacific Northwest produced temperatures above 100 degrees for two consecutive days breaking records in many locations. Two people died of heat-related illness.
August 15-17, 2008	An upper-level ridge and dry air brought excessive heat into eastern Oregon. Many locations experienced multiple days of at least 100-degree temperatures.
July 25-26, 2010	Temperatures topped 100 degrees for two successive days in Hermiston, Pendleton, 5 miles northeast of Pendleton, Ione, Echo, Arlington, and Umatilla.
August 1, 2011	A dry weak westerly flow aloft under a broad upper-level high pressure system combined with a surface thermal trough to bring several days of temperatures in the 90s.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **Very High Probability** of extreme heat events.[69] This is a relative probability, dividing counties within the state into quintiles considering the historic and projected future frequency of days above 90°. As previously discussed, high temperatures are common in eastern Oregon, but are rarely paired with high relative humidity.

Climate Change Impacts

The Oregon Hazard Mitigation Plan included extreme heat as a hazard for the first time in 2020 in recognition of the increased frequency, duration, and intensity of extreme heat events in the state. Human-caused climate change is contributing to the severity of heat events in Oregon, making the hottest days in the summer warmer.[70] It is extremely likely that the frequency and severity of extreme heat events will continue to increase in Oregon. For the UIR, this will mean more days with very hot temperatures, potentially an additional 30 hot days per year.[71]

Vulnerability of the UIR to Extreme Heat

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **Moderate Vulnerability** to extreme heat events.[72] This is based on a combination of the County's social vulnerability with adaptive capacity. In short, while the community has a significant population of vulnerable community members, residents are generally prepared for extreme heat events. But, given the high frequency of extreme heat events, the 2020 Oregon Hazard Mitigation Plan assigned a **High Risk** Rating to the County. The FEMA National Risk Index does not provide a risk rating for the UIR census tract.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Extreme Heat

Criteria	Score	Description
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Facilities	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	1	Minimal
Environmental Impact	5	Widespread Severe
Economic and Social Impact	1	Long-term disruption
Culture Impact	1	Minimal
Frequency Score	5	Highly Likely; expected every 3-9 years
Total Impact Score	**17**	**Medium Risk**

Extreme heat events are the deadliest weather-related event in the country. That said, deadly heat waves in other parts of the country combine extreme heat, high humidity, and a persistent heat wave. These conditions are less likely in Oregon, and high temperatures do not often lead to such dangerous events.

Loss Estimates

It is difficult to provide accurate estimates of dollar losses due to extreme heat events. It is expected that losses could come from damage to infrastructure – roads, railroads, and power systems – and crop and livestock losses. Losses are most likely to be attributed to secondary hazards related to extreme heat, such as wildfire and drought events.

Impacts on CTUIR Operations

The impacts to CTUIR operations are expected to be minimal from extreme heat events. The greatest risk would be any prolonged power outages due to rolling blackouts as controlled by

utility providers. Intentional power disruptions are increasingly common to prevent wildfires. Pacific Power, one of the utility providers for CTUIR, outlines Public Safety Power Shutoff (PSPS) areas that could experience shut offs during extreme weather events.[73] CTUIR lands are not included in PSPS areas at this time.

Impacts on Human Health and Happiness, Economics & Community

Extreme heat can kill by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is slowed, and the body must work extra hard to maintain a normal temperature. Heat exposure can lead to heat exhaustion or heat stroke, characterized by dizziness, fatigue, headache, nausea, and lightheadedness. Dehydration is common particularly where extreme heat and high humidity combine. Small increases in temperatures can lead to heat-related deaths, especially for vulnerable community members with underlying medical conditions.

The people most vulnerable to extreme heat include children, older adults, people with existing medical conditions or disabilities, people with limited incomes, people who work outdoors, or people who live outdoors (those experiencing homelessness). As the region regularly experiences temperatures over 90° F, most people are both accustomed and prepared for extreme heat events. Over 90% of single-family homes in state Cooling Zone 3 (which includes Umatilla County) have air-conditioning.[74]

Impacts on Infrastructure, Built Systems, and Energy Production & Use

Extreme temperatures can disrupt important infrastructure, including delayed rail service or damaged railroad tracks. Extreme heat also places higher demand on the power grid for cooling, leading to potential cascading failures. Additionally, Oregon Department of Transportation (ODOT) has determined that roadways are vulnerable to damage from extreme heat and is planning for investments in roadway improvements based on an upcoming Climate Change Vulnerability Assessment.

Impacts on Water and First Foods

If a stagnant high predominates to the north or east of Pendleton during the spring, the hot, dry conditions may prove detrimental to crops during late May and June. Prolonged warm temperatures and extreme heat can increase tree mortality and deteriorating forest conditions, leading to fire danger in forest and grassland areas. More intense summer heat will also contribute to warmer water temperatures, affecting aquatic systems and fish populations. Additionally, important First Foods may be less viable during extreme heat conditions, including huckleberries drying on the stem or root crops going to seed more quickly. Extended extreme heat conditions will shorten the window for harvest of these important cultural foods and medicines.

3.8 Flooding

Flooding is defined by the National Weather Service as the inundation of normally dry areas because of increased water levels in an established watercourse. Two types of flooding events are included in this plan:

- **Riverine or Stream Flooding**: Riverine flooding occurs when a channel receives more water than it can hold, and the excess water flows over its banks and inundates low-lying areas, causing a flood. Riverine flooding can occur due to rapid snowmelt or prolonged or heavy rainfall, which is also a cause of flash flooding.
- **Flash Flooding:** Flash floods result from a large amount of rain in a short period of time, typically within six hours of an event. This type of event is particularly hazardous in mountainous areas or other places with restricted floodplain storage. More urbanized areas may see flash flooding due to a lack of permeable surfaces.

Flooding can be natural, human-caused, or a combination of both. Human-caused flooding includes dam failure, levee failure, and activities that increase the rate and amount of runoff, such as paving, reducing ground cover, and clearing forested areas. The amount of damage caused by a flood is influenced by the speed and volume of the water flow, the length of time the impacted area is inundated, the amount of sediment and debris carried and deposited, and the amount of erosion that may take place.

Although floods can happen at any time during the year, there are typical seasonal patterns for flooding in Oregon and likewise for the UIR. The following are the causes and characteristics of the types of floods likely to occur on the Reservation:

- The most common type of flooding is associated with unseasonably warm weather during the winter, with rain falling on accumulated snowpack in the Blue Mountain and causing flooding at lower elevations.
- Rainfall combined with melting of the low elevation snowpack typically causes early spring floods.
- Flash floods are typical in the summer months, associated with severe storm events.

Flood Terminology

Several flood-related terms are frequently used in this plan and are defined below.

- **Flood Insurance Rate Map (FIRM):** The Flood Insurance Rate Maps (FIRM) are the official maps on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
- **Floodplain:** A floodplain is an area adjacent to a lake, river, stream, estuary, or another water body that is subject to flooding. If left undisturbed, the floodplain serves to store and discharge excess floodwater. In riverine systems, the floodplain includes the floodway.
- **Floodway:** Floodway means the channel of a river or other watercourse and the adjacent areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

Extent and Intensity

Under the National Flood Insurance Program (NFIP), the Federal standard for floodplain management is the **100-year floodplain.** This area is chosen using historical data such that in any given year, there is a 1% chance of a Base Flood (also known as 100-year Flood or Regulatory Flood).

A **500-year floodplain** has a 0.2% of being equaled or exceeded each year. The nomenclature can be confusing and does not mean this flood will only happen every 500 years. This type of flood has at least a 6% chance of occurring in a 30-year time period with the 100-year flood.

Flood Insurance Rate Maps (FIRMs) identify flood zones through detailed hydrologic and hydraulic studies. These zones represent the areas susceptible to the 1% annual chance flood, or 100-year flood. Where possible, FEMA also determines a Base Flood Elevation (BFE) for the 100-year floodplain, which is the calculated elevation of flooding during this event and a commonly used standard for determining flood risk and managing potential floodplain development. These maps provide a more definitive representation of the highest flood risks in the communities.

Since the 100-year flood level is statistically computed using existing data, as more data comes in, the level of the 100-year flood will change. As more data are collected, or when a river basin is altered in a way that affects the flow of water in the river, re-evaluation is needed. Alterations can include dams and urban development, and other human-made changes in a basin that affect floods.

Geographic Location

Flooding on the UIR is limited to low areas near the Umatilla River, Meacham Creek, Łskúulpa Creek, Buckaroo Creek, Patawa Creek, Mission Creek, and McKay Creek. Major floods in this area usually last less than one week and occur in late winter or spring. Flash floods, that last only a few hours, may also occur from late spring through summer.

In 2001, the U.S. Army Corps of Engineers (COE), Jerry R. Gardenhire, PE, completed a “Report of Flood Fight Potential Sites in Umatilla County, Oregon” for the area within the Portland District that includes the UIR. This study identified areas on the Reservation which were vulnerable to flooding and those areas best suited for temporary or permanent flood prevention measures. Although data for this report was primarily gathered in 2001, it still provides an excellent historical basis on which to evaluate and build effective flood mitigation measures.

The Gardenhire Report focused on the Gibbon, Cayuse, and Mission rural unincorporated residential community areas on the UIR that are near the Umatilla River. In the Gardenhire Report an evaluation of crossing structures located at previous flood damaged areas were varied; ranging from corrugated metal culverts to bridges of various kinds. Two areas where quite a few homes are located, are the Upper McKay Creek area and upstream and downstream of the Gibbon community on the Umatilla River.

There are three sites upstream of the Upper McKay Creek area where the creek eroded the county road, closing it. There are approximately 15 homes upstream of these sites, which would be cut off from access. Along the Umatilla River there are two sites, downstream from the Thorn Hollow area (between Gibbon and Cayuse) similar to the McKay Creek situation.

The Mission Community residential area known locally as the “July Grounds,” although not within the designated Flood Hazard Overlay Zone as defined by the 100-year floodplain, is a low-lying area where homes and roadways are subject to minor flooding due to high water table events. The Yellowhawk Tribal Health Clinic is located near the “July Grounds” and has been impacted when these events occur with water running across access roads and parking areas.

History of Flooding in the UIR and Surrounding Areas

CTUIR participates in the National Flood Insurance Program (CID #4100012) and the last FIRM for the area was issued on September 3, 2010. CTUIR does not currently participate in the Community Rating System.[75]

The UIR and surrounding areas have a significant history of flash flood, flood, and heavy rain events. There have been three Presidential Disaster Declarations for the UIR and Umatilla County since 1996, including one major flood, severe storm, mudslide, and landslide event in February 2020. A description of these major disasters is below.

February 5-9, 2020 (DR-4519):[76],[77]

Preliminary data shows that this was a 100-year flood event for the Umatilla River. A combination of heavy snow followed by heavy rain led to reduced snowpack at high elevations, followed by significant flooding at low elevations. The flooding caused extensive damage to areas along the Umatilla River, including homes, roads, railroads, as well as other public facilities. I-84 was closed at several locations over the course of five days. Several semi-trucks were stranded in the flood waters with extensive damage to the highway.

Tragically, one resident was swept away by flood waters and died. Several residents had to be evacuated via helicopter or 4-wheeler with 70 homes on the UIR damaged. Numerous levees along the Umatilla and Walla Walla Rivers were damaged or overtopped including several locations on the UIR and adjacent to Pendleton. Damage is estimated at $1.3 million to private property on the UIR, with damage for public infrastructure for Umatilla County at $39.7 million.

February 4-21,1996 (DR-1099): Flooding occurred affecting numerous areas within the UIR. The Umatilla River was 11.2 feet high and 13,432 cubic feet per second. On February 8, 1996, a news release from the UIR indicated that the Thornhollow and the Gibbon areas remained closed to traffic while the following areas were still impacted by floodwaters: Ɬsqúulktpe Creek, McKay Creek, Buckaroo Creek, Kirkpatrick Road, Section Line Road, South Market Road, and Short Mile Road. On February 9, 1996, the UIR news release indicated that sandbags along Kirkpatrick road were holding, but those around Cayuse had not held and water had broken through. The Mission Community Center remained open for people needing shelter and food.

December 1996 – January 1997 (DR-1160): On February 7, 1997, the Superintendent of the Umatilla Agency of the Bureau of Indian Affairs declared a “local emergency” due to flood waters created by heavy rains and snow runoff from the Blue Mountains. All creeks channeling water into the Umatilla River throughout the Reservation were flooding. The Thornhollow and the Gibbon areas on the Reservation were closed to traffic. Some families stranded by floodwaters needed rescue. Ɬsqúulktpe Creek, McKay Creek, Section Line Road, South Market Road, Short Mile road and Confederated Way continued to be impacted by flooding.

The following table describes flooding events between 1997-2020 as recorded in the NOAA NCEI Storm Events Database for Umatilla County.

TABLE: Flash Flood, Flood, and Heavy Rain Events for the UIR and Surrounding Areas (1997-2020)[78]		
Date	**Type**	**Description**
May 29, 1997	Flash Flood	A flash flood sent water into Pilot Rock High School and Junior High School, covered parts of highway 395, flooded a few basements, and filled a house and yard with mud lifting it off its foundation.
Sep. 8, 1998	Heavy Rain	0.75 inches of rain fell in 20 to 25 minutes.
Nov. 24, 1999	Heavy Rain	I-84 closed at Meacham.
Feb. 14, 2000	Heavy Rain	Steady rain fell all day and washed mud and other debris on several city streets. This rain, which totaled 0.93 inches at the Pendleton Airport, also washed out a section of Wildhorse Road near Weston. $4,000 property damages.
Apr. 26, 2005	Flash Flood	A rupture in a retaining wall of a wastewater storage lagoon led to a dam failure which sent 77 million gallons of wastewater onto highway 207 south-southwest of Hermiston, washing out part of the road, and depositing several feet of silt on the road. A resident across the highway ended up with four feet of mud surrounding his home. The flash flood also damaged lines in the Westland Irrigation District. The storage lagoon was at around half capacity at the time of the flood. $170,000 property damages.
Jun. 13, 2009	Heavy Rain	In 15 minutes, 0.75 inch of rainfall and small hail fell which produced minor flooding over the road near Pilot Rock.
May 17, 2010	Heavy Rain	Very heavy rainfall caused street flooding, ditch erosion, and water in some basements. One half to one inch of rain fell within a 20-minute period. The very heavy rainfall limited visibility which caused an automobile-pedestrian accident with one injury.
Jun. 1, 2010	Heavy Rain	Late frost and heavy rainfall caused at $3.5 million loss to the cherry crop around Milton-Freewater.
Jan. 16, 2011	Flood	Minor to moderate flooding along the Umatilla River from Gibbon to Echo. The gauge at Gibbon crested at 7.21 which was .21 above flood stage. The gauge at Pendleton crested at 10.31 which was 2.51 above flood stage.
Jul. 16, 2012	Flash Flood	Heavy rainfall caused flood waters and mud to flow into Helix and damage 16 roads, yards, homes, and basements.
Apr. 19, 2013	Flood	Flooding occurred at the Umatilla at Gibbon and Pendleton. The water washed out a section of the road near the Umatilla Forks Campground.
Sept. 5, 2013	Flash Flood	Several reports of severe weather from wind damage to large hail, and flash flooding hit portions of central and northeast Oregon on September 5th. The largest hail reported was 1.75 inches and the strongest estimated wind gust was 70 mph.
Mar. 10, 2014	Flood	Heavy rain fell across much of the northern Blue Mountains. March 9th received very heavy rain with snow levels around 6000'. This allowed for a significant increase in runoff, which lead to a quick rise in rivers for the period. Along the Umatilla River, water was reported running beneath a structure near Cayuse, there was sandbagging in the Riverside area near Pendleton with water into several yards. There continues to be bank erosion along the river from Reith to Echo. There was also small stream flooding along Meacham Creek and Wildhorse Creek, with water spilling into pastures.

May 22, 2015	Flash Flood	Scattered Thunderstorms producing heavy rain over the Blue Mountains migrated over the Pilot Rock on the afternoon of May 22nd. Two cells, one from the southwest and the other from the northeast collided and dumped over 1.50 inches in less than an hour to the small city. Water was reported over the roadway and County Emergency Managers were sand bagging near the 900 block of Birch Creek.
Mar. 16, 2017	Flood	Heavy rain and snow melt resulted in flooding along portions of the Umatilla River. The Umatilla River near Gibbon (flood stage 7.0') crested at 7.8 feet.
Jun. 26, 2017	Flash Flood	In Pendleton, heavy rain caused several small debris flows along Airport Road and several intersections were flooding with water about 5 to 6 inches deep. Rainfall amounts include 1.54 inches of rain at the NWS office at the Pendleton Airport, with 0.88 inch falling in 30 minutes.
Feb. 4, 2018	Flood	Two to three inches of rain fell along the west slopes of the Blue Mountains from February 1-4. The increased runoff caused high water levels and minor flooding along the Umatilla and Walla Walla Rivers. Umatilla River near Gibbon (flood stage 7.0') crested at 7.5 feet.
Apr. 9-10, 2019	Flood	Snow water equivalents near 200% of normal in the Blue Mountains coupled with warm temperatures and near record rainfall totals for April produced significant river flooding across eastern Oregon. McKay Creek, with headwaters in the Blue Mountains saw significant rises with record inflows recorded at McKay Reservoir in Pendleton. This resulted in increased releases from the McKay Dam, with flooding downstream along the creek through Pendleton. Teams were out in partnership with Team Rubicon and surveyed 102 homes in the McKay area. Nine homes reported flooded basements, 28 homes reported subfloor or foundation flooding and 65 homes had water encroachment on the property. Over 90 homes had actively sandbagged their property. A combination of high flows from rain and snow melt coming out of the Blue Mountains and record releases out of McKay Reservoir produced field and roadside flooding downstream of Pendleton.
Feb. 6, 2020	Flood	Heavy snow on February 4-5 was followed by a period of heavy rain, February 5-7. Snow levels rose to near 5000 feet. The heavy rain and snow melt lead to moderate flooding and several landslides along the East Slopes of the Washington Cascades. There was record flooding on several rivers, including the Umatilla, Walla Walla, and Touchet rivers with widespread flooding of numerous other creeks and streams and rivers across Umatilla, Union, and Wallowa Counties of Oregon and Walla Walla and Columbia Counties of Washington. The streams and rivers continued the rapid rises through the day on February 6, with the Umatilla River reaching record high water levels at the gaging sites near Gibbon and at Pendleton. There was record flooding along the entire reach of the Umatilla River.
May 20, 2020	Flood	Heavy rain with QPF amounts of 2-4 inches across the Blue Mountains, Blue Mountain Foothills, and John Day Highlands produced areal and river flooding on May 20th and ending on May 21st. Most of the flooding was minor. The most significant flooding was reported in Pilot Rock along Birch Creek where some homes were flooded. Minor flood was reported along McKay Creek in Pendleton due to outflow from the Dam. Flooding was also reported in and around Ukiah. The Umatilla at Gibbon and Pendleton both reached flood stage cresting at 8.3 and 12.4 feet respectively.

Prior to 1997, records of flooding events impacting the Reservation are scattered across several sources. The table below outlines reported flood events and damages.

TABLE: Flood Events in Umatilla County prior to 1997				
Date	**Type**	**Location**	**Description**	**Source**
Dec.1964	Flooding	Statewide	Record-breaking floods throughout state; heavy snow in mountains followed by intense rain; considerable flood damage. Umatilla River reached 11.4' and 12,300 cubic feet per second.	2020 Oregon HMP
Jan. 1965	Flooding	Umatilla County	Umatilla River reached 12.1' and 15,500 cubic feet per second.	Umatilla County HMP
Jan. 1975	Flooding	Umatilla County	Umatilla River reached 11.5' and 14,082 cubic feet per second.	Umatilla County HMP
Jul. 1978	Flash Flood	Umatilla County	Crop damages reported.	SHELDUS
Feb. 1979	Flooding	Umatilla County	Crop damages reported.	SHELDUS
Feb. 1986	Heavy Rain Flooding	Statewide	A warm rain on snow event led to widespread flooding and considerable damage across the state. Crop damages were reported across Umatilla County.	SHELDUS, 2020 Oregon HMP
Jan. 1990	Flooding	Umatilla County	Crop damages reported.	SHELDUS
May 1991	Flooding	Umatilla County	Crop damages reported.	SHELDUS
Aug. 1991	Flash Flood	Umatilla County	Crop damages reported.	SHELDUS
May 1993	Flooding	UIR	A dike broke leading to the flooding of 10 homes and $50,000 damage.	NWS
May 1995	Flooding	McKay Reservoir		NWS
Nov. 1995	Flooding	Umatilla County	Crop damages reported.	SHELDUS

The table below provides historic and recent crests on the Umatilla River near Gibbon. The gauge is located on the UIR in the foothills of the Blue Mountains. Crests have exceeded flood stage at least 21 times and moderate flood stage at least four times. The Umatilla River has exceeded flood stage three times during the HMP analysis period (2016-2020), as indicated in **bold text** below. Historic crests for the Upper McKay Creek are not available.

TABLE: Historic Crests on the Umatilla River near Gibbon[79]		
Flood Stage	**Date**	**Crest**
Moderate Flood Stage (exceeding 9 feet)	**Feb. 7, 2020**	**11.32 feet**
	Jan. 29, 1965	9.50 feet
	Nov. 8, 1995	9.40 feet
	Jan. 25, 1975	9.18 feet
Flood Stage (exceeding 7 feet)	Dec. 12, 1946	8.84 feet
	Jan. 1, 1997	8.76 feet
	May 21, 2020	**8.31 feet**
	Apr. 20, 2013	8.28 feet
	Apr. 10, 2019	**8.26 feet**
	Feb. 23, 1986	8.10 feet
	Mar. 10, 2014	7.93 feet
	Dec. 28, 1946	7.86 feet
	Mar. 16, 0017	7.80 feet
	Apr. 20, 1958	7.78 feet
	Jan. 16, 2011	7.71 feet
	Dec. 7, 1975	7.61 feet
	Dec. 26, 1967	7.55 feet
	Apr. 14, 2002	7.52 feet
	Feb. 16, 1981	7.46 feet
	Jan. 6, 1969	7.32 feet
	May 19, 1991	7.02 feet

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is considered **Highly Likely**. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Probability** of flooding.

The most likely scenario for flood waters affecting the UIR is when a warm storm front carries an extensive amount of rain over heavy snowpack in the Blue Mountains, as was the case with the floods of February 1996 and 2020. This “winter snow meets a pineapple express” scenario is likely to occur again and become a major flood affecting the UIR.

Twenty flood events have occurred in Umatilla County between 1997 and 2020, including at least one 100-year flood event (February 2020). Based on this information, Umatilla County has an annualized frequency of 0.87. Because this is a countywide statistic, the frequency of flooding within the UIR is expected to be less. According to the FEMA National Risk Index, the UIR census tract has experienced 10 riverine flooding events, an annualized frequency of 0.45.

Climate Change Impacts

Oregon is expected to experience an increased frequency of extreme precipitation events and extreme river flows, related to factors of human-caused climate change. The likelihood of an increase in precipitation is greater in eastern Oregon.[80]

Statistical modeling of basin flows projects an increased intensity and a shift in peak flows into the winter, causing more rain-on-snow events in the region. This shift could increase the quantity of rainfall, with higher rates of variability year to year.[81]

According to historic flow data for the Umatilla River recorded at the Gibbon Gauge and detailed in the CTUIR Climate Change Adaptation Plan, warmer winters with rainfall replacing snow will change the peak flow patterns in the river. This increase in event intensity and shift to more winter rainfall creates potential for dramatic flood conditions during vulnerable winter months.[82]

Vulnerability of the UIR to Flooding

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **High Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **Very High Risk** of flooding, mostly driven by high social vulnerability. According to the FEMA National Risk Index, the UIR census tract has a **Relatively High Risk** rating.

Floods can cause loss of life and damage to structures, crops, land, flood control structures, roads, and utilities. Floods also cause erosion and landslides and can transport debris and toxic products that cause secondary damage including health and environmental problems. The extent of damage caused by a flood depends on the topography, soils, and vegetation in an area, the depth and duration of flooding, velocity of flow, rate of rising, and the amount and type of development in the floodplain.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Flooding		
Criteria	**Score**	**Description**
Deaths	1	0 to 1 death expected
Injuries	1	0 to 3 injuries expected
Critical Assets	2	Closed for 1-2 days
Lifelines	1	Interrupted for less than 12 hours
Property Damage	3	Widespread repairable
Environmental Impact	4	Localized severe
Economic and Social Impact	3	Temporary widespread
Culture Impact	2	Localized
Frequency Score	5	Highly Likely; expected every 3 to 9 years
Total Impact Score	**22**	**High Risk**

Loss Estimates

CTUIR has participated in the National Flood Insurance Program since 2011. Flood Insurance Rate Maps and CTUIR Land Development Code amendments were adopted meeting FEMA flood plain development regulations. Development within the designated Flood Hazard Overlay Zone (Special Flood Hazard Area) is and will continue to be regulated to reduce impacts of flooding and to reduce environmental impacts of development to First Foods. As of 2014, there are 17 flood insurance policies in effect and no claims have been reported. According to data provided by FEMA in September 2021, there is one Repetitive Loss property in the UIR (#284503). The property is not NFIP insured.

According to the FEMA National Risk Index, the UIR census tract has an expected annual loss of $5,407 in building damages due to riverine flooding. The UIR has a **Relatively Moderate** expected annual loss rating.

Impacts on CTUIR Operations

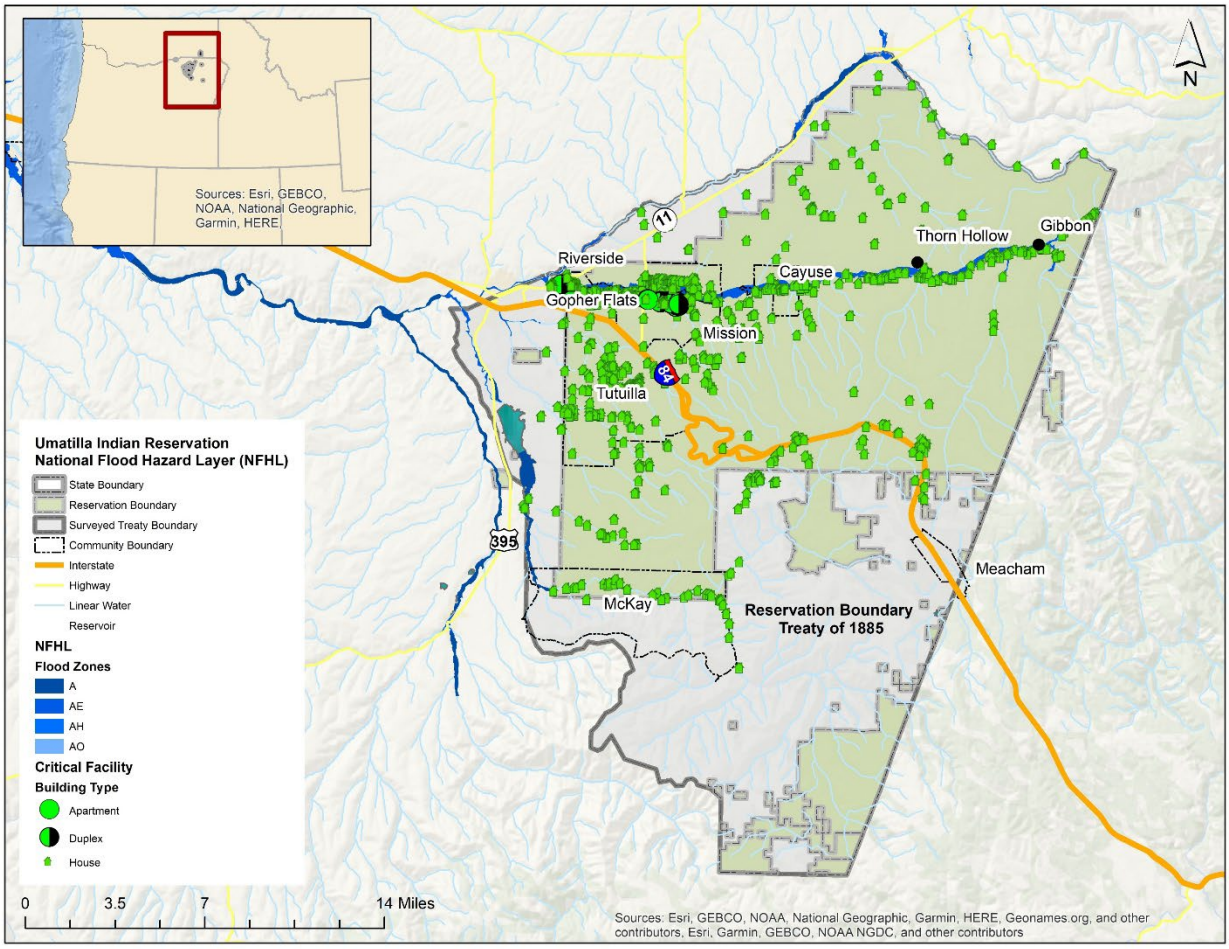
Flooding events may require significant resources and assistance from emergency responders as well as state, federal, or community service organizations such as the Red Cross. Rapid access for large emergency vehicles has a maximum depth of 0.9- 1.2m (2.9-3.9ft). If flood depths exceed this amount, first responders may not be able to access areas in need of assistance. Damage to critical infrastructure may also inhibit the ability of first responders to carry out emergency operations. During the 2020 flood event, damage to roadways and bridges hindered response and rescue operations.

Impacts on Human Health and Happiness, Economics & Community

Flooding can threaten life, safety, and health and often results in substantial damage to homes, vehicles, land, crops, or livestock. Flooding sometimes leads to deaths if floodwaters become deep and swift enough to sweep away people or vehicles. It is possible that the sick, disabled, or elderly may not be mobile enough to escape rising floodwaters and may become trapped in their houses. During flooding events, residents may also be at an increased risk of waterborne diseases. For many, the psychological impact of major floods can be intense. Loss of loved ones, homes, and livelihoods can obviously create intense psychological and social disruption.

The map below illustrates the number of housing units on the UIR that are located within the National Flood Hazard Layer (NFHL) a FEMA database that supports the NFIP. There are 268 housing units in the AE flood zone, and 1 unit in the A flood zone, which both equate to the BFE, 100-year floodplain, or Special Flood Hazard Area (SFHA). Housing units at risk include Hall's Trailer Court, the apartment complex on Riverside Avenue, among others. **Appendix C** of the plan provides a list of all critical assets, including housing units, at risk to flooding.

FIGURE: Housing Units in the Special Flood Hazard Area (SFHA) or 100-year Floodplain

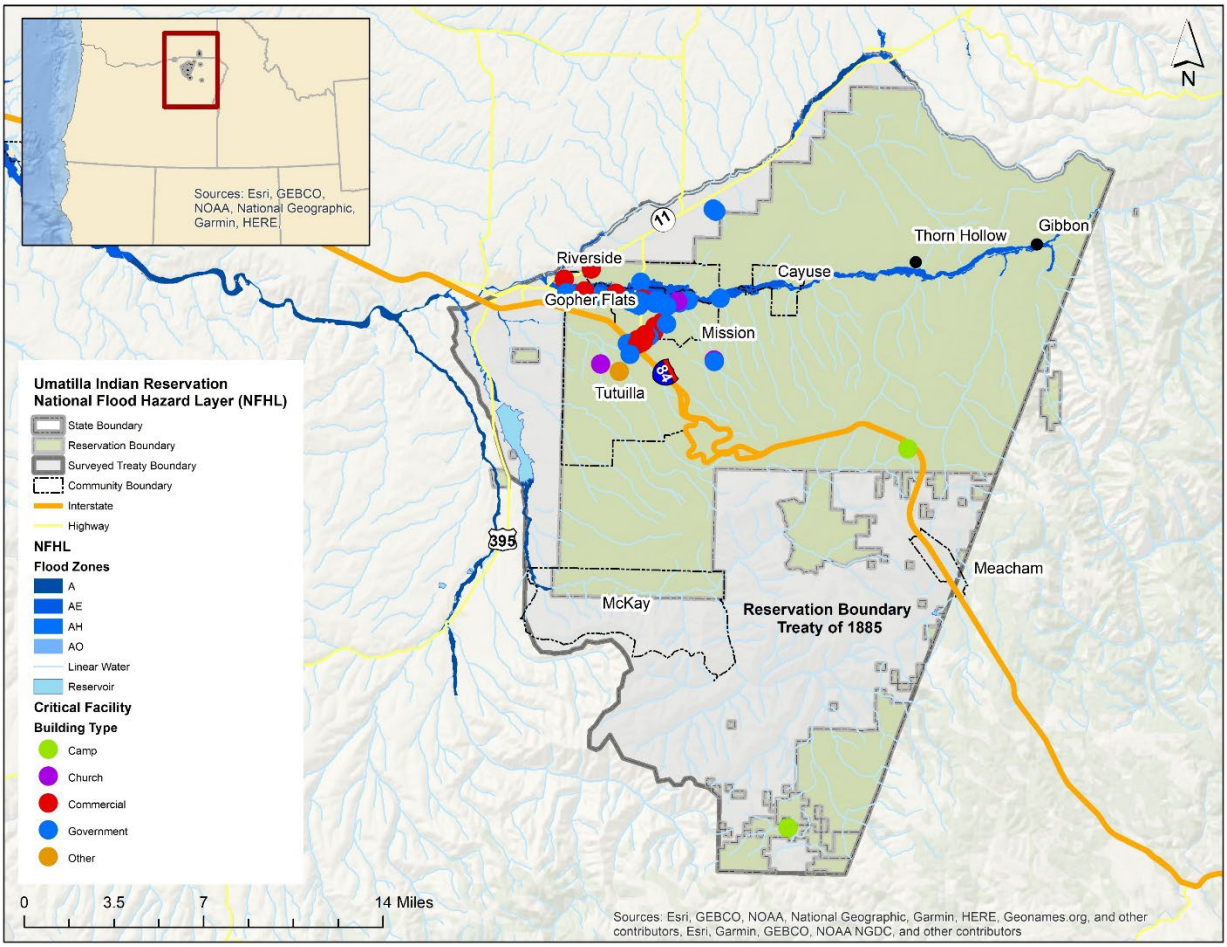


Impacts on Infrastructure, Built Systems, and Energy Production & Use

The most vulnerable assets to flood impacts in the UIR are transportation and utility infrastructure. Interstate 84 has closed due to flooding during numerous events – a corridor that crosses through the UIR and is vital to the local, regional, and state economies. Additionally, the Union Pacific railroad, electric power and gas lines could all be vulnerable to flooding.

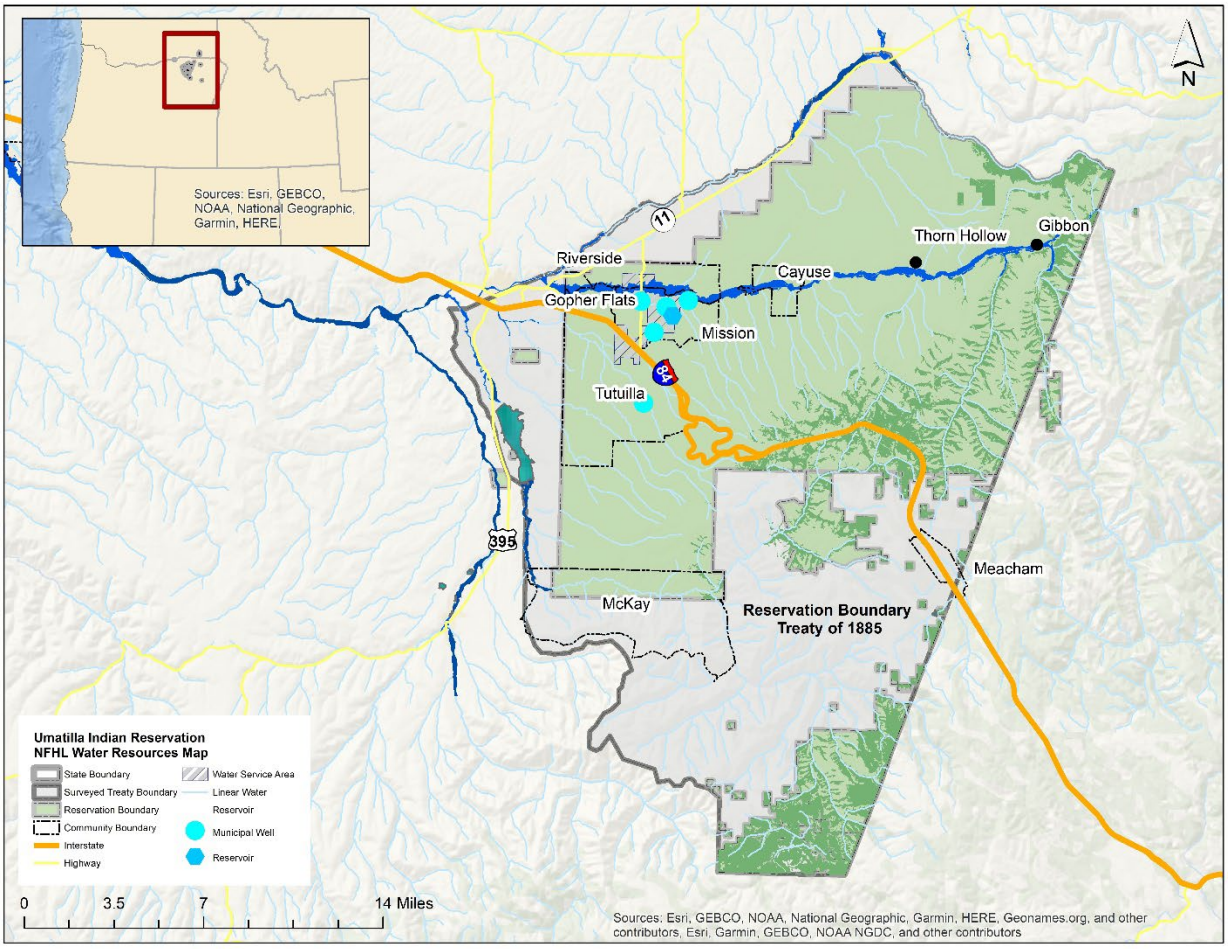
The map below illustrates the critical assets located within the 100-year floodplain, including one commercial building (American Rock Products) and one government building (Fish Acclimation Facility).

FIGURE: Critical Assets in the Special Flood Hazard Area (SFHA) or 100-year Floodplain



Additionally, there is one municipal well site (Site #3) located in the 100-year floodplain, illustrated in the figure below.

FIGURE: CTUIR Water Infrastructure in the Special Flood Hazard Area (SFHA) or 100-year Floodplain



Impacts on Water and First Foods

Flooding is a dynamic natural process. Along rivers, streams, and coastal bluffs, a cycle of erosion and deposition is continuously rearranging and rejuvenating the aquatic and terrestrial systems. Although many plants, animals, and insects have evolved to accommodate and take advantage of these ever-changing environments, property and infrastructure damage often occurs when people develop within floodplains, and natural processes are altered or ignored.

A shift in the hydrology of the Umatilla River and the faster melt of winter waters due to human-caused climate change, as discussed above, will have significant impact on water resources and First Foods. Winter flooding can reduce the amount of water that infiltrates into shallow aquifers. A shifted river peak flow can impact aquatic ecosystem seasonal cycles, causing challenges for migratory fish, particularly spring-running Chinook, steelhead trout, freshwater mussels, and lamprey.[83]

Impacts on Off-Reservation CTUIR-owned Trust Lands

The off-Reservation CTUIR-owned Trust lands are identified in the Community Profile (Section 2) and referred to as Wanapa, Wanaket and French Town. Although Wanapa and Wanaket lands are located near the Columbia River, this river is controlled by a series of dams that eliminate flood hazards.

The French Town property is located on the Walla Walla River which is a free-flowing river. Walla Walla County recognized the need for a comprehensive floodplain management strategy and developed the Walla Walla Comprehensive Flood Hazard Management Plan which was completed in 1999. Based on the probability of occurrence and Walla Walla County's vulnerability, Walla Walla County determined flooding to have a **High Risk** rating as assessed in the 2018 Walla Walla County Hazard Mitigation Plan. Therefore, this risk rating of moderate also applies to the CTUIR-owned French Town property.

3.9 Fog

Essentially, fog is just a cloud at ground level. It is made from condensed water droplets. The National Weather Service defines fog as water droplets suspended in the air at the Earth's surface.

Fog occurs when the air is cooled to the point (the dew point) where it can no longer hold all the water vapor it contains.[84] Fog is often hazardous when visibility is reduced to ¼ mile or less. Thick fog or even freezing fog tends to occur in the Blue Mountains during the late fall and winter months. Winter fog is distinct from coastal fog, formed when the moist ground cools rapidly at night, causing water vapor to condense.[85] Fog that presents the greatest risk occurs as very thick fog hovering over I-84 through the Blue Mountains.

Extent and Intensity

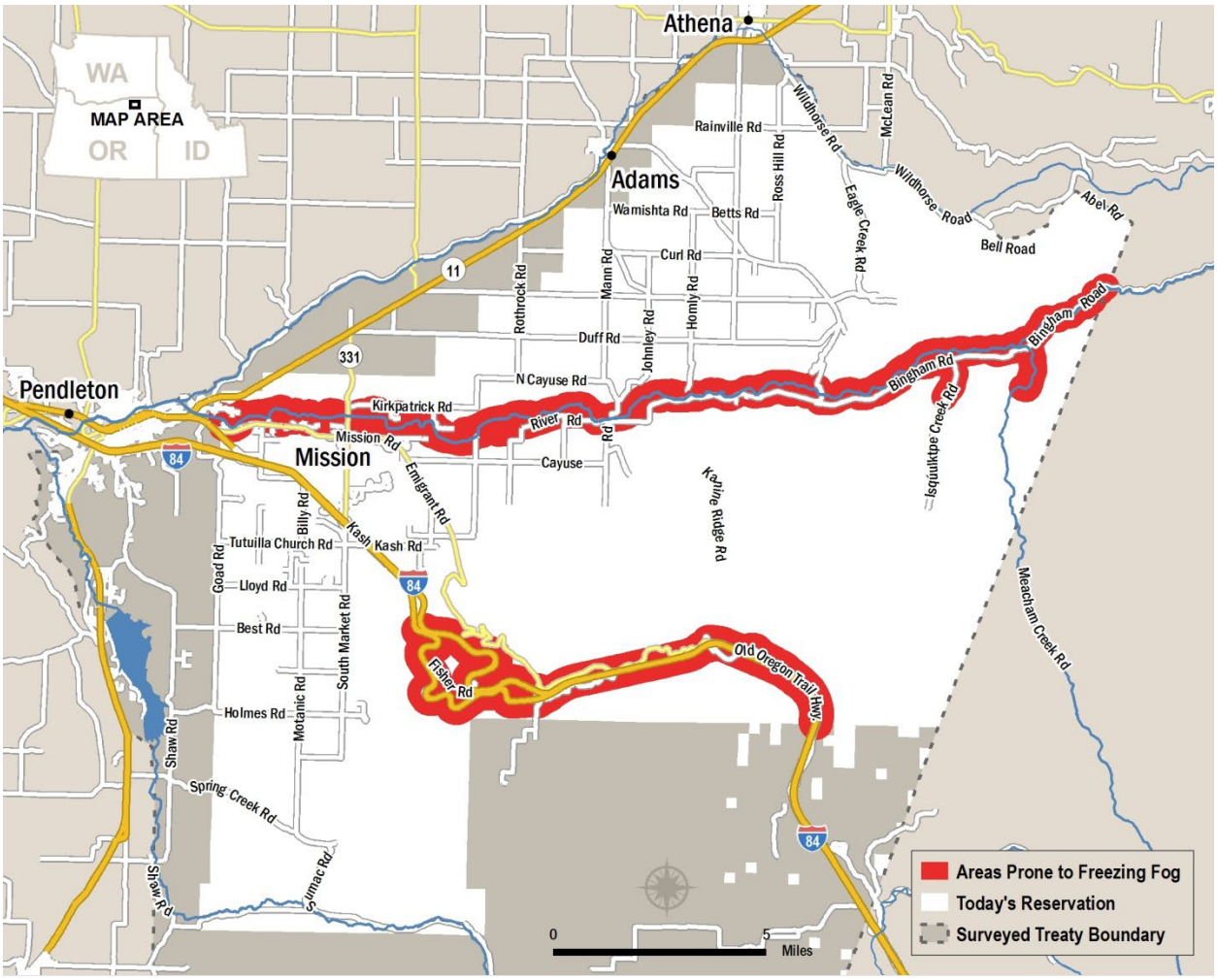
The National Weather Service issues Fog Advisories based on visibility. The two types of advisories are described as:[86]

- **Dense Fog Advisory** is issued when widespread dense fog develops. When this happens, visibilities frequently drop to one-quarter of a mile or less. These conditions make travel difficult. Take extra caution when on the road or avoid driving if possible.
- **Freezing Fog Advisory** is issued by your local National Weather Service office when fog develops and surface temperatures are at or below freezing. The tiny liquid droplets in the fog can freeze instantly to any surface, including vehicles and road surfaces. Freezing fog makes driving, boating, flying and other forms of transportation particularly hazardous. Visibilities are typically at or below 1 mile.

Geographic Location

Dense and freezing fog can affect the entirety of the UIR but is of greater concern along main transportation corridors. Fog primarily affects traffic using Interstate 84 as it passes through the Reservation. The switchbacks at Cabbage Hill and Deadman's Pass on I-84 are "feared for both high winds and freezing fog that rises out of the Columbia River Basin and often envelopes the Interstate."[87] The map below illustrates areas prone to freezing fog within the UIR, including the I-84 corridor and along the Umatilla River.

FIGURE: Areas Prone to Freezing Fog



History of Fog in the UIR and Surrounding Areas

Heavy fog, where visibility is equal to or less than ¼ of a mile, occurs in Pendleton, Oregon on average 30 days a year. The table below indicates that heavy fog is most likely to occur during the months of November through February. As the UIR borders the City of Pendleton, it is presumed the table below applies also to the Reservation.

TABLE: Mean Number of Days with Heavy Fog where Visibility ≤ 1/4 Mile[88]											
JAN	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
7.4	4.9	1.9	0.3	0.2	0.1	0.0	0.0	0.2	1.0	6.1	8.4

Fog events causing injuries or deaths are listed in the table below. No dense fog or freezing fog events have been recorded in the NOAA NCEI Storm Events Database since 2012. Fog is often a factor in deadly crashes on I-84, along with icy roads and high winds. These events are often not attributed to fog conditions in official records.

TABLE: Historic Fog Events as Hazard Events in the UIR and Surrounding Areas				
Date	**Type**	**Location**	**Comments**	**Source**
Dec. 12, 1997	Fog	Pendleton	One injury	SHELDUS
Dec. 24, 1997	Fog	Umatilla County	Four injuries	SHELDUS
Jan. 1999	Fog	Umatilla County	Four injuries and one death	SHELDUS
Jan. 2001	Fog	Foothills, Blue Mountains	One injury	SHELDUS
Nov. 27, 2002	Freezing Fog	Lower Columbia Basin	Two injuries due to a rollover accident on I-84 near Stanfield	Storm Events Database
Jan. 9, 2004	Dense Fog	Lower Columbia Basin	Collision of two semi-trailers on I-84. Sections between Pendleton and Stanfield closed for several hours.	Storm Events Database
Dec. 4, 2005	Dense Fog	Lower Columbia Basin	Two vehicle fatal accident two miles west of Umatilla.	Storm Events Database
2006	Freezing Fog	Foothills, Blue Mountains	Three deaths	Dennis Olson
Feb. 27, 2012	Freezing Fog	Northern Blue Mountains	12 vehicle crash on I-84 near Deadman's Pass; $50,000 property damage reported	Storm Events Database

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** The 2020 Oregon Hazard Mitigation Plan does not include fog as a hazard; no probability ranking is available for comparison. Even though fog is a relatively common occurrence during certain times of the year, fog does not actually affect the UIR very much. The greatest threat from fog is to travelers using I-84 where it passes through the Reservation.

Climate Change Impacts

Studies focused on the Central Valley of California, which experiences a similar winter fog patter to eastern Oregon, have found that fog days have decreased significantly in the region since 1980. Scientists found that this decline, and the preceding increase in fog days (1930-1970) are related to the presence of air pollution. As California and various polluting industries introduced new air quality regulations, in the late 1970s, fog levels decreased accordingly. This points to a connection between human activities and the presence of fog. Another consideration for this hazard is that fog helps to provide a degree of winter cold, which is important for agricultural crops that lay dormant in the winter and require chilling to induce flowering.[89]

Vulnerability of the UIR to Fog

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include fog as a hazard; no ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Fog		
Criteria	**Score**	**Description**
Deaths	3	4-5 deaths
Injuries	3	16 to 19 injured or hospitalized
Critical Facilities	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	1	Minimal
Environmental Impact	1	Minimal
Economic and Social Impact	2	Temporary localized
Culture Impact	1	Minimal
Frequency Score	6	Highly Likely; once every 1 to 2 years
Total Impact Score	**19**	**Medium Risk**

The fact that fog presents a greater threat to I-84 travelers passing through the UIR is a concern because the Tribe's emergency service providers are often first at the scene of an accident. Freezing fog presents an annual threat during winter months. Although the Federal Highway Administration and the Oregon Department of Transportation are responsible for managing the risks presented by fog on I-84, Cabbage Hill, the greatest obstacle to safe travel, is located on the Reservation. CTUIR is willing to assist in minimizing the risks associated with the hazards presented by fog.

The impacts from thick fog are like those of dust storms in that the greatest danger occurs to automobile and truck traffic traveling at higher speeds. Within the boundaries of the UIR, fog becomes particularly hazardous for freeway travelers using I-84. In some cases, fog freezes making driving conditions much worse. Fog also has been a hazard on roads within the Reservation. Fog occurs when there is an inversion, a condition which traps pollutants making air quality on the reservation along the river very poor. This can cause an increase in respiratory problems, particularly for those living on the reservation with respiratory problems. Poor road conditions due to fog and freezing fog can have a negative economic impact as well, especially to the Wildhorse Resort and Casino.

Loss Estimates

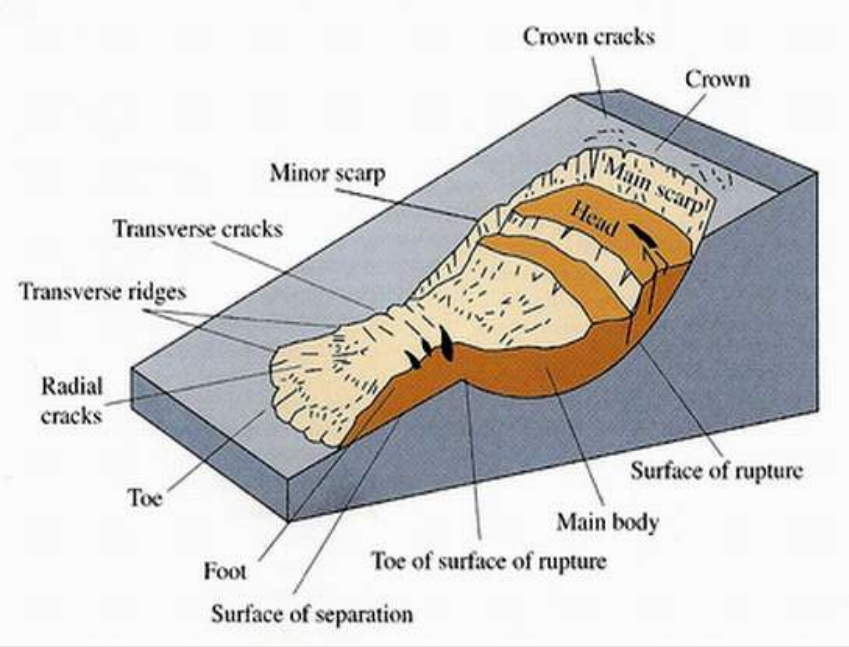
There is no established method for estimating losses from fog and freezing fog events. The vast majority of damages stem from vehicle accidents along I-84 which is monitored by ODOT.

3.10 Landslides

Landslides are the down-slope movement of rock, soil, or other debris. In Oregon, landslides are triggered by heavy rainfall, rapid snowmelt, earthquakes, or volcanoes. Landslides can also be triggered by human activities. Landslide susceptibility is based on slope, geologic material, and water. Given the moderate-to-high relief characteristics of the UIR's river beds, along with hilly and mountainous terrain in rural areas, the chance of landslides occurring is high but is not deemed to present a serious threat to people or property. Areas that have seen previous landslides are left in a weakened state, leading to repeated failures over time.

The characteristics of a landslide are depicted in the following diagram from the U.S. Geological Survey (USGS):

FIGURE: USGS Typical Landslide Diagram[90]



Extent and Intensity

The 2020 Oregon Hazard Mitigation Plan uses landslide susceptibility to categorize the probability of landslides in different parts of the state. The categorization combines a geologic map, the most recent landslide inventory, and a slope map using USGS elevation data. Each class is defined as follows:

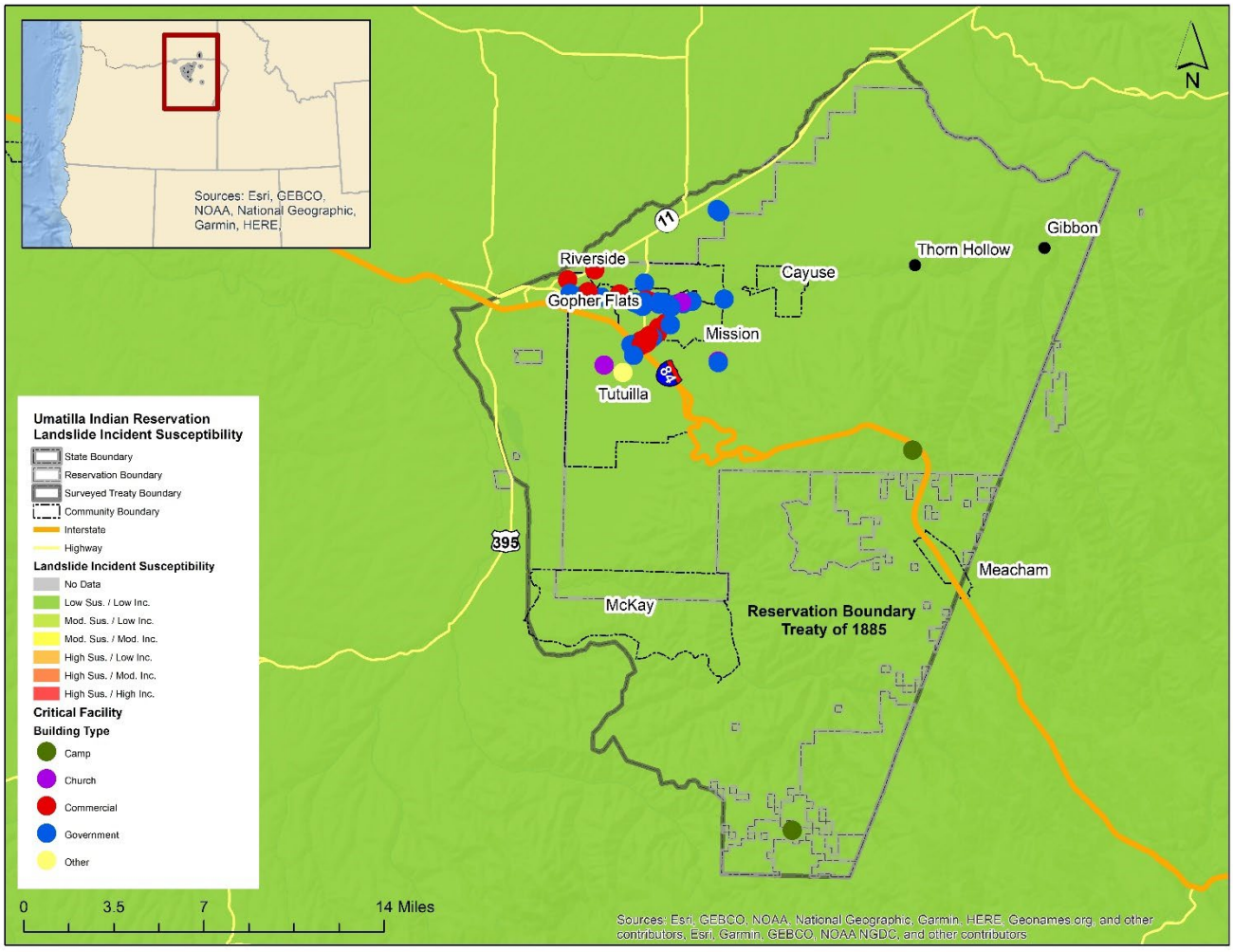
- **Low Susceptibility**: Landsliding unlikely. Areas classified as Landslide Density = Low (less than 7%) and areas classified as Slopes Prone to Landsliding = Low. Note that landslide density and slopes prone to landsliding data were not considered in this category because existing slides are inherently prone to instability. Note also that the inventory quality of existing landslides varies highly across the state.
- **Moderate Susceptibility**: Landsliding possible. Areas classified as Landslide Density = Low to Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = Moderate OR areas classified as Landslide Density = Moderate (7%-17%) and areas classified as Slopes Prone to Landsliding = Low.

- **High Susceptibility**: Landsliding likely. Areas classified as Landslide Density = High (greater than 17%) and areas classified as Slopes Prone to Landsliding = Low and Moderate OR areas classified as Landslide Density = Low and Moderate (less than 17%) and areas classified as Slopes Prone to Landsliding = High.
- **Very High Susceptibility:** Existing landslides. Landslide Density and Slopes Prone to Landsliding data were not considered in this category. Note: the quality of landslide inventory (existing landslides) mapping varies across the state.

Geographic Location

The entirety of the UIR has a low susceptibility and low incidence of landslide events, as illustrated in the map below. Landslides are most likely to be reported when they impact roadways, resulting in more significant reporting of events along the I-84 corridor. Isolated landslides on the UIR tend to occur in remote areas away from any populated areas, limiting impacts on residents. Landslide events in tandem with flooding events are more likely to cause significant damage and community impacts.

FIGURE: Landslide Susceptibility on the UIR and Surrounding Areas



History of Landslides in the UIR and Surrounding Areas

Little documentation exists regarding landslide history on the UIR. There have been a recorded 151 landslides within or touching Umatilla County according to Oregon's most current landslide inventory database.[91] Most landslide prone areas have little or no development, leading to minimal documentation of small and moderate slides. Little or no damage resulting from isolated landslide events has occurred on the UIR or in other areas with Umatilla County.

Oregon Disaster Declaration 4452 encompassed a severe storm, flooding, landslide, and mudslide incident between February 5-9, 2020. This event included CTUIR, Umatilla County, and neighboring Union and Wallowa counties. A federal Major Disaster Declaration was later declared for CTUIR and Umatilla County. More information on flooding impacts from this event are described in the Flooding hazard profile. Most damages were caused by flooding, debris flows, and erosion of waterways.

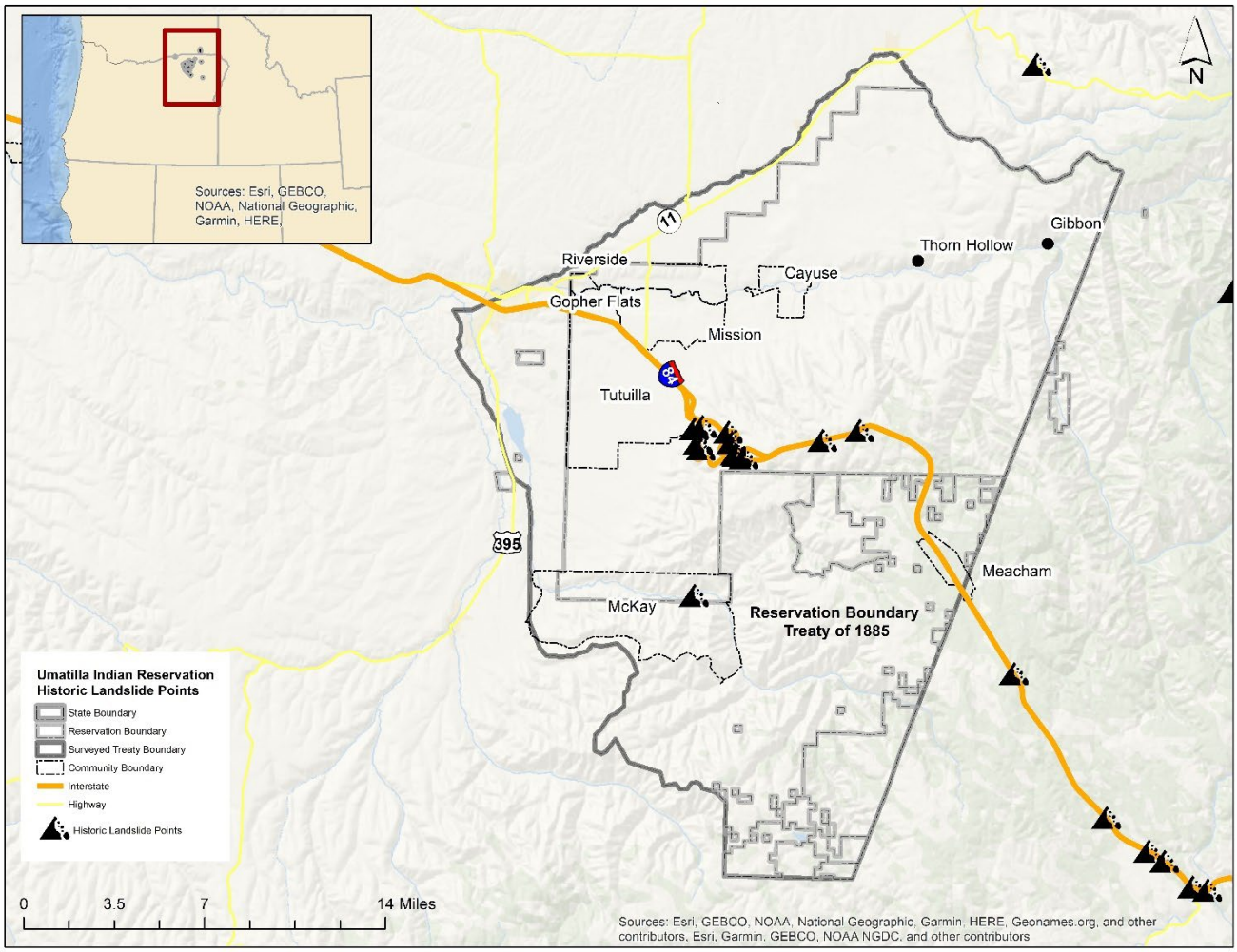
The following table includes historic disaster declarations including UIR that included landslide or mudslide events. All these events related to severe winter flooding and storm events between December and April.

TABLE: Historic Landslide Disasters affecting the UIR and Surrounding Areas[92]

Date	Disaster Number and Type
December 1964	DR-184 (Flooding)
February 1996	DR-1099 (Flooding, Landslides)
December 1996 – January 1997	DR-1160 (Flooding, Landslides)
December 2003 – January 2004	DR-1510 (Severe Winter Storms)
April 2019	DR-4452 (Severe Storm, Flooding)

The following map illustrates the historic landslides on the UIR between 1996 and 2011 using data from the Oregon Department of Geology and Mineral Industries (DOGAMI).

FIGURE: Historic Landslides on the UIR and Surrounding Areas



Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely**. According to the 2020 Oregon Hazard Mitigation Plan, the future probability of landslides in Umatilla County is **Likely**, meaning that 20-30% of the county has either high or very high susceptibility to landslides.

Climate Change Impacts

Given that landslides are often triggered by heavy rainfall events, it is possible that Oregon and the UIR will experience more landslides in the future. Future climate change projections show that Oregon will experience an increase in the frequency of extreme precipitation events.[93]

Vulnerability of the UIR to Landslides

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Low Risk** to this hazard. Landslides on the Reservation could damage roads, block access roads, damage timber, streams, and fisheries.

DOGAMI does not consider Umatilla County to be one of the most vulnerable jurisdictions in Oregon to landslides, but according to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Vulnerability** to landslides driven by its high social vulnerability rating.[94] The County has a **High Risk** to landslide events based on probability and the exposure of critical and state facilities combined with social vulnerability. According to the FEMA National Risk Index, the UIR census tract has a **Relatively Moderate Risk** rating for landslide events.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Landslide		
Criteria	**Score**	**Description**
Deaths	1	0-1 deaths expected
Injuries	1	0-3 injuries expected
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	2	Localized repairable
Environmental Impact	1	Minimal
Economic and Social Impact	1	Minimal
Culture Impact	1	Minimal
Frequency Score	4	Somewhat Likely; expected every 10 to 29 years
Total Impact Score	**13**	**Low Risk**

Loss Estimates

FEMA's National Risk Index describes the UIR census tract's Historic Loss Ratio is **Very Low** with a **Relatively Moderate** expected annual loss rating for landslides. FEMA determined an Estimated Annual Loss of $9,940 in building value and $3,464 in population equivalent, for a total of $13,405 for landslide events.[95]

Impacts on CTUIR Operations

Landslides are expected to have minimal impacts on CTUIR operations. The greatest strain would include first responders involved in any accidents or roadway disruptions from landslides along I-84 through the Reservation.

Impacts on Human Health and Happiness, Economics & Community

Landslides pose relatively small impacts to residents of UIR. More likely impacts will stem from associated flooding and severe storm events, as described in the supporting hazard profiles.

Impacts on Infrastructure, Built Systems, and Energy Production & Use

The greatest vulnerability posed by slides is the potential for road closures. Interstate 84 was closed for nearly a week in February 2014 due to a landslide in Hood River, about two hours west of Pendleton. The corridor is considered vital to the state economy, along with the Union Pacific transcontinental railroad that runs through the UIR. Development on the UIR is primarily in valleys and some distance from higher elevations where the greatest potential for landslides exists.

Impacts on Water and First Foods

Landslides, especially when paired with severe weather and flooding events, could impact fisheries and water quality due to erosion of riverbanks and debris flows. Landslides in forested areas could also damage timber stands.

3.11 Severe Winter Storms

Severe winter weather includes prolonged cold spells and winter storms. This potentially hazardous event is most likely to occur from late November through February when very cold artic air stalls over the region. When this phenomenon occurs, a prolonged cold spell is the result. When warm moist air from the Pacific moves across cold air trapped in valleys and drops precipitation, a winter storm occurs. This precipitation may fall as snow, sleet, or freezing rain.

Sleet is “pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes.” These pellets of ice usually bounce after hitting the ground or other hard surfaces as opposed to freezing rain which is rain that falls as a liquid but freezes into glaze upon contact with the ground.[96]

Extreme winter temperatures are not particularly common in the Pendleton area. Below zero readings are recorded in approximately 60 percent of winters.[97] When cold spells and winter storms occur, most of the time, such weather is a mere inconvenience. However, when a severe winter storm occurs, it can close Interstate 84, which ultimately can harm businesses and reduce the flow of goods and services as transportation can be slowed to a crawl for several days. Usually, life returns to normal after a few days as temperatures warm. However, severe winter storms can lead to flooding given large snowfall amounts and quickly rising temperatures.

Extent and Intensity

The National Weather Service provides a classification system for various types of winter storm events. Severe winter weather can often be forecasted a few days in advance, allowing more time to prepare life and safety measures, notify residents, and position resources. National Weather Service definitions include:

- **Winter Storm Watch:** Issued when there is a potential for heavy snow or significant ice accumulations, usually 24 to 36 hours in advance.
- **Winter Storm Warning for Snow:** Issued for winter storms producing at least 6 inches of snow in a 12-hour period or at least 8 inches of snow in a 24-hour period.
- **Winter Storm Warning for Sleet:** Issued by the National Weather Service for winter storms producing at least a half (½) inch of sleet.
- **Blizzard Warning:** Issued for winter storms with sustained or frequent winds of 35 mph or higher with considerable falling and/or blowing snow that frequently reduces visibility to a quarter (¼) mile or less. These conditions are expected to prevail for a minimum of 3 hours.
- **Ice Storm Warning:** Issued when freezing rain produces more than a quarter (¼) inch accumulation of ice.
- **Winter Weather Advisory for Snow and Blowing Snow:** Issued for winter storms with 25-34 mph winds and blowing snow that frequently reduces visibility to a quarter (¼) mile or less.
- **Winter Weather Advisory for Snow:** Issued for winter storms producing 3 to 5 inches of snow. Occasionally will be issued for winter storms producing 2 to 4 inches of snow.
- **Winter Weather Advisory for Sleet:** Issued for winter storms producing less than a half (½) inch of sleet.

Geographic Location

Severe winter weather events affect the entirety of the Reservation. The Blue Mountains and communities in the foothills experience the greatest impacts from heavy snow and winter

weather events, while lower elevation communities can experience both heavy snow events and flooding from significant runoff.

History of Severe Winter Weather in the UIR and Surrounding Areas

Umatilla Indian Reservation is quite used to winter storms. Based on the historical record, there is a winter storm almost every year. Most of the winter storms that occur fall into the nuisance category; a couple of inches of snow that lasts a day or two. However, a major winter storm occurs on average about every three years that is more than just a nuisance. Major winter storms have been defined as ten or more inches of snowfall.

Impacts from winter storms vary depending on the amount of moisture and the temperatures associated with the cold fronts that descend on the Blue Mountains. The Pendleton area averages 16 inches of snow a year with a maximum annual accumulation of 50.3 inches and a minimum of 0.8 inches.[98] In addition to heavy snowfall, wind, freezing rain or sleet may accompany the cold temperatures associated with a winter storm.

In most years, Pendleton receives less than 20 inches of snow. However, in December 1983 and January 1993 over 25 inches of snow fell, and in December 2008 and February 2019 over 32 inches of snow fell. Between 1970 and 2020, there are eighteen occasions where more than 10 inches of snow fell in a single month in Umatilla County.[99]

The UIR has had two federal Declared Disasters for winter storm events – DR-1510 in 2003-2004 and DR-4519 in February 2020. The 2020 event is described in detail in the Flooding hazard profile (Section 3.8).

The table below provides a description of the most significant historic winter storms impacting the UIR and surrounding areas. The northern part of Umatilla County is situated at the east end of the Columbia River Gorge and experiences more significant winter weather as a factor of the Gorge's geography. With that consideration, many of the storms impacting the region and Umatilla County had a less significant impact on populated areas of the UIR such as Mission, which are more accustomed to both regular high-elevation snow in the Blue Mountains and less severe storms than the Gorge.

TABLE: Major Historic Winter Storms affecting the UIR and Surrounding Areas Prior to 2016[100]

Date	Description
Dec. 1861	Storm produced 1-3 feet of snow throughout Oregon.
Dec. 1892	Substantial snow across most of northern Oregon; greatest snowfall in the northwest part of the state (Pendleton, 8.0 inches)
Jan. 1916	Two storms produced very heavy snowfall across the state, especially in mountainous areas.
Dec. 9-11, 1919	One of three heaviest snowfall-producing storms to hit Oregon on record. Lowest statewide average temperature since record keeping began in 1890. The Columbia River froze over, closing the river to navigation from the confluence with the Willamette River upstream. Nearly every part of the state affected (Pendleton, 15.0 inches).
Feb. 10, 1933	Cold outbreak across state; the city of Seneca, in northeast Oregon, recorded the state's record low temperature of −54°F; the next day high was nearly 100 degrees warmer at 45°F.
Jan. – Feb. 1937	Deep snow drifts across the entire state.
Jan. – Feb. 1950	Statewide event with extremely low temperatures that injured a large number of orchard and ornamental trees and shrubs and harmed many power and telephone lines and outdoor structures. Severe blizzard conditions and a heavy sleet and ice storm together caused several hundred thousand dollars

TABLE: Major Historic Winter Storms affecting the UIR and Surrounding Areas Prior to 2016[100]	
Date	**Description**
	damage and virtually halted traffic for two to three days; Columbia River Highway closed between Troutdale and The Dalles leaving large numbers of motorists stranded, removed to safety only by railway.
Jan. 18, 1956	Freezing rain mixed with snow. Ice coated trees, highways, and utility lines. Traffic accidents due to slick surfaces; trees heavy with ice broke, sometimes on top of houses.
Jan. 17-18, 1970	Stagnant and cold air in the Columbia River Basin east of the Cascades had surface temperatures well below freezing for a week. Ice accumulated on tree branches up to 1.5 inches. Damage was mostly destroyed orchards and utilities.
Feb. 1985	Two feet of snow in the northeast mountains; downed power lines and fatalities in central and eastern Oregon.
Feb. 1-8, 1989	Heavy snow across state; numerous record temperatures set; wind chill temperatures 30–60 degrees below 0°F; power failures throughout state, with home and business damage resulting from frozen plumbing; several moored boats sank on the Columbia River because of ice accumulation; five weather-related deaths (three auto accidents caused by ice and snow, and two women froze to death); damage estimates exceeded one million dollars across the state.
Dec. 1990	Severe ice storm with light freezing rain over the Columbia Basin east of the Cascades. Heavy ice accretions on trees, highways, power and telephone lines causing accidents due to broken limbs, slippery pavements, and down power lines. Heavy snowfall across Oregon.
Jan. 1991	Constant precipitation all over Oregon with 1–6 inches of new snow in high ground of eastern Oregon.
Dec. 28, 2003 – Jan. 9, 2004	DR-1510: Gilliam, Hood River, Morrow, Sherman, Umatilla, and Wasco Counties declared in Region 5. The most significant winter storm in several years brought snowfall to most of Oregon. ODOT closed I-84 through the Columbia Gorge twice, for almost 70 hours total. Freight trucks and passenger cars had to detour over Mount Hood where, ironically, road conditions were better than they were in downtown Portland where all vehicles were required to chain up. A frigid arctic air mass, heavy snow, sleet and freezing rain, strong east winds and blizzard conditions through and near the Columbia River Gorge snarled travel, forced school and business closures, and resulted in widespread power outages and properly damage.
Jan. 2005	33 injuries reported across Gilliam, Morrow, and Umatilla counties
Jan. 2008	Heavy freezing rain from Bonneville westward through Columbia Gorge causing accidents on I-84 with one fatality.

During the analysis timeframe (2016-2020) for the HMP update, 28 events were recorded in the NOAA National Centers for Environmental Information (NCEI) Storm Events Database for Umatilla County. A summary of events is included in the table below.

TABLE: Severe Winter Weather Events Impacting the UIR and Surrounding Areas from 01/01/2016 to 12/31/2020[101]

Date	Event Type	Event Narrative
12/4/2016	Heavy Snow	Heavy snow was expected and occurred in the Blue Mountains of Oregon and Washington. Snowfall of 10 inches was recorded in at higher altitudes (5,000').
12/14/2016	Heavy Snow	A strong Pacific system resulted in widespread snow accumulations of 4-6 inches.
12/26/2016	Heavy Snow	A Pacific system brought heavy snow to the Washington Cascade east slopes, the Blue mountains, Wallowa county and the Grande Ronde Valley. Measured heavy snow accumulation of 10.5 inches overnight at Meacham, in the foothills just east of the UIR.
1/10/2017	Heavy Snow	A storm system moving across southern Oregon produced heavy snow over portions of the Columbia River Gorge in both Oregon and Washington. Measured snow fall of 7+ inches in Pendleton.
1/17/2017	Ice Storm	A major winter storm brought significant snow and ice to the region. Accumulated ice of 0.25 - 0.5 inches across Umatilla County.
1/31/2017	Heavy Snow	A system produced significant snow over portions of the Columbia Basin of Washington and Oregon. Measured snowfall of 6 inches at Mission (UIR).
2/3/2017	Ice Storm	A Pacific system spread wintry precipitation across the Pacific Northwest. Ice accumulation of 0.25 inches at Pendleton.
10/12/2017	Heavy Snow	A Pacific storm system lowered snow levels to between 3500 and 4500 feet. This was followed by a second system that produced significant early season snow in the Blue Mountains.
12/22/2017	Heavy Snow	North flow behind a modified Arctic cold front caused significant snow. Measured 6-11 inches of snow in parts of Umatilla County.
12/24/2017	Heavy Snow	A Pacific system spread snow across much of southeast Washington and northeast Oregon on Christmas Eve and early Christmas Day. Measured 5.1 inches of snow at Pendleton.
1/11/2018	Heavy Snow	A Pacific system brought rain and snow the region during the second week of January. Snow levels were relatively high for this time of year, with snow accumulating above 3800' in the Blue Mountains.
2/14/2018	Heavy Snow	A cold front moved south from Washington through eastern Oregon February 13th and 14th. This front caused widespread snow across the area.
2/23/2018	Heavy Snow	A pair of disturbances brought snow to the region late Friday February 23rd and on Saturday February 24th. The most significant snow fall occurred in the northern Blue Mountains.
3/17/2018	Heavy Snow	Snow fall was heavy above 4500' in the Northern Blue Mountains.

TABLE: Severe Winter Weather Events Impacting the UIR and Surrounding Areas from 01/01/2016 to 12/31/2020[101]		
Date	**Event Type**	**Event Narrative**
1/22/2019	Heavy Snow, Winter Weather	A warm front brought heavy snow to the Blue Mountains and the Grande Ronde Valley during the evening of January 22nd. Between 8 and 10 inches of new snow was reported in the Blues with 3 to 6 inches reported in the Grande Ronde Valley. Highway 395 between Pilot Rock and John Day was closed for several hours due to very heavy snowfall rates and poor visibility.
2/3/2019	Heavy Snow	A pair of storm systems brought significant snow to all elevations on the 3rd and 4th of February. Wraparound moisture from the first system brought 8 to 12 inches of snow to the Blue Mountains as well as the Grande Ronde and Wallowa Valleys. Initial precipitation with the second system combined with lingering wraparound moisture brought between 4 and 7 inches to all elevations on the 4th of February. Numerous accidents were reported due to slippery conditions. Interstate 84 for closed for several hours between Baker City and Pendleton to clear multiple accidents.
2/8/2019	Heavy Snow	A potent storm system brought heavy snow to much of the region beginning early morning on the 9th of February and tapering off by the morning of February 10th. Snowfall totals of 8 to 12 inches in the Columbia River Gorge, 5 to 10 inches in north central Oregon and around 4 inches in the Blue Mountains foothills and Columbia Basin were recorded.
2/11/2019	Heavy Snow	A winter storm brought heavy snowfall to the Columbia River Gorge, Northern Blue Mountains and the Blue Mountain foothills from the late afternoon on the 10th of February through the day on the 12th of February. Snowfall totals of 8 to 12 inches in the Columbia River Gorge, 6 to 10 inches in the northern Blue Mountain foothills, 10 to 13 inches in the Northern Blue Mountains, 8 to 20 inches in the Grande Ronde Valley and 4 to 9 inches in Wallowa County were reported.
2/19/2019	Heavy Snow	A winter storm brought heavy snow to the Blue Mountains and adjacent valleys. Storm total accumulations in the northern Blue Mountains ranged from 6 to 14 inches with 4 to 6 inches in the Grande Ronde Valley and 3 to 6 inches in Wallowa County. Interstate 84 between Pendleton and La Grande was closed for several hours due to heavy snow and near zero visibility.
2/22/2019	Winter Storm, Heavy Snow	Persistent troughing off the coast of the Pacific Northwest focused a stream of mid-level moisture over the Inland Northwest resulting in a long duration snow event as the plume drifted north and south several times between the 22nd and 27th of February. Snowfall rates were greatly enhanced over central Oregon with the proximity of a nearly stationary surface boundary where snowfall rates were in excess of 1 inch per hour. Storm total snowfall amounts were measured at: 26 inches in Meacham and 12 inches in Pendleton.
4/10/2019	Heavy Snow	A cool late season system brought one last gasp of wintry weather to the Blue Mountains from 10 to 11 April. Storm total snowfall estimated by Snow Telemetry sites ranged from 5 to 10 inches with the highest amounts in the northern Blue Mountains above 5000 feet.

TABLE: Severe Winter Weather Events Impacting the UIR and Surrounding Areas from 01/01/2016 to 12/31/2020[101]		
Date	**Event Type**	**Event Narrative**
10/19/2019	Heavy Snow	An unusually cold Arctic front settled into the region mid to late October, setting the stage for an early winter weather scenario. As a secondary storm system and cold front interacted with the mountains of northeast Oregon, moderate to heavy snow developed.
1/10/2020	Heavy Snow	Heavy Snow was reported over the mountains and High Valleys with 6 to 12 inches of accumulation reported in many locations.
2/4/2020	Heavy Snow	A winter storm with copious moisture dumped 1 to locally 2+ feet of snow over the eastern mountains and valleys February 4th and 5th. This was the precursor to significant flooding that occurred later in the week when the snow melted due a warm-up and heavy rains.
2/8/2020	Heavy Snow	Heavy snow fell over the Northern Blue Mountains on February 8th beginning in the early morning and ending in the evening.
2/15/2020	Heavy Snow	Heavy snow fell over the Northern Blue Mountains of Oregon with around 10 inches of accumulation February 15-16.
3/13/2020	Heavy Snow	Description not available.
11/13/2020	Winter Storm	A series of weather systems beginning Nov. 12th moved through the forecast area with moderate to heavy snow to mountains and light to moderate snow accumulations to higher elevation valleys.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Probability** of winter storms. [102]

Based on the history of winter storms occurring in Umatilla County and the number of snowstorms occurring between 1970 and 2020, the probability of winter storms affecting the UIR in the future remains high. During the HMP analysis period (2016-2020), there were 28 winter weather events impacting the UIR, an annualized frequency of about 5.6 events. The FEMA National Risk Index offers an annualized frequency of 5.78 winter weather events.

Climate Change Impacts

Projections show one of the primary impacts of a changing climate on the Pacific Northwest will be warmer winters, including more winter precipitation falling as rain instead of snow. Warming winters will have compounding impacts for the UIR, including reduced reliability of snowfall and increased frequency of rain-on-snow events.[103] There is not currently any evidence that the incidence of winter storms will change in Oregon due to human-caused climate change.[104]

Vulnerability of the UIR to Severe Winter Storms

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **High Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Vulnerability** to winter storms.[105]

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Severe Winter Storms		
Criteria	**Score**	**Description**
Deaths	2	2-3 deaths
Injuries	2	4-7 people injured/hospitalized
Critical Assets	2	Closed for 1 to 2 days
Lifelines	3	Interrupted for 3 to 6 days
Property Damage	3	Widespread repairable
Environmental Impact	1	Minimal
Economic and Social Impact	3	Temporary widespread
Culture Impact	2	Localized
Frequency Score	4	Somewhat Likely; expected once every 10-29 years
Total Impact Score	**22**	**High Risk**

Winter storms are a regular occurrence on the UIR. Impacts increase for communities isolated by a few critical roadways that may be impacted by winter storm conditions and heavy snowfall. While the Reservation is accustomed to winter storm events, significant snowfall can lead to road closures that limit emergency response, utility repair, or supply delivery, and lead to short-term but significant negative impacts to the area's economy. Power outages can last up to a week after a major winter storm.

Loss Estimates

Economic impacts can stem from many sources including limited transportation of goods and services, flooding from burst water pipes, forced closing of businesses and facilities on the Reservation, the inability of employees to reach the workplace, damage to homes and structures, automobiles, and other belongings by downed trees and branches, loss of livestock and vegetation and many others. In most cases, severe winter storms have no or little impact on structures and facilities located on the Reservation.

There were no reported losses from winter weather events from 2016-2020. The FEMA National Risk Index indicates that Umatilla County has a **Relatively Low** Expected Annual Loss rating and a **Very Low** Historic Loss Ratio due to Severe Winter Weather.

Primary losses to the UIR are economic losses rather than actual damage to critical owned and operated facilities and structures. From a three to four-day major snow storm, total economic losses are estimated to reach over $1 million, as described below:

- Reduced revenue for the Wildhorse Casino and hotel with a partial offset from stranded travelers for four days = approximately $484,402.
- Increase in traffic accidents contributing to deaths and injuries: four to five deaths and eight to eleven people hospitalized.
- Increase in staff absenteeism for 4 days affecting Tribal governmental = $306,884.
- Interruption of power: 4 days – dollar value unknown.

- Lost revenue to Tribal enterprises (1/3 reduction in revenue for 4 days) = $343,744.
- Property damage: minor – dollar value unknown.

Impacts on CTUIR Operations

Severe winter storms may sometimes lead to the loss or disruption of electric power. The response by the UIR to severe winter storms is early closure of some businesses and facilities on the Reservation. This results in lost revenue and productivity. First responders will experience increased activity to support vulnerable residents who may be isolated due to limited road access, loss of power, or accidents. When I-84 closes due to dangerous driving conditions, truck traffic often backs up, causing overflow and traffic congestion on the shoulders as well as within the Wildhorse Casino and Arrowhead parking areas.

Impacts on Human Health and Happiness, Economics & Community

Winter storms that include wind, freezing rain or sleet can cause hazardous driving conditions and usually mean an increase in traffic accidents. If cold temperatures persist, crops can be damaged, water pipes can burst, and livestock may perish.

Most deaths correlated to winter storms are not directly related to the storm itself. The three causes of deaths commonly associated with "side-effects" of winter storms are: 1) traffic accidents on icy roads; 2) heart attacks while shoveling snow; and 3) hypothermia from prolonged exposure to cold. [106] If the power is out, the situation can range from a severe hardship to very dangerous as people try to keep themselves warm. In such situations, carbon monoxide poisoning often increases as people use various means to try and keep warm.

While everyone is at-risk during a winter storm, residents are more vulnerable based on their situation. Of injuries related to ice and snow about 70% occur in automobiles, 25% are people caught out in the storm, and the majority are males over 40 years old. [107]

Some groups, such as low-income families, elders, people with disabilities, and those with unsuitable housing may be more vulnerable in severe winter weather, particularly if power outages occur. Those residents that depend on electric heat may face very cold temperatures within their living quarters and may not be able to find alternative heat sources. Elders and people with disabilities may be dependent on medications and may not have access to medicine or the ability to travel if roads are closed.

Impacts on Infrastructure, Built Systems, and Energy Production & Use

Intense snowstorms in the past have closed I-84 more than a day and have downed power lines, mostly due to falling trees, and caused power outages. State Highway 11 located north of the UIR is often closed for various periods of time under windy conditions due to blowing snow. In such situations, businesses, school districts, and government offices often close or their hours of operation are reduced. A major winter storm can last for days.

Impacts on Water and First Foods

Historically, the hydrology of the Umatilla River has featured peak flows occurring from March to May, following snowmelt from the mountains. Future flows will have increased intensity and variability, with peak flow shifting into the winter between December and March. This shift, generated by more unpredictable snowfall and faster melt of winter water, may disrupt migration timings and beneficial symbiotic relationships of First Foods. [108]

3.12 Spring and Summer Storms

Spring and summer storms are relatively common events in eastern Oregon. These storms normally occur between April and September and may include thunder and lightning, hail, wind, intense rainfall and more infrequently, tornadoes.

Thunderstorms are produced by cumulonimbus clouds accompanied by lightning and thunder. A typical thunderstorm consists of several cells. A cell involves convection in the form of a single updraft, downdraft, or updraft/downdraft couplet, typically seen as a vertical dome or tower as in a towering cumulus cloud. Lightning is a visible electrical discharge produced by a thunderstorm. Thunder is caused by rapidly expanding gases in a lightning discharge. A tornado is a violently rotating column of air, usually suspended from a cumulonimbus cloud, with circulation reaching the ground.

About 10% of the annual total precipitation for Umatilla County occurs during the months of July through September. The lighter summertime precipitation usually accompanies thunderstorms which often move into the area from the south or southwest. On occasion, these storms are quite intense, causing flash flooding and hail.

Extent and Intensity

The National Weather Service defines a **severe thunderstorm** as "a thunderstorm that produces a tornado, winds of at least 58 mph (50 knots or ~93 km/h), and/or hail at least one inch in diameter. Structural wind damage may imply the occurrence of a severe thunderstorm." A thunderstorm is **approaching severe** when "wind is equal to or greater than 40 mph (35 knots or ~64 km/h) and/or hail of at least ½ inch."[109]

Geographic Location

Severe spring and summer storms can occur in any part of the UIR.

History of Spring and Summer Storms in the UIR and Surrounding Areas

Storms during the spring and summer months pass over the UIR several times a year. These storms are usually short in duration, lasting only a few hours, but can be intense. Besides thunder and lightning, relatively large-sized hail, and intense rainfall that can produce flooding may occur.

Three severe weather events, characterized by hail, were reported during the HMP analysis period (2016-2020), including:

- **June 8, 2016:** A few severe thunderstorms developed with good rotation associated. Hail of one inch was reported in Ukiah, to the southwest of the UIR. One of these storms produced a short-lived tornado and golf-ball sized hail in nearby Wheeler County.
- **May 28, 2020:** An isolated supercell thunderstorm produced large hail in southern Umatilla County.
- **May 30, 2020:** A major severe weather event by Pacific Northwest standards occurred over central and northeast Oregon and southeast Washington. A powerful upper-level storm system moved across the area during the afternoon and evening helping to trigger severe thunderstorms. The airmass was unusually unstable for this area of the country with surface dewpoints well into the 60s. With strong upper-level winds in place the stage was set for numerous fast moving intense storms through the afternoon and early evening. Numerous reports of large hail and damaging winds were received with most of

the hail falling in central Oregon. There were multiple reports of significant hail (2 inch in diameter) and winds in excess of 75 mph.

The following table details hail, lightning, and funnel cloud events that have occurred on or near the UIR. Based on records from the NOAA NCEI Storm Events Database, there have been a recorded 54 hail, lightning, or funnel cloud events on or near the UIR since 1969. The Storm Events Database does not filter events to the UIR boundaries, but rather reporting across all of Umatilla County. To be as specific as possible, events in Milton-Freewater, Hermiston, Stanfield, and other communities have been excluded due to their distance from the UIR. Weather conditions vary greatly across Umatilla County and even within the UIR given the changing topography and proximity to other natural features such as the Columbia River Gorge.

TABLE: Hail, Lightning, and Funnel Cloud Events near the UIR (1969-2020)[110]

Location	Date	Event Type	Description
Umatilla County	Jun. 10, 1969	Hail	Hail up to 1 inch reported.
Umatilla County	Apr. 30, 1981	Hail	Hail up to 1.75 inches reported.
Umatilla County	May 1, 1981	Hail	Hail up to 1.75 inches reported.
Umatilla County	Jul.23, 1983	Hail	Hail up to 1 inch reported.
Umatilla County	Aug. 6, 1991	Hail	Hail up to 2 inches reported.
Pendleton Airport	Aug. 3, 1994	Hail	Hail up to 1.6 inches reported.
Umatilla County	May 9, 1995	Hail	Strong thunderstorms rumbled into Umatilla County mid-afternoon. A spotter near Pilot Rock reported one inch diameter hail, while small hail piled up to a depth of 4 inches at Deadman's Pass on I-84 southeast of Pendleton. In the Athena-Weston area brief heavy rain resulted in near zero visibility and water flowing over roadways.
Pendleton	May 31, 1997	Lightning	A power pole caught fire and caused power and cable TV outages in southeast Pendleton.
Ukiah	Aug. 1, 1997	Hail	A weather spotter reported 3/4-inch hail.
Umatilla County	Apr. 10, 1998	Hail	A thunderstorm produced hail up to one inch as it moved through northwestern Umatilla County.
Meacham	Jul. 9, 1998	Hail	A thunderstorm produced 3/4-inch hail and 0.25 inches of rain in 15 minutes. Lightning from this storm caused at least 11 spot fires to start. Lightning and windblown trees also caused scattered power outages.
Pilot Rock	Jun. 24, 1999	Hail	Spotters in Pilot Rock reported hail covering the ground to a depth of one inch and a 54-mph wind gust. Tree damage due to hail reported 10 miles west of Pilot Rock. Hail covered the ground to a depth of one inch.
Lehman	Aug. 2, 1999	Hail	Hail reported at Tower Mountain lookout tower.
Lehman	Aug. 6, 1999	Hail	1 inch hail fell for 10 minutes.
Mission	Aug. 13, 1999	Lightning	Lightning damaged a power pole next to highway 11 near Mission. This caused a 45-minute power outage that affected 1300 homes.
Pendleton	May 9, 2000	Hail, Funnel Cloud	Several severe thunderstorms brought widespread reports of hail and gusty winds to Umatilla County. One-half inch sized hail covered the ground to a depth of one inch along Interstate 84 near

TABLE: Hail, Lightning, and Funnel Cloud Events near the UIR (1969-2020)[110]			
Location	**Date**	**Event Type**	**Description**
			Cabbage Hill, which is 10 miles east of Pendleton. A small funnel cloud that descended a couple hundred feet from a thunderstorm was observed from the National Weather Service forecast office by an off-duty forecaster. This funnel lasted for around 15 seconds.
Ukiah	Aug. 24, 2000	Lightning	Lightning sparked a 640-acre fire in the Umatilla and Wallowa-Whitman national forests. This fire was called the Meadow Creek fire and was finally contained on the 31st of the month.
Tollgate	Apr. 27, 2001	Hail	Dime sized hail was reported at an elevation of 4000 feet.
Ukiah	Jun. 8, 2001	Hail	Hail up to the size of nickels covered the ground at the Winom Creek Campground, which is in the Blue Mountains at an elevation of 5500 feet.
Weston	Jul. 12, 2001	Hail	Along with nickel sized hail, wind gusts of 65 mph were reported at the same time 2 miles away in Pine Creek Canyon.
Ukiah	Aug. 13, 2001	Lightning	Lightning started a large fire in the Bridge Creek Wilderness area 7 miles south of Ukiah. This fire, which burned over 9000 acres of protected elk habitat, was finally contained on the 22 of August, after having forced several residents from their homes on the west side of Camas Creek. It also briefly threatened the town of Ukiah. State Highway 395, the main artery between Ukiah and John Day, was closed from the 15th to the 23rd due to dense smoke and firefighting efforts.
Ukiah	Apr. 14, 2003	Hail	The hail also contributed to a truck running off the road into Camas Creek, three miles south of Ukiah. No injuries were reported from the accident.
Indian Lake	May 24, 2003	Hail	Hail up to 1.5 inches reported.
Pilot Rock	Aug. 5, 2003	Lightning	Lightning ignited most of an 800-ton haystack on the Bar 41 Ranch in Pilot Rock.
Pilot Rock	Jun. 5, 2004	Hail	
Lehman	Jul. 19, 2004	Hail	Golf ball sized hail damaged vehicles and broke windshields at Tower Mountain.
Pendleton	Aug. 2, 2004	Lightning	Lightning associated with a thunderstorm moving through downtown Pendleton struck a power pole near Dairy Queen. This caused a fire in an electricity box and shut off power to homes and businesses across most of west Pendleton. $1,000 damage
Mission	Aug. 4, 2004	Hail, Funnel Cloud	Hal up to 0.75 inches reported.
Pilot Rock	Aug. 6, 2004	Funnel Cloud	
Weston	May 9, 2005	Funnel Cloud	
Tollgate	Jun. 21, 2005	Hail	Hal up to 0.88 inches reported.
Tollgate	May 19, 2006	Hail	Hail covered the ground.
Meacham	Jun. 24, 2006	Hail	Hail reported at Emigrant Springs State Park.

TABLE: Hail, Lightning, and Funnel Cloud Events near the UIR (1969-2020)[110]			
Location	**Date**	**Event Type**	**Description**
Meacham	Jul. 4, 2006	Hail	Hail up to 0.75 inches reported.
Ukiah	Jul. 5, 2006	Hail	Hal up to 0.88 inches reported.
Ukiah	Jun. 4, 2007	Hail	Daytime heating over the mountains and an upper-level trough produced a moist and unstable air mass which led to severe thunderstorms and flash flooding.
Tollgate	Aug. 31, 2007	Hail	Severe thunderstorms developed ahead of a cold front. Afternoon heating of a moist and unstable atmosphere combined with an active jet stream aloft sustained strong to severe thunderstorms with abundant lightning.
Adams	May 27, 2008	Funnel Cloud	NWS employee observed a funnel cloud that was 3/4 of the way to the ground just northeast of Adams.
Pilot Rock	Aug. 18, 2008	Hail	Large hail wrecked garden ($100 damage). An upper-level short wave combined with daytime heating, mid-level moisture, and vertical wind shear to produce severe thunderstorms across central and northeast Oregon.
Thorn Hollow	May 6, 2009	Hail	Hail up to golf ball size punched holes in vinyl siding. $1,000 damage reported.
Ukiah	May 29, 2009	Hail	A moist atmosphere combined with daytime heating and a weak upper-level disturbance produced scattered thunderstorms.
Mission	Jul. 12, 2009	Funnel Cloud, Hail	An upper-level low pressure area off the Oregon coast combined with daytime heating and an embedded disturbance in southerly flow aloft produced severe thunderstorms.
Mission	Apr. 17, 2010	Hail	Dime sized hail reported.
Pilot Rock	Jul. 9, 2010	Hail	Dime to penny size hail accumulated to near 2 inches and caused minor vegetation damage. Street flooding occurred due to the hail overwhelming culverts.
Pendleton	Apr. 16, 2011	Funnel Cloud	Public reported a shaft of rotation along with a wall cloud in a thunderstorm.
Pendleton	May 14, 2011	Lightning	Lightning struck the attic of a residence and blew out the power and sent sheetrock flying off the walls downstairs. The lightning also struck a bathroom vent on the neighbor's house. $500 damage.
Bingham Springs	Jul. 16, 2011	Hail	Hail accompanied by 5 to 10 minutes of heavy rainfall that left areas of standing water.
Mecham	Jul. 20, 2012	Hail	Hail accompanied by 0.31 inches of rainfall. Hail accompanied by 30 mph wind. A nearly stationary upper-level low pressure area parked near Brookings, Oregon brought abundant moisture across eastern Oregon. This combined with daytime heating to produce a few severe thunderstorms and locally heavy rainfall. Lightning caused a few wildfires which were quickly contained.

TABLE: Hail, Lightning, and Funnel Cloud Events near the UIR (1969-2020)[110]			
Location	**Date**	**Event Type**	**Description**
Kamela	Aug. 13, 2014	Hail	An upper-level low pressure system off the coast of southwest Oregon slowly moved inland the afternoon and evening of August 13th. This led to another round of showers and thunderstorms for most of the forecast area. Heavy rain and large hail were the main severe weather threats on this day.
Meacham	Jul. 1, 2015	Hail	Public reported penny sized hail in Meacham.
Ukiah	Jun. 8, 2016	Hail	A few severe thunderstorms developed with good rotation associated. One of these storms managed to produce a short-lived tornado. In addition to the tornado a wind gust about 70 MPH was reported 14 miles east of Mitchell. That same area received golf ball (1.75) hail. Other areas that received hail ranging from penny to golf ball in size were: 1.75 2 miles N of Monument, 1.75 in Monument, 1.00 just east northeast of Ukiah, 1.00 a mile northeast of Ukiah, 0.88 14 miles north northwest of Dayville, and 0.75 9 miles southeast of Spray.
Ukiah	May 28, 2020	Hail	An isolated supercell thunderstorm developed on May 28th and produced large hail in southern Umatilla County.
Pendleton	May 30, 2020	Hail	A major severe weather event by Pacific Northwest standards occurred over central and northeast Oregon and southeast Washington on May 30th. A powerful upper-level storm system moved across the area during the afternoon and evening helping to trigger severe thunderstorms. The airmass was unusually unstable for this area of the country with surface dewpoints well into the 60s. With strong upper-level winds in place the stage was set for numerous fast moving intense storms through the afternoon and early evening. Numerous reports of large hail and damaging winds were received with most of the hail falling in central Oregon. There were multiple reports of significant hail (2 inch in diameter) and winds in excess of 75 mph.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** The 2020 Oregon Hazard Mitigation Plan does not include spring and summer storms or severe weather broadly as a hazard; no probability ranking is available for comparison.

Given the hazard history detailed above, the UIR-Pendleton area can expect an annualized occurrence of about 1.05 severe thunderstorm events (characterized by large hail, lightning, and/or a funnel cloud). Typical thunderstorms are even more frequent. The table below details the average number of thunderstorms in Pendleton each month, a total of 10.6 storms annually.

TABLE: Mean Number of Days with Thunderstorms near Pendleton[111]											
Jan.	**Feb.**	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sep.**	**Oct.**	**Nov.**	**Dec.**
0.0	0.0	0.2	0.9	1.8	2.0	2.0	2.1	1.2	0.3	0.1	0.0

Since 2012, the CTUIR has been a certified participant in the National Weather Service "StormReady" Program. StormReady is a nationwide community preparedness program that provides emergency managers with guidelines on how to improve hazardous weather operations. The CTUIR StormReady status has been renewed through April 2022.

Climate Change Impacts

There is not yet clear, scientific consensus on whether human-caused climate change will contribute to more frequent or more severe thunderstorms in the Pacific Northwest. There have been some studies into the effect of greenhouse gases on Convective Available Potential Energy (CAPE), which measures how much energy is available for storms. These studies have mostly concentrated on the eastern and southeastern parts of the United States.[112]

Vulnerability of the UIR to Spring and Summer Storms

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include spring and summer storms or severe weather broadly as a hazard; no risk ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Spring/Summer Storms

Criteria	Score	Description
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	2	Localized minor
Environmental Impact	2	Localized minor
Economic and Social Impact	1	Minimal
Culture Impact	1	Minimal
Frequency Score	6	Highly Likely; expected every 1-2 years
Total Impact Score	**16**	**Medium Risk**

The greatest impacts from spring and summer storms come from hail, flooding (Section 3.8), and wind (Section 3.15). Spring and summer storms have produced hail from over ¾ of an inch to almost 2 inches in size. Hail often occurs with these storms and can cause economic damage to agricultural crops. Damage to property and possible injuries to people can also occur. As summers get hotter and drier in Oregon, lightning strikes and associated wildfires are of greater concern.

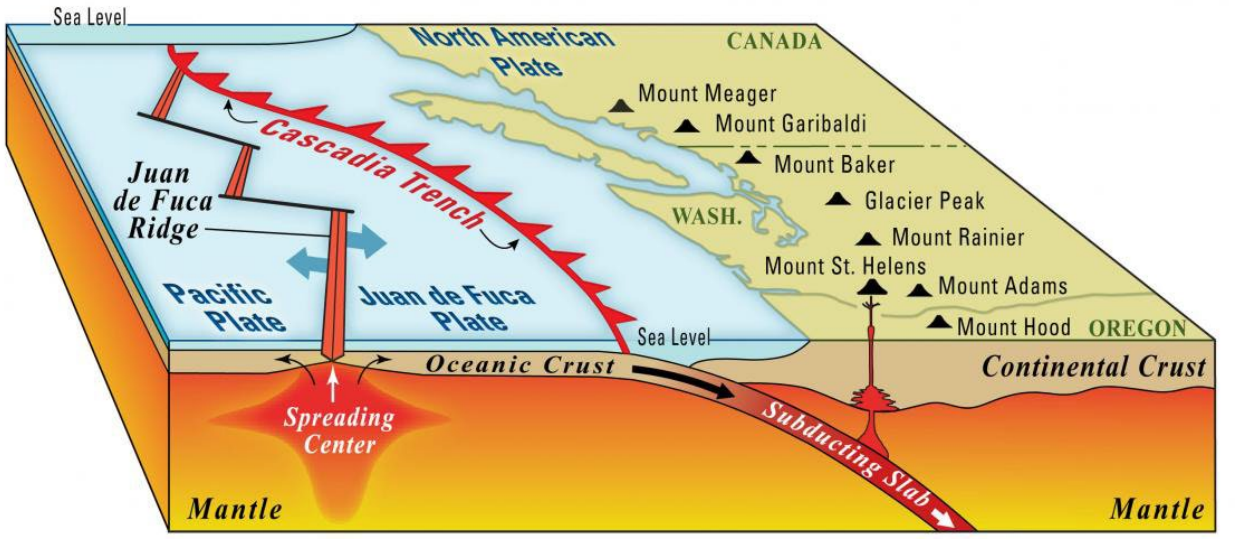
Loss Estimates

Most losses from severe weather in the UIR come from associated flooding impacts. Hail has led to negligible damages – less than $5,000 since 1969, based on the hazard history above.

3.13 Volcanic Activity

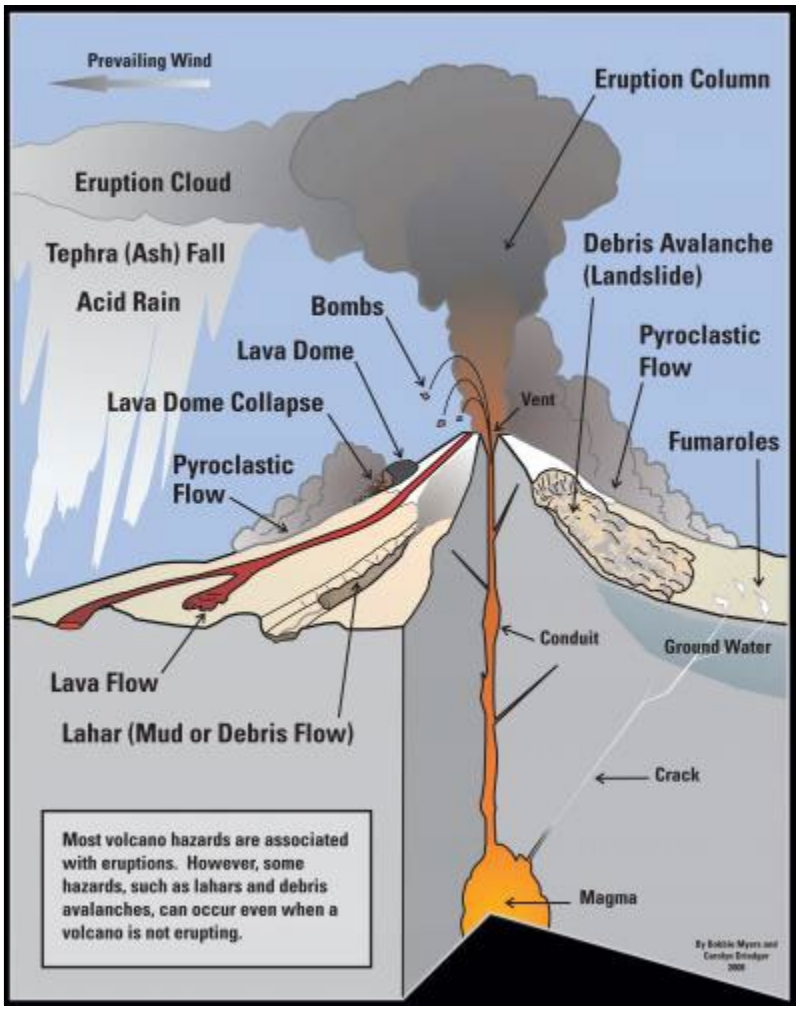
Volcanoes are a result of the complex interaction of tectonic plates along the Cascadia Subduction Zone. The process results in the Juan de Fuca Plate subducting, or sinking, underneath the North American plate on which we live. As the subducted plate descends, it heats up and begins to melt. This provides the reservoir of heat and molten rock needed to create the magma chambers that lie kilometers deep underneath the Cascades.[113] This process is reflected in the figure below.

FIGURE: Generalized Subduction Zone Setting[114]



Volcanic eruptions are focused around a single vent area but can vary in their explosivity. The hazards associated with volcanoes are based on relative proximity to the eruptive center. Without a volcano within 100 miles of the Reservation, CTUIR is most concerned about distal hazards, which create an impact beyond an active vent (over 30 miles). Distal hazards include lahars (mud or debris flows), eruption columns and clouds, and tephra (ash) fall. Volcanic hazards are illustrated in the figure below.

FIGURE: Volcanic Hazards[115]



Extent and Intensity

The U.S. Geological Survey (USGS) Volcano Hazards Program has developed a threat level system to categorize the 169 volcanoes in the U.S. Volcanic threat is defined as the "qualitative risk posed by a volcano to people and property." This threat assessment considers both exposure and the relative danger of volcanic hazards, as shown in the figure below. There are five threat levels: Very High, High, Moderate, Low, and Very Low. Of 57 priority volcanoes in the country (Very High or High Threat), nine are in Oregon and Washington.

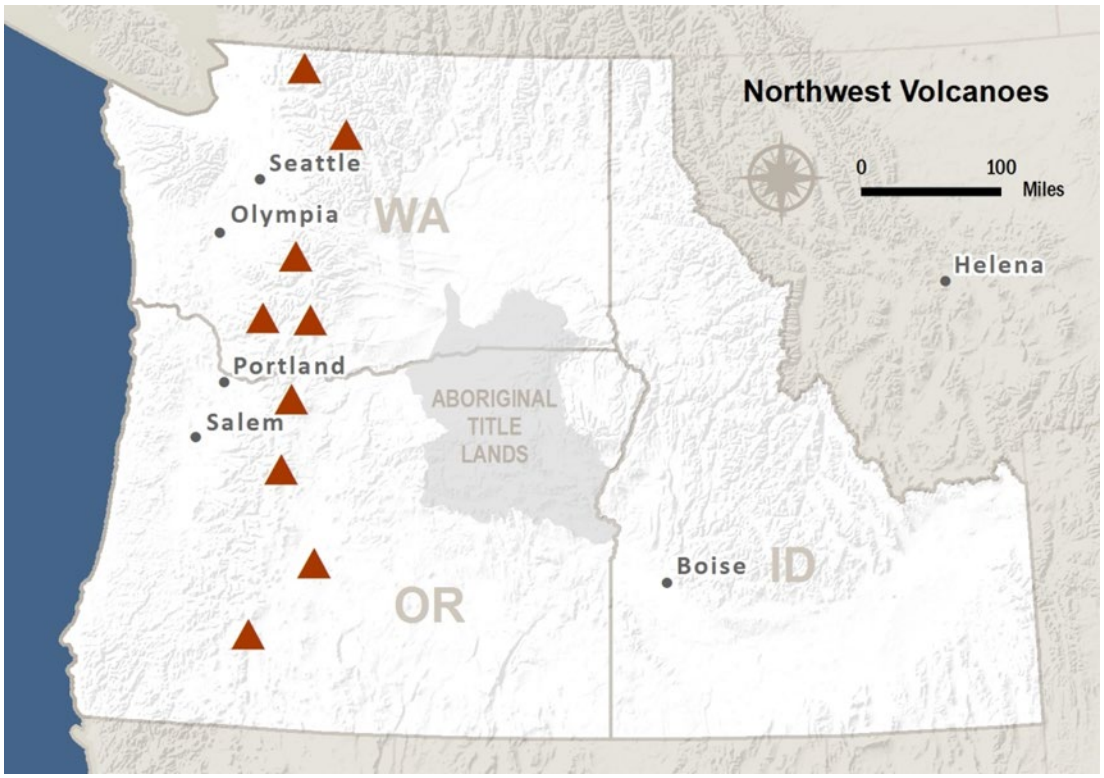
FIGURE: Volcano Threat Potential[116]

Geographic Location

The closest active and potentially active volcanoes to the UIR are Mount Hood (Columbia River Region), Mount Jefferson (Central Oregon), Mount Adams (Southwest Washington), and Mount St. Helens (Southwest Washington). Mount Hood and Mount St. Helens are considered to have Very High Threat Potential, while Mount Adams has High Threat Potential, and Mount Jefferson Low Threat Potential. Volcanoes within the Cascade Mountains are shown in the map below.

The UIR is over 100 miles from the nearest Cascade Mountain volcano, so any impact from a volcanic event would involve the amount of ash that might be deposited on Reservation property. The farther away from the volcano, the smaller the amount of ash will fall on the UIR. Mount St. Helens is the most likely source of ashfall currently, although geoscientists estimate some future activity on Mount Hood.

FIGURE: Cascade Mountains Volcanoes[117]



History of Volcanic Activity in the UIR and Surrounding Areas

There have not been any volcanic eruptions in the UIR. The closest, most recent volcanic eruption was Mount St. Helens (1980). During the eruption of Mount St. Helens, the UIR received a dusting of volcanic ash. A brief history of the closest volcanic activity is included in the table below.

TABLE: Historic Volcanic Events near UIR[118]

Year/Period YBP = Years Before Present	Volcano	Activity Description
About 20,000 to 13,000 YBP	Polallie Eruptive Episode, Mount Hood	
About 7,700 YBP	Parkdale, north-central Oregon	Eruption of Parkdale lava flow
About 1,500 YBP	Timberline Eruptive Period, Mount Hood	Lava dome, pyroclastic flows, lahars, tephra
1760-1810	Crater Rock/Old Main Flat, Mount Hood	Pyroclastic flows, lahars, dome building
1859-1865	Crater Rock, Mount Hood	Steam explosions, tephra falls
1907	Crater Rock, Mount Hood	Steam explosions
1980-1986	Mount St. Helens	Volcanic Explosivity Index (5); debris avalanche, ashfall, flooding on Columbia River; lava dome growth, steam, lahars
1989-1990	Mount St. Helens	Volcanic Explosivity Index (2); hydrothermal explosions
1990-1991	Mount St. Helens	Volcanic Explosivity Index (3); hydrothermal explosions
2004-2008	Mount St. Helens	Volcanic Explosivity Index (2); lava dome growth, steam, ash

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Unlikely.** According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County as a **Low Probability** of Volcanic Hazards/Activity. The 30-year probability of at least 1 cm of ashfall from eruptions anywhere in the Cascade Range is 1 in 30 for Umatilla County.[119] The probability distribution reflects the frequency of explosive eruptions at each major Cascade volcano, variability in thickness of tephra that could be deposited at various downwind distances, and variability in wind direction.

Climate Change Impacts

There is no data currently available about the impact of changing climate conditions and volcanic activity. That said, volcanic activity can impact climate change, given the amount of gas and ash injected into the stratosphere during a major explosive eruption.

Vulnerability of the UIR to Volcanic Events

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Low Risk** to this hazard.

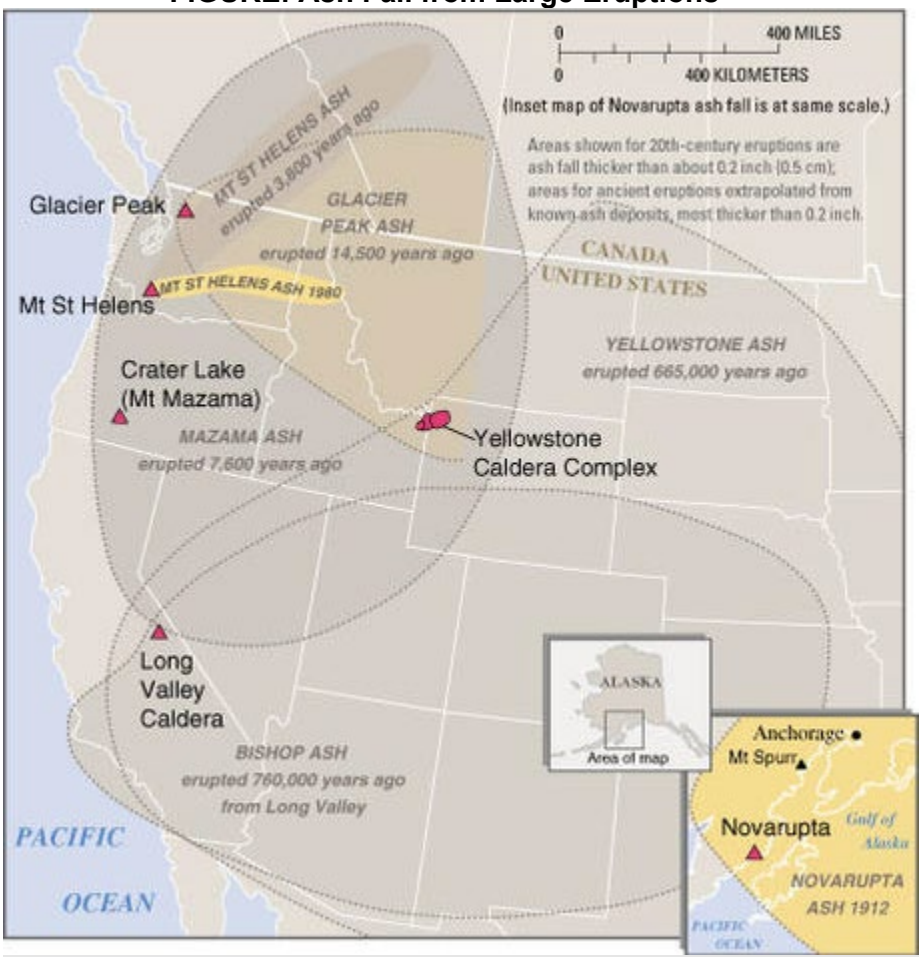
Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Volcanic Events		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	1	Minimal
Environmental Impact	1	Minimal
Economic and Social Impact	1	Minimal
Culture Impact	1	Minimal
Frequency Score	1	Unlikely; expected once every 200+ years
Total Impact Score	**9**	**Low Risk**

The greatest impact to the UIR from a volcanic event in the Cascade Range will be ash/tephra fall. Tephra is defined as the various rock fragments that are ejected into the air by an erupting volcano. Much of the tephra falls near the eruption site, but many smaller and lighter pieces (2 mm diameter and less), called ash, can be carried for thousands of miles.[120]

The figure below shows the ash fall extent from major volcanic events in the western U.S.

FIGURE: Ash Fall from Large Eruptions[121]



An eruption and subsequent tephra/ash fall will disrupt regional aviation, impact the health of people and livestock, and potentially disrupt essential infrastructure like power generation, transportation, water systems, and telecommunications.[122]

Loss Estimates

There is no clear way to estimate potential losses to property and economic activity due to volcanic events, especially for a more distant community like the UIR. It is expected that disruptions from a Cascade Range eruption will have minimal impact.

3.14 Wildfire

Oregon and the UIR have long experienced wildfire events, a common and widespread hazard in the state. Oregon's ecosystems, especially its extensive forestland, is dependent on regular fire for continued health. Increasingly, human development has grown within the Wildland-Urban Interface (WUI) where structural development meets natural vegetative fuels. Fire season in Oregon is typically between June and October, although it has increased in length in recent decades.[123]

The following, from the Umatilla County Wildfire Protection Plan, is a good description of the characteristics of the four broad categories of wildfires that occur in Umatilla County and can occur on the UIR:

> An **agricultural fire** burns in areas where the primary fuels are flammable cultivated crops such as wheat. This type of fire tends to spread very quickly but is relatively easy to suppress if adequate resources are available.
>
> The classic example of a wildfire is the **forest setting**. Timber fuels this type of fire, along with associated fuels such as brush, grasses, logging residue and thick stands of reproduction. The forest type of wildfire can be extremely dangerous and difficult to suppress due to fuel and topography factors. These fires are often very costly to suppress.
>
> **Range fires** burn across ground typically used for grazing or wildlife management purposes and are typically open landscapes that lack heavy stands of timber or large accumulations of fuel. Juniper, bitterbrush, and sage are common fuels involved in a range fire.
>
> **Wildland-urban interface fires** occur in portions of the state where urbanization and natural vegetation fuels allow a fire to spread rapidly from natural fuels to structures and vice versa. Structural suppression resources can be quickly overwhelmed, especially in the early stage of such fires, increasing the number of structures destroyed.

The most common causes of wildfires are lightning (30%) and human-caused events (70%).[124] Human-caused fires may be started by railroad activity, small or heavy equipment, recreational activities such as camping, smokers, debris burning, vandalism, arson and other, less common events such as automobile accidents.

Extent and Intensity

The extent and probable intensity of wildfires on the UIR depends on many factors. The grasslands and forestlands on the Reservation will always be vulnerable to wildfire. The extent and intensity will depend on when and where the fire starts and the ability of firefighting resources to mobilize to fight every wildfire.

Historically, most wildfires burn no more than 10 acres because of the success in suppressing them. As the Umatilla County Community Wildfire Protection Plan indicates, "the remaining 4% of the fires tend to be damaging and very difficult to suppress."[125]

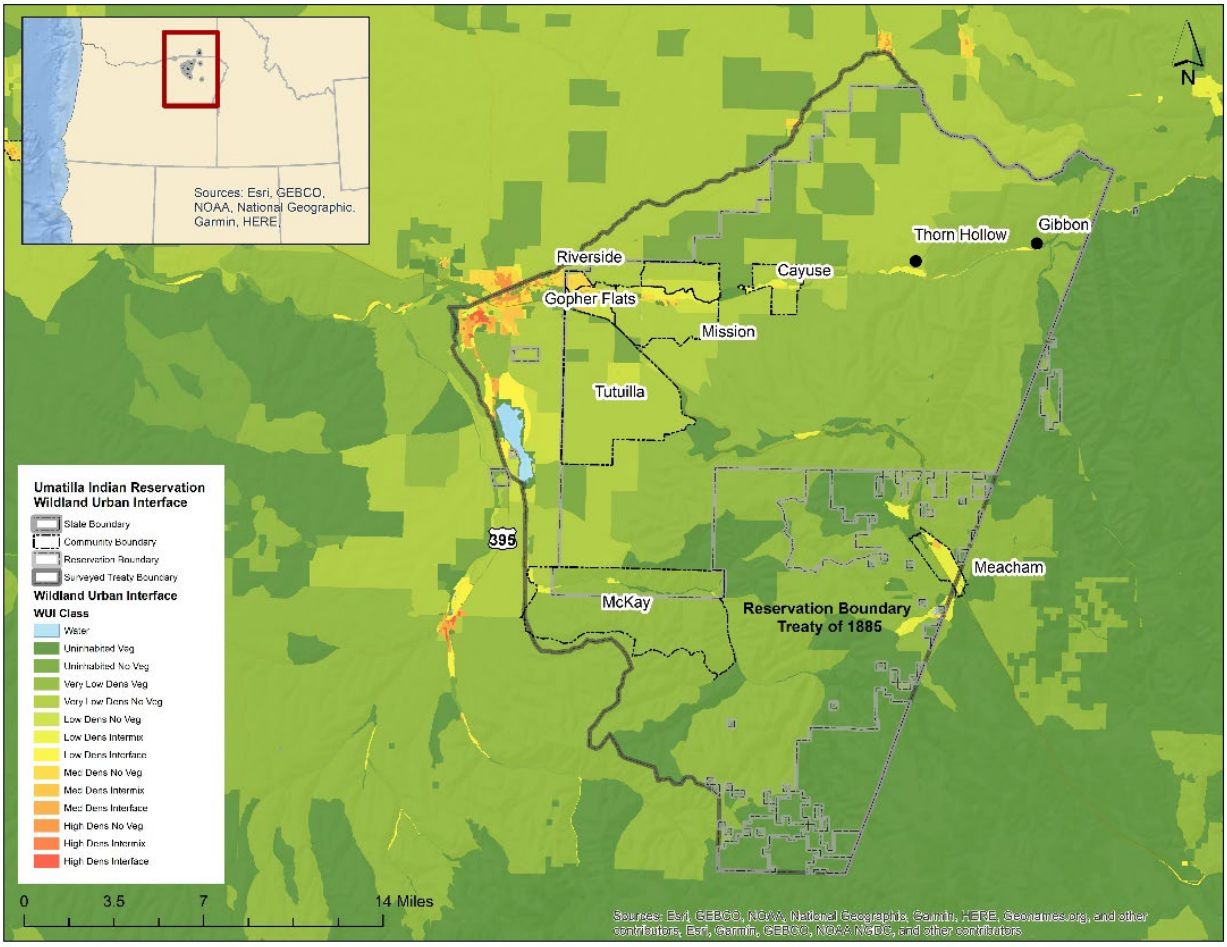
Geographic Location

The Department of Interior Bureau of Indian Affairs (BIA) Wildland Fire Prevention Plan (WFPP) 2012-2016 is specific to the UIR lands owned in Trust status. The purpose of the WFPP is to define a prevention and education strategy and to examine mitigation strategies. The WFPP identifies 11 communities within the UIR boundaries as Urban Wildland Communities Within the Vicinity of Federal Lands that are at High Risk from Wildfires. Of these communities Meacham,

I-84 Corridor, Meacham Lake, and Gibbon are rated as High; the communities of Mission, Umatilla, Thornhollow and Cayuse are rated as Moderate; Umatilla River, McNary and Mission Highway Corridor are rated Low.

The map below illustrates the UIR communities by Wildland Urban Interface (WUI), which categorizes the zone of transition between land and human development. This intermingling of wildlands and vegetative fuels with housing or other development poses greater risk for wildfire events. The UIR has several areas with medium density development in wildland intermix or interface areas, indicated in yellow and orange, in Mission, Cayuse, Thornhollow, Gibbon, and Meacham.

FIGURE: Wildland Urban Interface (WUI) Areas in the UIR



The State of Oregon and BIA WFPP both address wildfires or wildland fires on the UIR which involve multiple agencies, coordination by establishing inter-agency agreements is extremely important for efficient response and clarification of jurisdictional boundaries.

Four unincorporated communities on the UIR are identified as Urban Wildland Interface Communities and have a high risk for wildfire. These communities are among thousands of similar communities throughout the United States that are eligible for special wildfire hazard reduction activities.

History of Wildfire in the UIR and Surrounding Areas

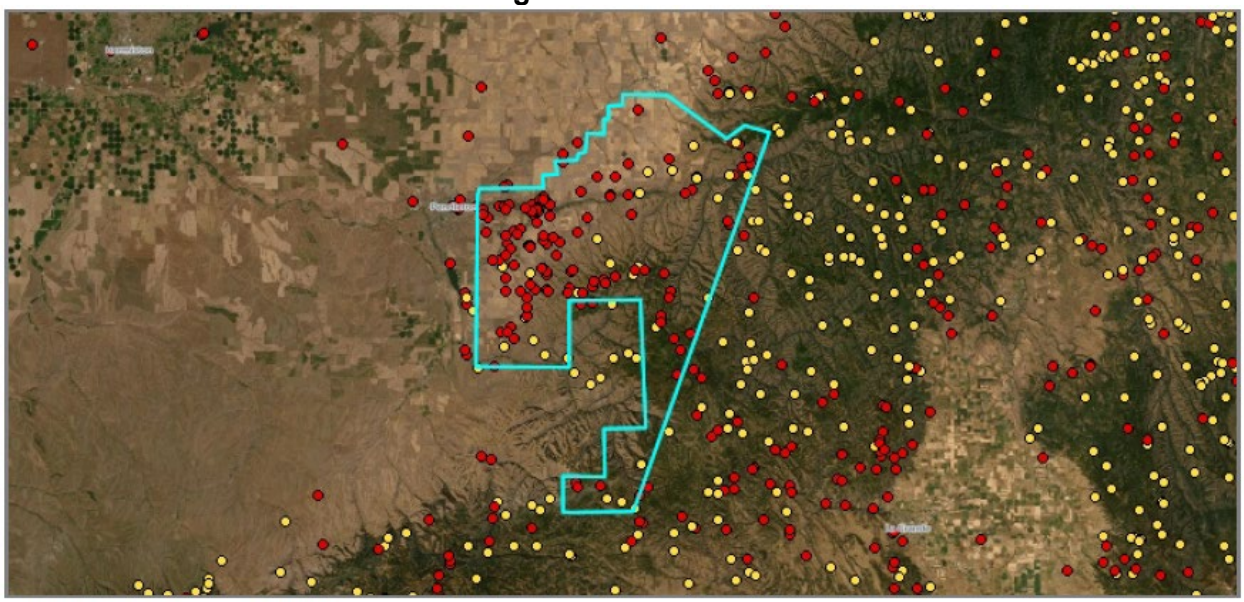
Wildfires have a long and often productive history in Oregon. Indigenous people used controlled fires as a form of active management before modern fire suppression tactics became the norm. The Blue Mountains were given their name by non-native immigrants because of the blue-colored wildfire smoke that was often present in the region.[126]

Historical records of wildfires within and surrounding the UIR boundaries have been documented by three jurisdictional agencies.

- BIA has jurisdiction for wildfire protection and prevention on lands held in Trust status within the UIR diminished boundary and on CTUIR-owned Trust lands within the Aboriginal Title areas.
- Oregon Department of Forestry (ODF) provides wildfire protection and prevention on lands owned in fee status within the UIR and on lands located outside the UIR diminished boundaries. Lands held in fee title ownership, both within the UIR and outside UIR boundaries, are assessed a fee through Umatilla County Assessment and Taxation for this service provided by ODF.
- U.S. Forest Service provides wildfire protection and prevention on off-Reservation Forest Service public lands which are adjacent to the UIR diminished boundaries.

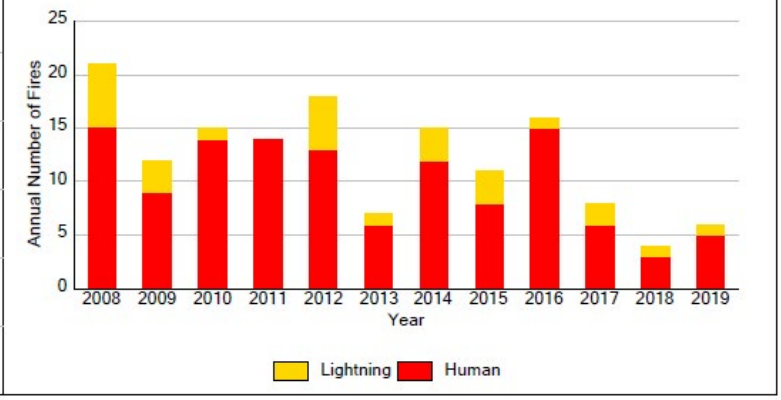
As the UIR is prone to occasional droughts, dry summers, and numerous lightning storms during spring and summer months, wildfires are relatively common. Using the Oregon Wildfire Risk Explorer, the map below demonstrates the significant number of fire ignitions within the UIR. Lightning-caused fires account for approximately 18% of all fires, and the other roughly 82% were human-caused. There are about 15 fires burning a total of 311 average acres every year in the UIR, with many more starting in the Blue Mountains and other surrounding areas.

FIGURE: Fire Ignitions between 2008-2019[127]



CTUIR fire starts between 2008-2019

Total Acres Burned	3,106
Total Number of Fires	147
Average Acres Burned Per Year	311
Average Fires Per Year	15
Percent Lightning Caused	18.4%
Percent Human Caused	81.6%



One of the oldest accounts of a major wildfire was described by W.H.B. Kent in 1904. He wrote the following about the fire in the Wenaha Forest Reserve (now fully incorporated into the Umatilla National Forest):

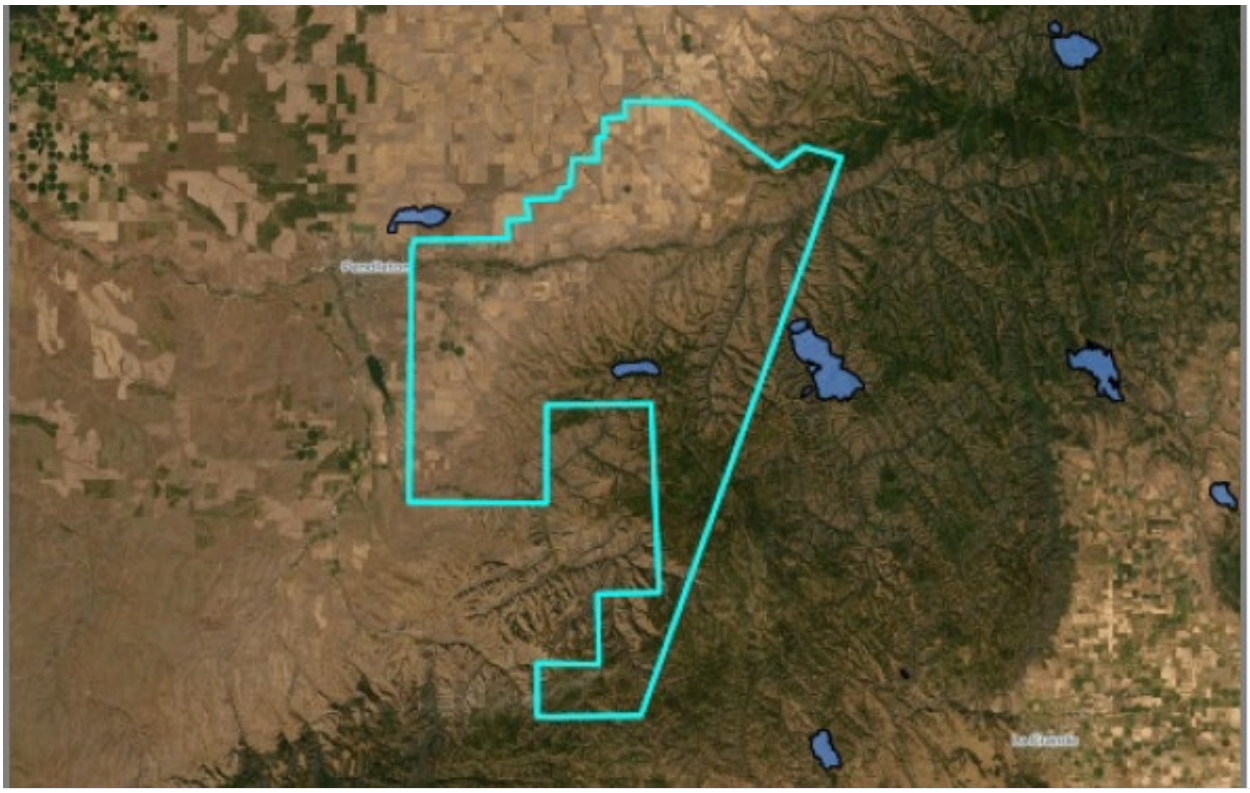
> *"Practically every portion of the reserve has suffered more or less from fire. The largest and most important of these was one which came from the present Umatilla Indian Reservation about fifty years ago, burned up the river Umatilla, into the Reserve, then turned north along the west slope, across the heads of the Walla Walla's, and reached as far as the head of the Wenaha. This burn has generally restocked finely, principally to tamarack and lodge pole pine."*

The fire area Kent describes was over 60,000 acres with much of it in what is now Umatilla County.

The CTUIR's interests in protecting its forest lands from wildfire go beyond the boundaries of the Reservation. The CTUIR now owns land within the Aboriginal Titled area surrounding the diminished Reservation in both Oregon and Washington that have cultural and environmental significance. In 2006, a major wildfire occurred on lands in the state of Washington owned by the CTUIR.

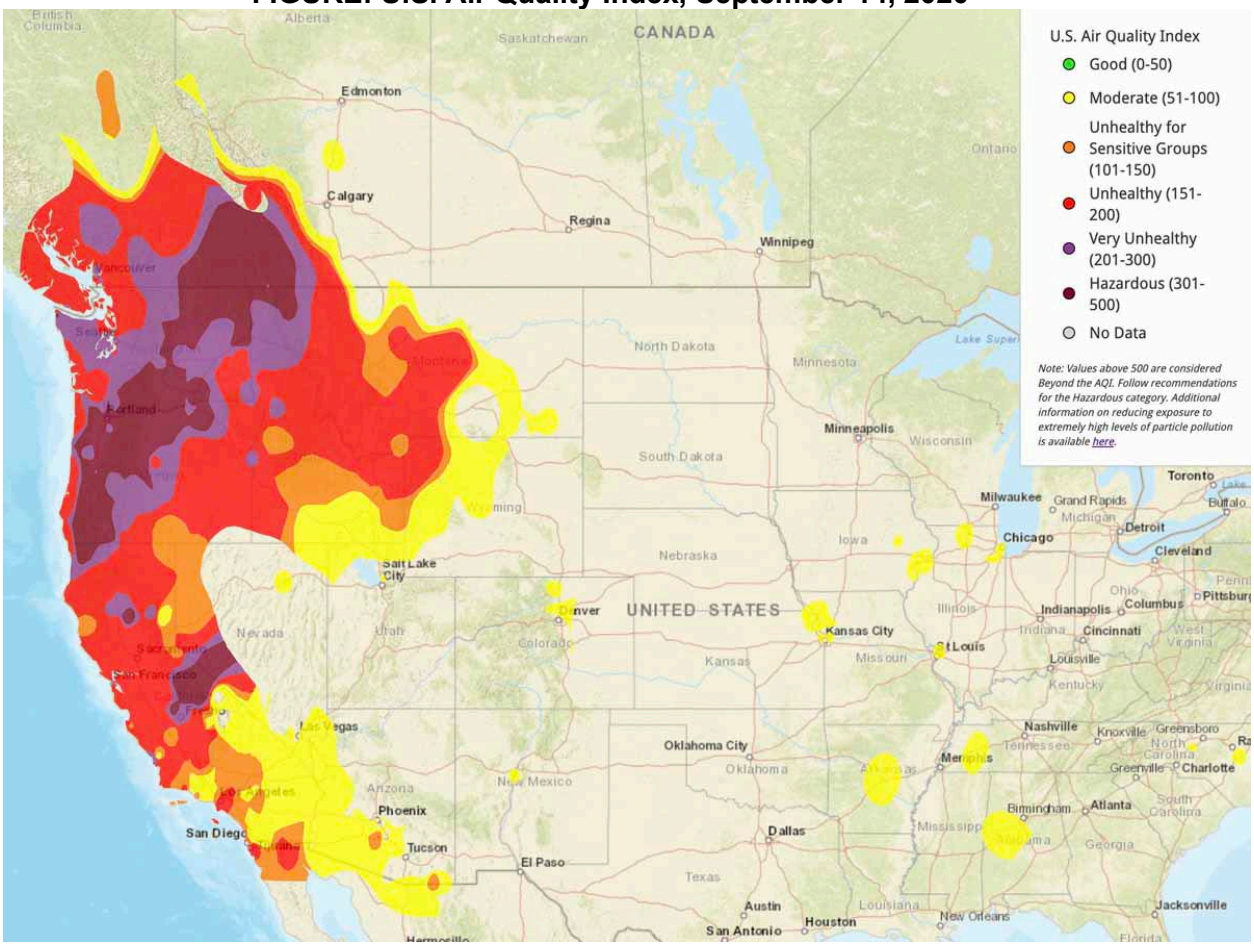
In July 2016, the Weigh Station Fire burned 914 acres within the UIR. The fire resulted in the closure of Interstate 84 for about 24 hours and Level 3 Evacuation Orders for nearby residents. The fire destroyed two outbuildings but no homes. Other fire perimeters have reached the boundaries of the Reservation, including the McCormmach Fire in 2014 north of Pendleton. Fire perimeters between 2000-2019 are illustrated in blue in the map below. Wildfire events outside of the UIR can create impacts for residents, including air quality concerns.

FIGURE: Wildfire Perimeters near the UIR 2000-2019[128]



2020 was a record year for wildfire events in Oregon and the Pacific Northwest. While Umatilla County and the UIR were not included in state and federal disaster declarations, the entire state was impacted by air quality concerns for several weeks in September 2020. The Air Quality Index (AQI), a ranking of air quality by the Environmental Protection Agency, reached over 400 in Pendleton, considered "Hazardous," during the worst of the fires. Businesses and public services closed due to smoke concerns, including Wildhorse Resort & Casino. The figure below provides a snapshot of the AQI across the region on September 14, 2020, when smoke was at its peak.

FIGURE: U.S. Air Quality Index, September 14, 2020[129]



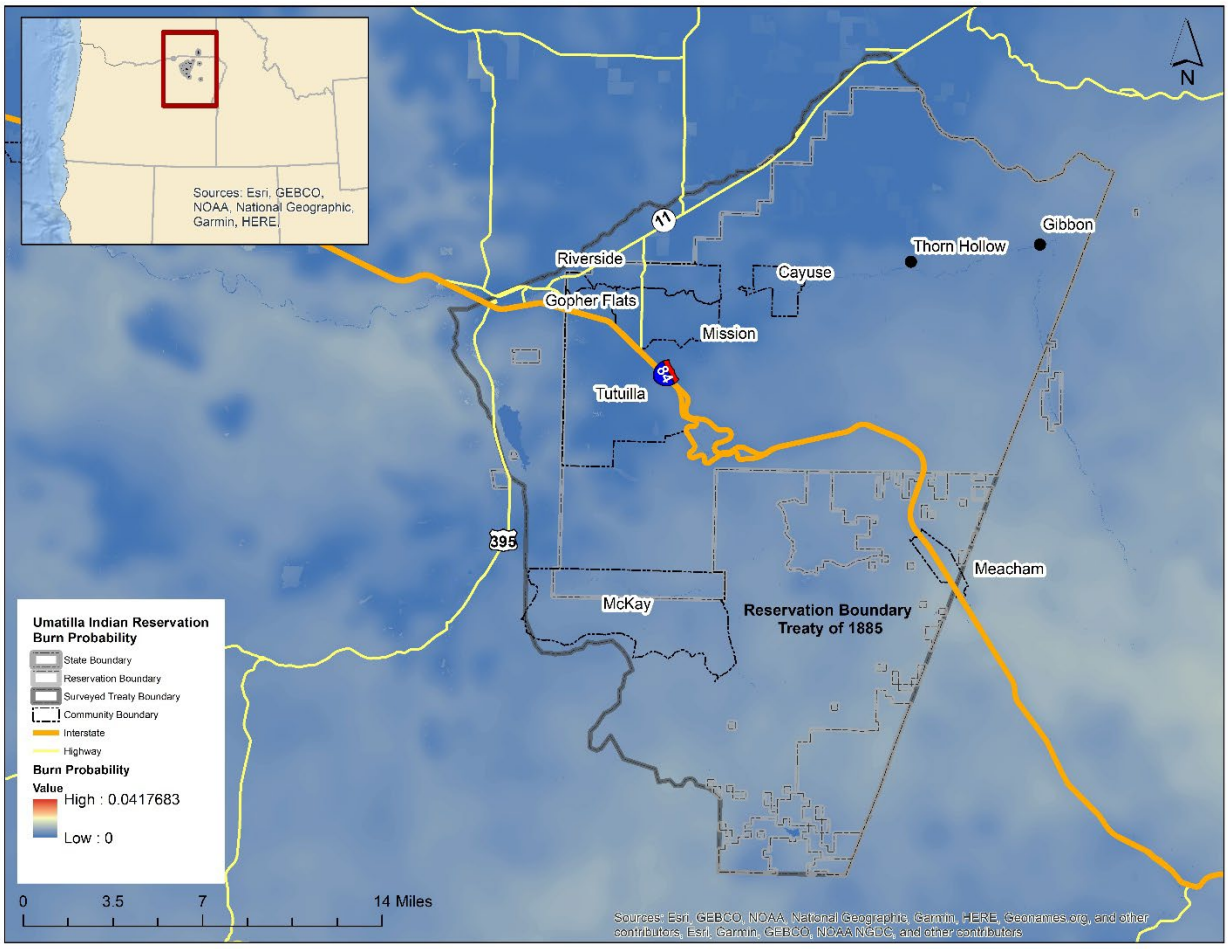
Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely**. According to the 2020 Oregon Hazard Mitigation Plan (HMP), Umatilla County has a **High Probability** of wildfires.[130]

Fire is a natural and expected force in Oregon and the UIR. The occurrence of fires is influenced by many factors, including warmer and drier summers, increasing human development, poor forest health, invasive species, and years of fire suppression and exclusion causing vegetation build-up.

The map below illustrates the Burn Probability (or Wildfire Likelihood), considered the annual probability of a wildfire burning in a specific location. Factors contributing to this probability include topography, weather, and ignition history. As indicated in dark blue, the populated areas of the UIR to the north and west have lower burn probability than the Blue Mountains and foothills to the east towards Meacham.[131]

FIGURE: Burn Probability for UIR and Surrounding Areas



Climate Change Impacts

Declining mountain snowpack, earlier spring snowmelt, and warmer and drier summer months have led to a longer fire season in Oregon. Human-caused climate change, along with years of fire suppression, have increased dry fuels to burn leading to more frequent large fires. All regions in Oregon are projected to see an increased incidence of wildfire in the future, with

lower elevations experiencing greater impacts. Based on the 100-hour fuel moisture index, used by Northwest Interagency Coordination Center to predict fire danger, Oregon will see an increased number of "extreme" fire danger days, especially in eastern Oregon. Umatilla County is projected to see an increase of 15 days (or 40%) of high fire danger days by 2050.[132]

Vulnerability of the UIR to Wildfire

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **High Risk** to this hazard. According to the FEMA National Risk Index, the UIR census tract has a **"Relatively High" Risk** rating.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Wildfire		
Criteria	**Score**	**Description**
Deaths	1	0-1 deaths expected
Injuries	1	0-3 injuries or hospitalizations expected
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	3	Widespread repairable
Environmental Impact	4	Localized severe
Economic and Social Impact	3	Temporary widespread
Culture Impact	3	Temporary
Frequency Score	5	Highly Likely; expected once every 3 to 9 years
Total Impact Score	**22**	**High Risk**

According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **"High" Vulnerability** to wildfire events.[133] The graphic below offers a framework for community wildfire vulnerability. The factors of "adaptive capacity" include 13 metrics from the American Community Survey across four domains: socioeconomic status, language and education, demographics, and housing and transportation.

FIGURE: Community Vulnerability to Wildfires Framework[134]

In comparing the demographics of the UIR to the factors of adaptive capacity, the community overall is highly vulnerable to wildfire events. Social vulnerability in Umatilla County is driven by a high percentage of single-parent households, low per-capita income, a high percentage of adults without a high school diploma, and a high proportion of people under 17 years old. All these demographics and indicators of socioeconomic status contribute to adaptive capacity.

A 2018 study found that census tracts that are majority Black, Hispanic, or Native American experience a 50% greater vulnerability to wildfire compared to other census tracts. The study found that census tribal tracts within Indian reservations tend to have higher wildfire hazard potential scores than non-reservation census tracts. This higher risk, when paired with lower adaptive capacity, makes Native Americans particularly vulnerable.[135]

Loss Estimates

According to the FEMA National Risk Index, the UIR census tract has a **"Relatively Moderate"** expected annual loss rating, with all the total of $30,117 annual loss contributed to buildings and structures. The UIR has a negligible history of losses to wildfire, given the remote location of most fires on or impacting the UIR.

Impacts on CTUIR Operations

CTUIR Fire Department and Public Safety could be significantly impacted by a wildfire event on the UIR. Fires require significant attention and resources, especially in the early stages before a wildfire escalates to the scale of state, interstate, or federal resources. A wildfire along I-84 would require significant response from partner agencies to prevent closures and monitor evacuations as needed. UIR operations are more regularly impacted by smoke and poor air quality from fires. The CTUIR Department of Natural Resources regularly monitors air quality and provides reports to CTUIR administration to inform decision-making and protect staff and tribal members.

Impacts on Human Health and Happiness, Economics & Community

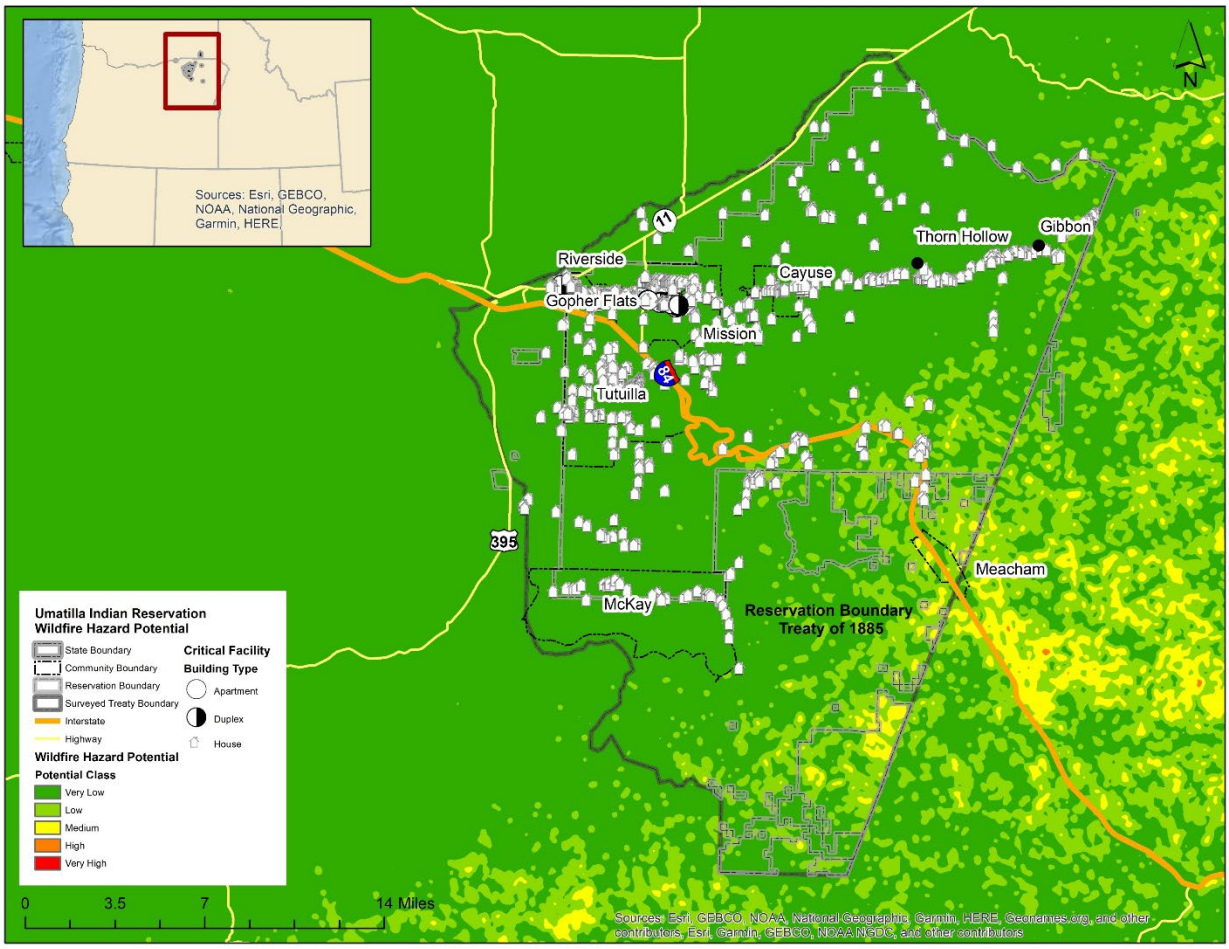
The impacts from wildfires can be devastating. If left uncontrolled, wildfires can burn homes and businesses. This Mission area is home to the CTUIR Fire Department and is considered at moderate risk to wildfires, but residents may still experience impacts from smoke. A wildfire in the vicinity of Mission could cause a loss of revenue to the businesses located in Mission and would cost the CTUIR great expense in fighting the fire and protecting area residents.

As indicated in the adaptive capacity indicators above, those who are less mobile, including the elderly, people with disabilities, and those without reliable transportation, are the most vulnerable to wildfires and would have face challenges in evacuating. These groups, in addition to children and those in unsuitable housing may experience greater impacts from smoke and poor air quality.

Lower income families in rural areas may be less able to afford fuel reduction measures, such as tree trimming and brush removal. With fewer resources to protect homes, low-income families may experience disproportionate damages in a wildfire event. The rural residential development clusters located in more remote areas of the Reservation are more at risk to wildfire than the Mission community.

The map below illustrates the housing units on the UIR overlayed with the Wildfire Hazard Potential. There are just four homes in areas with Medium Hazard Potential, indicated in yellow on the map. **Appendix C** of the plan provides a list of all critical assets, including housing units, at risk to wildfires.

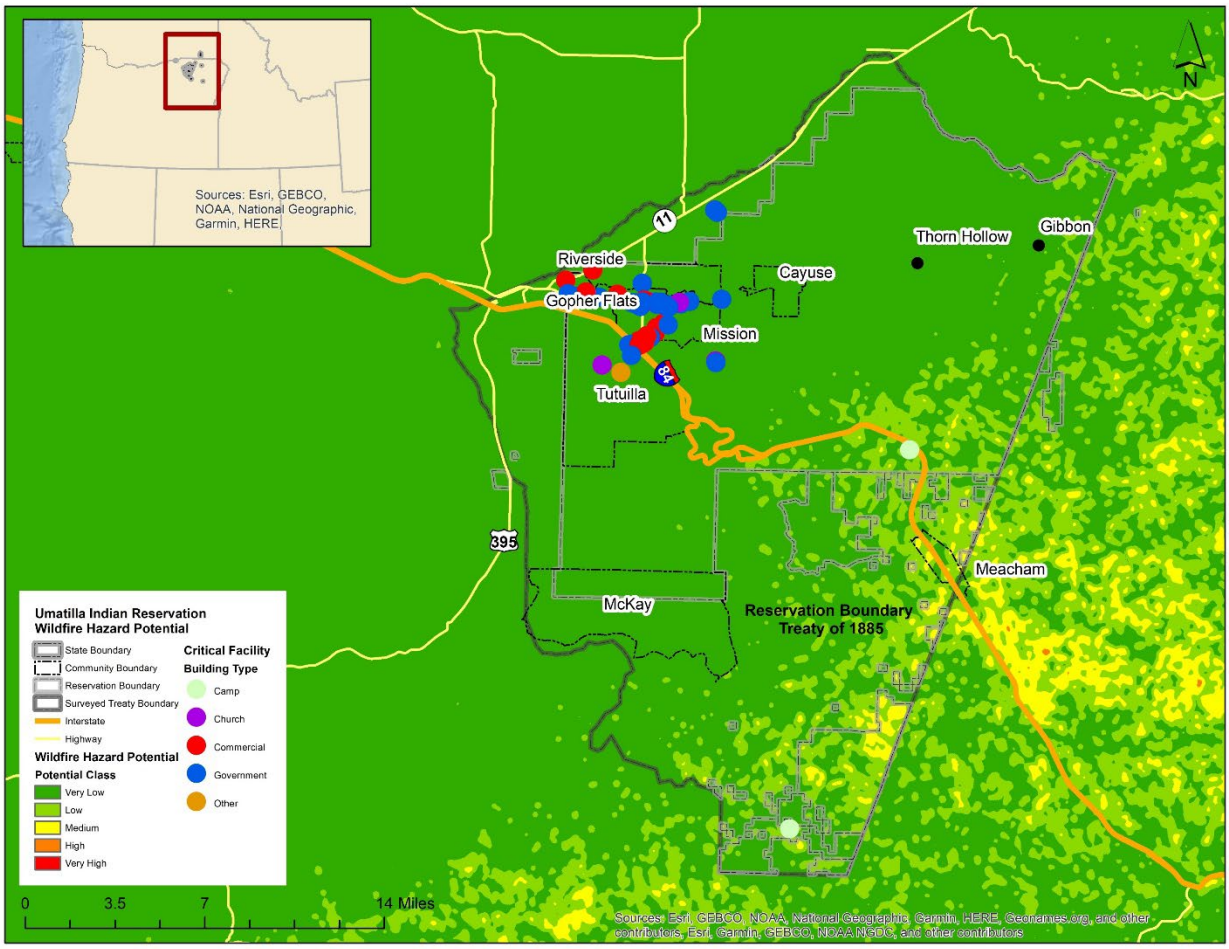
FIGURE: Housing and Wildfire Hazard Potential on the UIR and Surrounding Areas



Impacts on Infrastructure, Built Systems, and Energy Production & Use

Most critical assets are in low risk, low hazard potential areas within the UIR. Only one critical asset, Camp Da Kon Ya, is in a Medium Hazard Potential area, as illustrated in the map below. More significant would be the closure of I-84 due to nearby wildfires or hazardous driving conditions due to smoke. Additionally, critical facilities could experience disruption due to hazardous air quality limiting travel or work by personnel.

FIGURE: Critical Assets and Wildfire Hazard Potential on the UIR and Surrounding Areas



Impacts on Water and First Foods

First Foods habitat, forests, and agricultural lands are critical to the sustainability of the UIR as a community and Native American culture. Wildfires threaten to destroy First Foods and their habitats. Additionally, smoke and poor air quality associated with wildfire events can significantly limit Tribal members access to First Foods areas, whether due to poor travel conditions or the health risks associated with smoke. Temporary changes to the watershed and its water quality could be products of a major wildfire.

Many historical references document the use of broadcast burning by Tribal members for managing root and berry harvesting areas as well as grazing areas. However, with the onset of western settlements, the diminishment of the Aboriginal Title lands to a much smaller defined reservation and the federal government's sale of reservation lands into non-Indian ownership,

the area available for subsistence living was greatly diminished. Having such a restricted area for First Foods habitat heightens the impact of wildland fires to the CTUIR culture and traditions.

Impacts on off-Reservation CTUIR-owned Trust lands

The Wanaket and Wanapa properties are located adjacent to the City of Umatilla and are currently undeveloped and relatively treeless. Fires that may occur on these lands or surrounding lands would be either Range or Wildland Urban Interface fires. In the event of a wildland fire in the area, there would be minimal short-term impact. An irrigation pump station and associated irrigation lines on the Columbia River and a BPA power-line easement may be temporarily impacted. CTUIR manages Wanaket as a Wildlife Area; impacts to Tribal First Foods could be temporarily impacted.

The French Town property is undeveloped and located in an agricultural and rural residential area adjacent to the Walla Walla River. Fires that may occur on this property or adjacent lands would have minimal short-term impact since the property is relatively treeless and seeded to grass.

3.15 Wind Storms

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph. The most frequent surface winds in Oregon are from the southwest, with the Pacific Coast and Coast Mountains receiving the most severe and frequent impacts. Winds begin with differences in air pressures. Air pressure that is higher at one place starts an air flow from the high pressure toward the low pressure (the greater the difference in pressure, the stronger the force). The distance between the area of high pressure and the area of low pressure also determines how fast the moving air is accelerated.

The Umatilla Indian Reservation experiences several types of wind events, including:

- **Chinook Winds** are strong easterly winds coming out of the Columbia Gorge. The Chinook wind is a warm, dry wind that often leads to the rapid disappearance of snow and can gust up to 100 miles per hour.
- **West Winds** from the Pacific Ocean can be strong along the coast, but typically lose strength inland due to the obstruction of the Coastal and Cascade Mountain ranges. Storm tracks bring major storms from the Pacific Ocean to the United States mainland and particularly to the Pacific Northwest usually occurring during winter months.
- **Dust Storms** are a strong, violent wind that carries fine particles such as silt, sand, clay, and other materials, often for long distances. A dust storm can spread over hundreds of miles and rise over 10,000 feet. They have wind speeds of at least 25 miles per hour. Dust storms often arrive without warning and may only last a few minutes in any given location. The storms can range from small “dust devils” to large, fast moving regional air masses.
- **Tornadoes** are the most concentrated and violent of wind storms, known to produce winds more than 300 miles per hour. However, most tornadoes are much weaker. The UIR and surrounding areas have experienced some mild tornadoes, but they are not a common occurrence.

Extent and Intensity

Wind speed and duration of high winds vary. In recent years, the UIR-Pendleton area has experienced wind storms each year where steady wind speeds have ranged between 40 to 55 miles per hour with wind gust ranging between 47 and 66 miles per hour. Summer wind storms that accompany thunderstorms are short duration, but very intense.

There are several scales for measuring the intensity of wind events. The Beaufort Wind Scale was developed in the 18th century to help sailors estimate winds through observation of visual effects, detailed below. While more modern meteorological tools can provide more precise measurements of wind speed and gusts, the Beaufort descriptions are commonly used terminology to this day.

TABLE: Beaufort Wind Scale[136]

Force	Speed (miles per hour)	Description
0	0-1	**Calm**: smoke rises vertically
1	1-3	**Light Air**: direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	**Light Breeze**: wind felt on face, leaves rustle, ordinary vanes moved by wind.
3	8-12	**Gentle Breeze**: leaves and small twigs in constant motion, wind extends light flag.
4	13-18	**Moderate Breeze**: raises dust and loose paper, small branches are moved.
5	19-24	**Fresh Breeze**: Small trees in leaf begin to sway, crested wavelets form on inland waters.
6	25-31	**Strong Breeze:** Large branches in motion, whistling heard in telegraph wires, umbrellas used with difficulty.
7	32-38	**Near Gale**: Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	**Gale**: Breaks twigs off trees, generally impedes progress.
9	47-54	**Severe Gale:** slight structural damage occurs
10	55-63	**Storm:** Seldom experienced inland, trees uprooted, considerable structural damage occurs.
11	64-72	**Violent Storm:** Very rarely experienced, accompanied by wide-spread damage.
12	72+	**Hurricane:** see Saffir-Simpson Hurricane Scale.

The Enhanced Fujita Scale is used to measure the intensity of a tornado based on estimated wind speeds and related damages, detailed in the table below.

TABLE: Enhanced Fujita Scale[137]

EF Rating	3 Second Gust (miles per hour)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Geographic Location

Wind events can affect the entire UIR. The Columbia Gorge, at the north end of Umatilla County, is the most significant east-west gap in the mountains between California and Canada. It serves as a funnel for east and west winds, where direction depends solely on the pressure gradient. Areas within 30 miles of the Gorge experience the most significant wind storms in the state, but the storms are less severe for the UIR.

Dust storms tend to occur primarily in western Umatilla County between the Umatilla County line and City of Pendleton. Dust storm warning signs are posted on I-84 near milepost 165 and just to the west of Pendleton. The signs warn drivers that dust storms may occur within this 40-mile corridor. Due to its location east of Pendleton at the foothills of the Blue Mountain, the Reservation does not experience as intense dust storms as areas west of Pendleton. However, dust storms still occur and present a threat to the Reservation.

History of Wind Storms in the UIR and Surrounding Areas

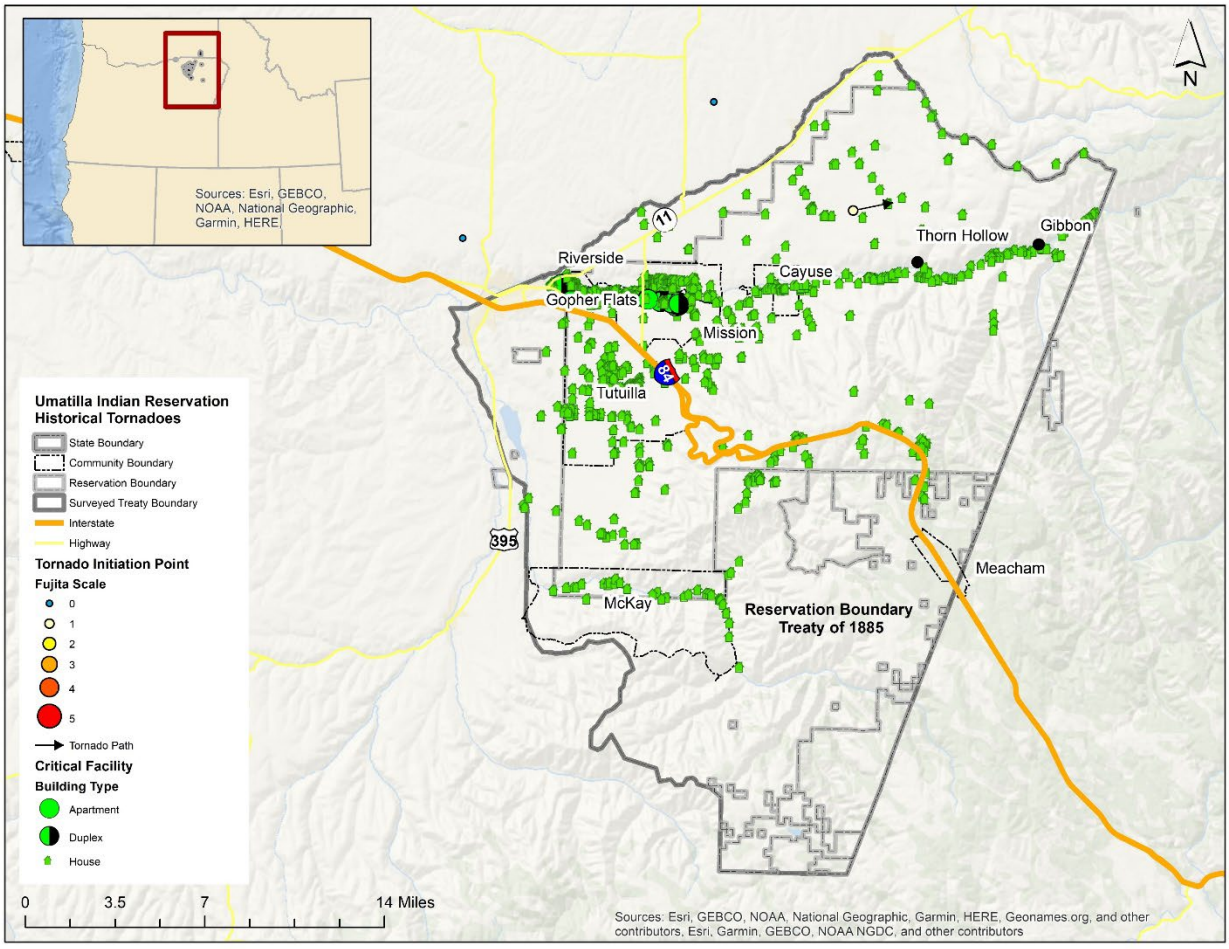
Blowing wind is not uncommon on the UIR. The following tables include major wind events impacting the UIR and surrounding areas, separated by type.

There have been five recorded tornadoes in Umatilla County, with one EF1 at Cayuse on the UIR in May 2009. No tornadoes have occurred on the UIR or in Umatilla County since 2009.

TABLE: Tornado Events in the UIR and Surrounding Areas (1991-2020)[138]			
Date	**Event Type**	**Location**	**Description**
May 1, 1991	Tornado – F0	Umatilla County	Some damage to wheat fields
July 9, 1995	Tornado – F0	Southeast of Hermiston (Umatilla County)	Some damage to wheat fields
July 13, 2002	Tornado – F0	Pendleton Airport	A brief tornado over a runway moved northwest before dissipating.
May 23, 2004	Tornado – F0	Stanfield (Umatilla County)	A weak tornado was spotted with no damage reported
May 6, 2009	Tornado – EF1	Cayuse (UIR)	$50,000 in property damage

The map below illustrates the historic tornadoes on or near the UIR since 1991. The EF-1 is indicated with a white dot and short arrow showing its path to the northeast of Cayuse.

FIGURE: Historic Tornadoes in the UIR and Surrounding Areas (1991 – 2020)



There is a history of dust storms causing deaths, injuries, and damage to areas surrounding the UIR. There is not a detailed record of dust storms on the UIR, but the table below details dust storm events since 2003 based on the NOAA NCEI Storm Events Database and the 2016 Oregon HMP. Dust Storms were not included in the 2020 Oregon HMP.

TABLE: Dust Storm Events in the UIR and Surrounding Areas (2003-2020)[139]		
Date	**Location**	**Description**
May 23, 1975	Near Echo	Winds up to 45 mph blew dust that caused a seven-car accident
March 24, 1976	Near Stanfield	18 vehicles piled-up in two separate accidents
July 9, 1979	Near Stanfield	Killed one and injured 20
Sept. 25, 1999	Near Echo	A chain-reaction of car crashes involving 45 vehicles; killed eight people and injured more than 20.
Oct. 28, 2003	Western Umatilla County	A dust storm lowered visibility to less than a quarter mile 11 miles southwest of Boardman.
Mar. 16, 2005	Western Umatilla County	Strong winds caused blowing dust and reduced visibilities to near zero in spots on Interstate 84. Traffic slowed to 25 MPH on the interstate due to the reduced visibility and tumbleweeds blowing across the road. On Highway 207 near Hermiston, visibility was reduced to near zero due to blowing dust. The extremely low visibility contributed to a non-injury collision near Boardman.
Mar. 31, 2009	Eastern Oregon	Blowing dust closed some roads. Power lines and trees were blown down and roofs were damaged in some areas. Peak wind gusts in miles per hour included: Pendleton Airport (62), Helix (61), and Pendleton (73).
May 3, 2010	Eastern Oregon	Blowing dust in the Columbia Basin reduced visibility to near zero around Stanfield and Pendleton. The blowing dust caused traffic accidents with an injury near Stanfield on Interstate 84. Peak wind gusts in mph included: Pendleton Airport (61), 10 miles north northeast of Pendleton (58), and Helix (60). Downed trees were observed 1 mile south of Stanfield and Blue Mountain Community College in Pendleton.
August 14, 2015	UIR	Blowing dust combined with smoke from fires closed I-84 at the UIR. Reported by CTUIR Public Safety.
Nov. 17, 2015	Western Umatilla County	Wind gusts were widespread and 58 MPH to a gust of 99 MPH. Several areas reported sustained winds over several hours ranging 40-50 MPH. Strong winds resulted in blowing dust and a multi-vehicle accident along I-84 near Stanfield, causing one fatality.
Sept. 7, 2020	Pendleton	Near Pendleton there was visibility of 1/4 mile or less due to blowing dust and smoke. Visibilities were low for much of the day into the early evening.

Finally, the table below includes high wind, thunderstorm wind, and strong wind events that have caused reported damages on the UIR or surrounding areas. The Storm Events Database does not filter events to the UIR boundaries, but rather reporting across all of Umatilla County. To be as specific as possible, events centered in Hermiston, Umatilla, and Stanfield were removed due to their distance from the UIR. These areas, along the Columbia River Gorge, typically experience more frequent and severe wind storms. The UIR-Pendleton area experienced 18 major wind events between 1994 and 2020, including two during the HMP analysis period (2016-2020).

TABLE: Wind Events causing Damage on the UIR and Surrounding Areas (1994-2020)[140]

Location	Date	Event Type	Damage*	Description
Pilot Rock	Aug. 2, 1994	Thunderstorm Wind	$5,000	Winds associated with a severe thunderstorm damaged the roof, chimney, and TV antenna on a house near Pilot Rock, about 12 miles south of Pendleton.
Pendleton	May 5, 1995	Thunderstorm Wind	$5,000	Thunderstorm wind blew sheets of metal roofing off a gas station at U.S. Highway 30 and Airport Road. No injuries were reported.
Pendleton	July 6, 1995	Thunderstorm Wind	$5,000	An area of vigorous thunderstorms hit the Pendleton area in mid-afternoon. Trees were blown down and visibility at the airport was reduced to one-quarter mile in blowing dust by winds gusting to 55 mph.
Pendleton	July 8, 1995	Thunderstorm Wind	$15,000	Thunderstorm winds toppled an old concrete and wood wall in Pendleton, crushing several cars under the falling debris. Tall trees were also blown down in SE Pendleton.
Ukiah	Aug. 18, 1999	Thunderstorm Wind	$1,000	A dry microburst tore a section of roof from of a mobile home near the center of Ukiah. A wind gust of 62 mph was measured by an anemometer 1/4 mile to the north of this home.
Weston, Meacham	Aug. 12, 2001	Thunderstorm Wind	$25,000	Thunderstorm winds downed several trees and many large branches, knocking out electricity for around 8 hours. Several residents reported broken windows due to flying debris. Winds knocked over 15 trees and damaged a motorhome at Emigrant Springs State Park, located at 4000 feet in the Blue Mountains. A site near Meacham recorded a peak wind gust of 46 mph.
Umatilla County	Jan. 30, 2004	High Wind	$1,000	
Umatilla County	Oct. 30, 2004	Strong Wind	$1,000	A wind gust estimated at 45 knots caused a defective power pole on north Highway 395 to lean over on its side. The power pole was held up by other electrical lines and did not fall onto the highway below. A nearby weather station in Hermiston reported a peak wind gust of 40 MPH at 1:38 PM PST.
Pendleton	June 21, 2008	Thunderstorm Wind	$10,000	Umatilla Electric Coop reports trees blown down on power lines in several locations between Pendleton and Nolin. New metal roof blown loose and rattling up and down on house located on Airport Hill.

TABLE: Wind Events causing Damage on the UIR and Surrounding Areas (1994-2020)[140]				
Location	**Date**	**Event Type**	**Damage***	**Description**
Umatilla County	June 30, 2008	Thunderstorm Wind	$108,000	Damage to roof and dozens of large branches downed. Two trees uprooted near the Pendleton High School. Twelve-inch diameter tree broke off and fell against a house in Meacham. Many other tree limbs downed. Semi-truck and pickup with camper were flipped over on Interstate 84 near Pendleton. Powerline down near Ukiah.
Eastern Oregon	Mar. 31, 2009	High Wind	$20,000	A strong low pressure moving from British Columbia to Montana tightened the pressure gradient east of the Cascades and produced high winds. Blowing dust closed some roads. Power lines and trees were blown down and roofs were damaged in some areas. Peak wind gusts in miles per hour included: Pendleton Airport (62), Helix (61), Pendleton (73).
Pendleton	May 5, 2009	Thunderstorm Wind	$5,000	Downed tree branches caused power outage. A 20-foot-tall lilac bush was uprooted, and shingles were torn off roofs.
Pendleton	May 17, 2010	Thunderstorm Wind	$5,000	Shingles blown off roof during thunderstorm.
Umatilla and Union counties	Nov. 2, 2011	High Wind	$1,000	A strong south-north pressure gradient produced damaging winds and blowing dust in Union and Umatilla counties. A tree was knocked down in Pendleton.
Eastern Oregon	Feb. 22, 2012	High Wind	$6,000	A warm front and strong jet stream produced widespread high winds and damage. Peak wind speeds in miles per hour included: 10 miles north northeast of Pendleton (65) and Pendleton Airport (59). Damage reports included batting cages blown over in Pendleton and shingles blown off roofs in Hermiston and Pendleton.
Eastern Oregon	Feb. 25, 2012	High Wind	$5,000	A strong cold front brought heavy snowfall to the mountains and widespread high winds with localized damage. Peak wind speeds reported in miles per hour included Pendleton airport (59). Damage reported includes downed rain gutters and vinyl siding in Pendleton.
Umatilla County	Feb. 19, 2016	Strong Wind	$150,000	A convective, but non-thunder producing squall line pushed through the Hermiston and Pendleton area. Strong winds were associated with this squall. Spotters reported damage to roofs at the Hospital in Hermiston, as well as a shed and an electric company car was blown over. Air conditioner blown off a roof at the Hermiston Cinema. A 53 MPH wind gust reported at KHRI.
Pendleton Airport	Aug. 9, 2019	Thunderstorm Wind	$6,000	Damage to metal exterior of home. Time estimated from radar.

**Damages are equal to the total reported for the event, not those within the UIR.*

Future Probability

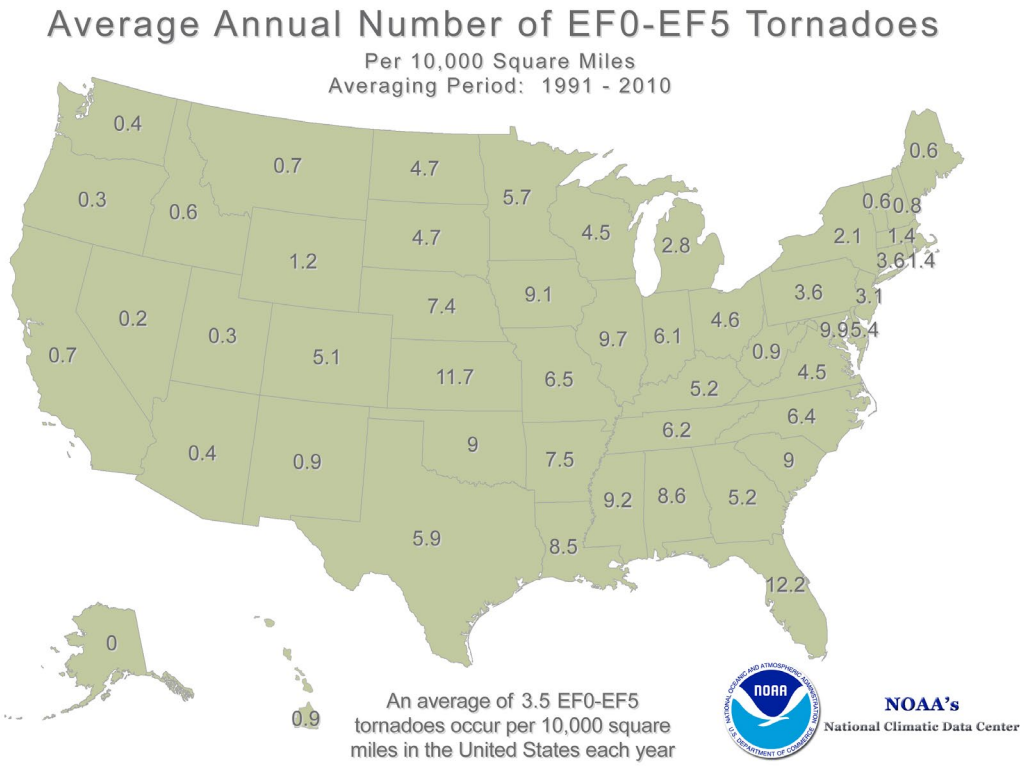
Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Probability** of wind storms, which reflects the high frequency of events in northern Umatilla County along the Columbia Gorge.

Blowing wind is a common occurrence in Umatilla County and on the UIR. However, most wind storms cause no or very minimal damage. Major, damage-causing wind storms are much less frequent. There have been 29 recorded wind events in the last three decades impacting the UIR and surrounding areas, as detailed in the previous tables. These events encompass minor tornadoes, dust storms, and wind storms causing damage. Given this history, the UIR can expect a major wind storm event on an annual basis. FEMA's National Risk Index has recorded 59 strong wind events with an annualized frequency of 1.87, as well as one historic tornado event for the UIR census tract.

Umatilla County falls into Oregon Natural Hazard Region 5 – Mid-Columbia. The Oregon Public Utilities Commission provided wind speed estimates (a one-minute average at 30' above the ground) for each region. A 25-year event (or 4% annual probability) will reach 75 mph in Region 5, while a 50-year event (2% annual probability) will reach 80 mph, and a 100-year event (1% annual probability) will reach 90 mph. Region 5 includes Hood River County and other areas along the Columbia River Gorge, and as such, the regional averages are likely significantly higher than the UIR would expect to experience.

The Pacific Northwest experiences some of the fewest tornadoes in the entire country. Oregon sees 0.3 average annual tornadoes per 10,000 miles, or a total of three tornadoes each year. Only Nevada and Utah see as many or fewer tornadoes when considering land mass, as illustrated in the figure below.

FIGURE: Average Annual Number of Tornadoes by Land Mass (1991-2010)[141]



Climate Change Impacts

There is no scientific consensus as to changes in the likelihood of wind storms in the Pacific Northwest. There is, however, a link between dust storms and human activity. About half of the dust in the atmosphere may result from changes to the environment caused by human activity, including agriculture, overgrazing, and the cutting of forests. Research near urban areas such as Las Vegas shows that the spread of development across the desert directly causes increases in dust storms by destabilizing the surface and vegetation.[142] It can be expected that further development, large scale agriculture, and deforestation, activities often associated with human-caused climate change, could increase the frequency of dust storms near the UIR.

When wind storms occur during hot and dry summers, they can lead to dangerous wildfire conditions. The National Weather Service issues “red flag” warnings when warm temperatures, low humidity, and strong winds combine to produce increased fire danger. Red flag warnings preceded many of the major fires across Oregon during the historic 2020 wildfire season. In August 2015, a combination of a dust storm with smoke from wildfires led to dangerous conditions on the UIR. While climate change may not increase the frequency of wind storms, the combination of dryer and hotter summers with existing wind patterns could lead to more dangerous conditions.

Vulnerability of the UIR to Wind Storms

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. According to the 2020 Oregon Hazard Mitigation Plan, Umatilla County has a **High Vulnerability** to wind storms, but again this score is inclusive of northern Umatilla County along the Columbia Gorge, which experiences more significant and frequent wind events. According to the FEMA National Risk Index, the UIR census tract has a **Relatively High** risk rating to strong wind events, and a **Very Low** risk rating to tornadoes.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Wind Events

Criteria	Score	Description
Deaths	1	0-1 death
Injuries	2	4-7 people injured
Critical Assets	1	Closed for less than 12 hours
Lifelines	2	1 to 2 day loss of service
Property Damage	2	Localized repairable
Environmental Impact	1	Minimal
Economic and Social Impact	2	Temporary localized
Culture Impact	1	Minimal
Frequency Score	5	Highly Likely; expected every 3 to 9 years
Total Impact Score	**17**	**Medium Risk**

Loss Estimates

According to the FEMA National Risk Index, the UIR census tract has a **Relatively Moderate** expected annual loss rating due to strong wind events. The total estimated annual loss is $43,426, stemming mostly from population exposure rather than historic building or agricultural losses. The Index includes no historic losses due to strong wind events.

The following is a summary of damage from a wind storm to properties within the UIR. The damage occurred from a January 8, 2008, wind storm with reported winds of 67 miles per hour. The damage from this wind storm is representative of the type of damage that can occur from most major wind storms. Of course, more intense winds will likely cause more damage, but their occurrence is less frequent than the 67 mile an hour wind storm described below:

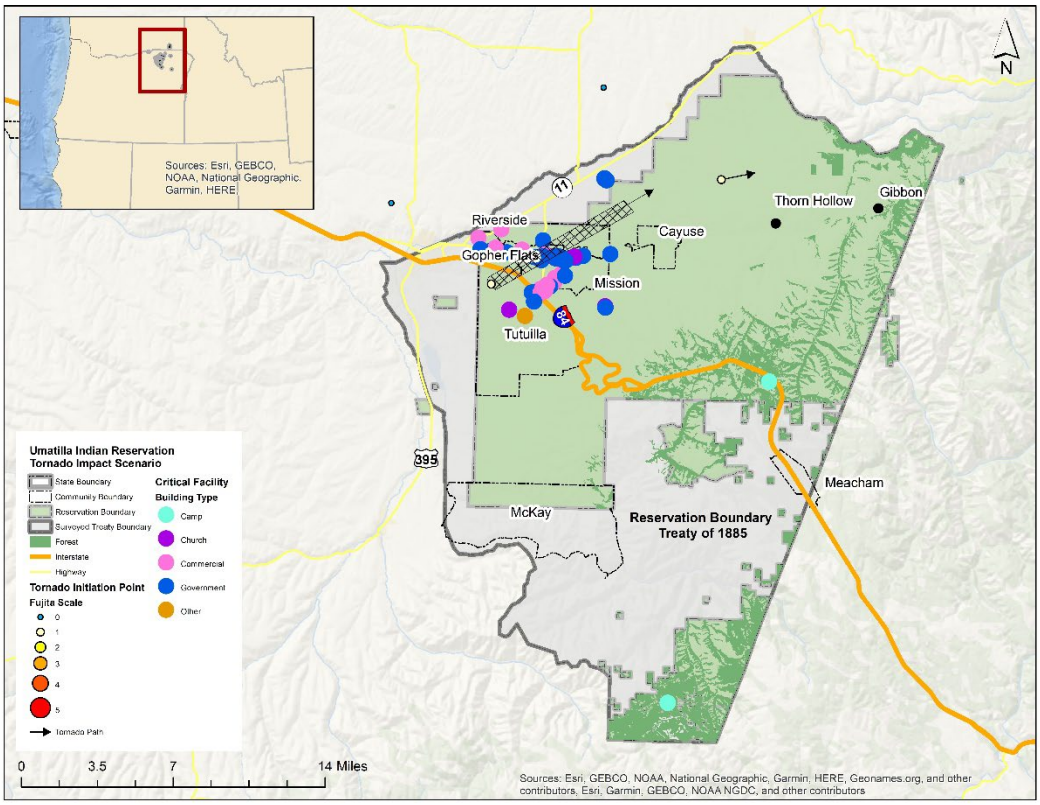
TABLE: Damage Summary from January 2008 Wind Storm		
Number of Reports	**Type of Damage**	**Total Cost of Damage**
26	Roof Damage	$ 48,555
12	Structural Damage	$122,747
6	Damaged Trees	$ 4,400
2	Damaged Windows	$ 600
	Other	$ 8,679
Total		**$184,981**

There were 54 reports of damage. Most damage (26 reports) involved lost shingles and general damage to roofs. However, the greatest expense came from the 12 reports involving damage to buildings. Six reports identified damage to trees. Two reports identified damage to windows. One report indicated that a trailer had been turned over. Total damages reached $184,981.

The January 8, 2008 wind storm was a major wind storm. Storms with greater intensity are likely to cause more damage than this particular wind storm while less intense storms will likely cause less damage.

To estimate potential losses from a tornado event on the UIR, the scenario detailed below considers an EF-1 event (similar to the only recorded tornado on the UIR) passing through the Mission area for an extended distance. This scenario is illustrated in the map below.

FIGURE: Scenario EF-1 Tornado in Mission Area



As illustrated on the map, a tornado in the Mission area would impact many more critical assets than the actual EF-1 that passed through a more rural part of the Reservation. Based on this scenario, 75 housing units, one church, one commercial building, and 26 government facilities would experience impacts and potential damages. Critical government and commercial assets are listed in the table below. **Appendix C** of the plan provides a list of all critical assets, including housing units, at risk to the scenario tornado.

TABLE: Critical Assets within Scenario EF-1 Tornado Path	
Asset Type	**Asset Name**
Church	Seventh Day Adventist Church and School
Commercial	American Legion Post 140
Government	4 unnamed buildings
Government	3 BIA Forestry Buildings
Government	8 BIA/Interior Buildings
Government	Cay-Uma-Wa Head Start
Government	CTUIR - Fire Station
Government	CTUIR Public Safety
Government	CTUIR Senior Center
Government	CTUIR Daycare
Government	Former CTUIR Office Building 119
Government	Former CTUIR Office Building DNR 109
Government	Nixyáawii Community School
Government	Nixyáawii Communtiy School Gym
Government	Umatilla Reservation Housing Authority Office
Government	URHA Maintenance Shop

Impacts on CTUIR Operations

Major wind events could cause short disruptions to power and communications service that impacts the ability of CTUIR to conduct essential operations. Dust storms on the Reservation could place greater demand on first responders to address vehicle crashes.

Impacts on Human Health and Happiness, Economics & Community

Dust storms pose the greatest threat to human health in the UIR. Dust storms have historically led to significant automobile accidents, as they often arrive with little warning, forming a wall of dust and debris. The dust can be blinding to drivers traveling and can be especially dangerous to those traveling at high speeds, such as the travelers on Interstate 84 through the Reservation. Historically, multi-care pileups on I-84 near Echo and Stanfield have led to the death of dozens of people and injured many more.

Additionally, dust storms and wind events can negatively impact air quality, stirring up high concentrations of particulate matter. People with underlying medical conditions, the elderly, people with disabilities, and young children are especially vulnerable to poor air quality.

Impacts on Infrastructure, Built Systems, and Energy Production & Use

Severe wind storms damage residential and commercial buildings, damaging roof shingles and beams, as well as bringing trees and branches down onto buildings. Residents living in mobile homes are most vulnerable to severe wind storms, requiring proper anchoring and tie-downs.

CTUIR has adopted the 2010 Oregon Manufactured Dwelling Installation Specialty Code, which requires manufactured homes to have ground anchors, tie downs, or another approved attachment method to reduce storm impacts.

Severe wind storms can cause trees or tree limbs to fall on power lines, leading to power outages after a major storm. Major wind storms can blow mobile homes off their foundations if not anchored properly. Even minimal damage to commercial and public property can result in hours of costly overtime pay for clean-up.

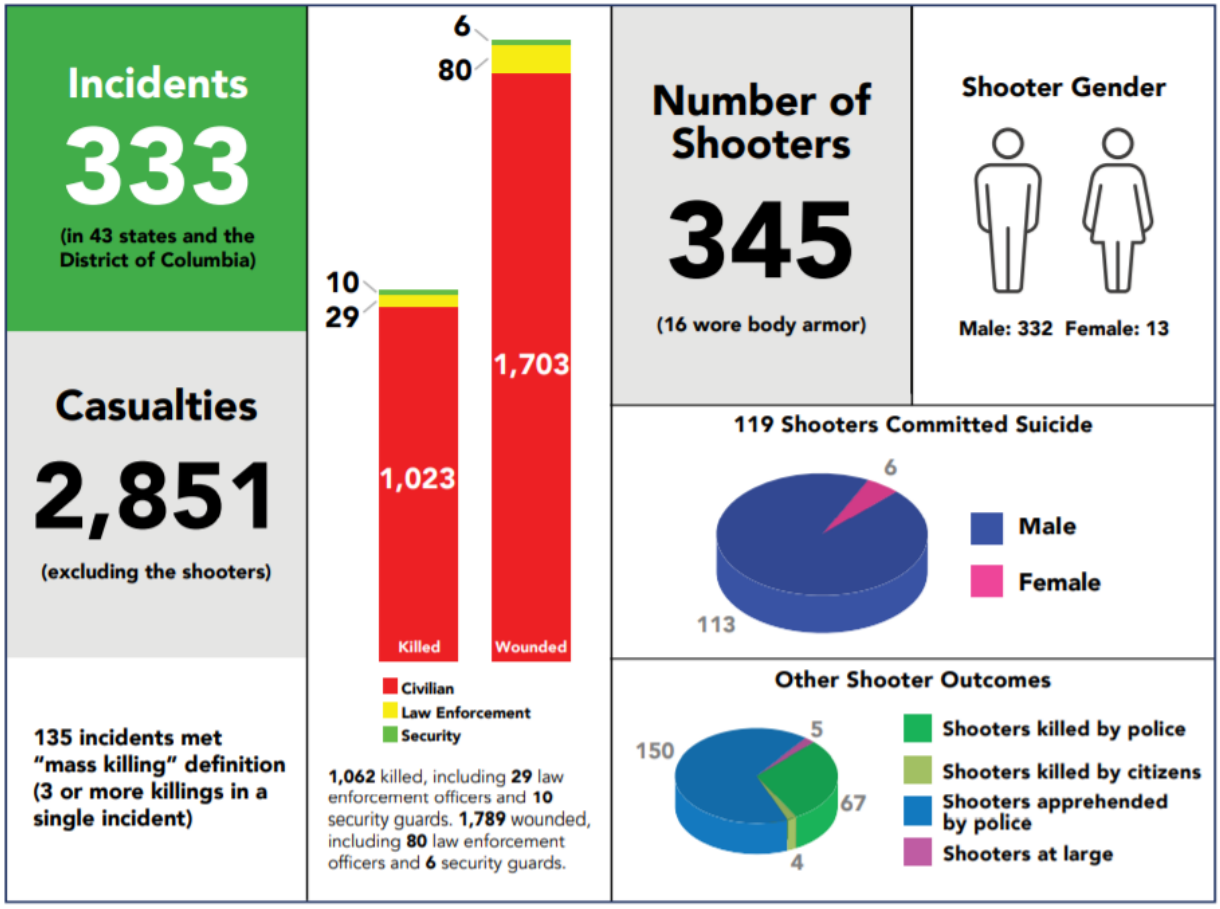
Impacts on Water and First Foods

Wind and dust storms can lead to a significant loss of top soil in agricultural areas. This soil, suspended as fine particulate in the air, can travel for thousands of miles, leading to regional losses. Intensive tillage of soils through various agricultural uses is also a significant condition releasing soil to make it easily transportable by high winds. Depending on the crop and region involved, tillage may be occurring in the spring and/or in the autumn. Wind storms can also lead to significant damage to shrubbery and trees.

3.16 Active Shooter Incident

An “active shooter” is any individual or group that attempts to, or succeeds in, killing someone in a populated area using a firearm. The Federal Bureau of Investigations has identified and reported a total of 333 active shooter incidents in the U.S. between 2000 and 2019. These incidents caused more than 2,800 deaths across 43 states. A summary of the 20-year history of active shooter events is provided in the figure below.

FIGURE: 20-Year History of Active Shooter Incidents in the U.S.[143]



Extent and Intensity

Deaths and injuries from an active shooter event can range widely based on the motive, location, and weapon used. The table below shows the casualties and injuries by year from active shooter events between 2000 and 2019.

TABLE: Casualties by Year from Active Shooter Events

Year	Civilians Killed (Including Security Guards)	Civilians Wounded (Including Security Guards)	Law Enforcement Killed	Law Enforcement Wounded
2000	16	2	0	0
2001	26	59	0	0
2002	18	21	0	3
2003	33	22	0	0
2004	17	9	0	0
2005	30	31	0	0
2006	26	27	0	1
2007	68	54	1	3
2008	30	33	3	1
2009	61	75	4	3
2010	37	50	1	3
2011	45	66	0	0
2012	90	111	0	7
2013	50	45	0	7
2014	33	59	3	2
2015	55	70	1	8
2016	74	114	9	17
2017	139	588	4	3
2018	84	133	2	6
2019	101	140	1	16

Geographic Location

Active shooter incidents most commonly take place in businesses open to pedestrian traffic (bars, malls, restaurants, offices, etc.), open spaces, and schools.[144] Particularly vulnerable locations on the UIR may include the Wildhorse Resort & Casino or other public gathering space. Additionally, schools and educational facilities on the UIR and Pendleton may be at risk.

History of Active Shooter Incidents in the UIR and Surrounding Areas

There have been five recorded active shooter incidents in Oregon between 2000 and 2019.[145] Four of the incidents occurred in the Portland metro area, with the fifth at Umpqua Community College in Roseburg. There is no history of active shooter incidents on the Reservation or in surrounding areas.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely.** The 2020 Oregon Hazard Mitigation Plan does not include any human-caused incidents; no probability ranking is available for comparison. While the frequency of active shooter incidents has increased in the U.S. in recent years, there is very limited history of these events in both Oregon and Tribal reservations.

Vulnerability of the UIR to an Active Shooter Incident

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Low Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include human-caused incidents; no risk ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Active Shooter		
Criteria	**Score**	**Description**
Deaths	2	2-3 deaths expected
Injuries	2	4-7 injuries expected
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	1	Minimal
Environmental Impact	1	Minimal
Economic and Social Impact	3	Temporary widespread
Culture Impact	1	Minimal
Frequency Score	3	Somewhat Likely; expected every 30-99 years
Total Impact Score	**15**	**Low Risk**

Loss Estimates

Minimal property damage or economic losses are expected from an active shooter incident.

Impacts on CTUIR Operations

An active shooter event on the Reservation could create some short-term disruption to UIR operations. A lock-down or closure of Tribal offices or enterprises (including the Wildhorse Resort & Casino) could limit response efforts or other services.

Impacts on Human Health and Happiness, Economics & Community

An active shooter event could have significant impacts on residents, employees, and members of CTUIR. The psychological impact of an active shooter incident can be severe and could lead to lingering mental health issues for those involved. An active shooter could lead to a few or dozens of deaths and injuries.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

There are no expected impacts to the critical infrastructure or other built systems due to an active shooter incident. If an incident were to take place at a critical infrastructure site, employees could be at risk, leading to a short disruption in services.

Impacts on Water and First Foods

There are no expected impacts to the environment, water, or First Foods from an active shooter incident.

3.17 Cyber Attack

A cyberattack is an effort by outside parties to gain access to an electronic network or system. Cyberattacks happen every day around the world. Major targets typically include governments, banks, and businesses, but any online network can be attacked. Advancements in technology have increased productivity and made daily operations more reliant on cyber systems. As a result, our communities are increasingly vulnerable to non-traditional attacks including cyberattacks on information and operations.

Cyberspace is the nervous system for all critical infrastructure and is composed of hundreds of thousands of interconnected computers, servers, routers, switches, and fiber optic cables that allow our critical infrastructures to work. Studies performed by the Government Accounting Office and the Computer Security Institute found that the number of cyber security threats to both public and private sectors are on the rise. The aggressors range from nation-states to unorganized groups or individuals. The Federal Bureau of Investigation Internet Crime Complaint Center (IC3) received nearly 800,000 complaints in 2020, an increase of 69% over 2019. These complaints resulted in reported losses of over $4.1 billion.[146]

Extent and Intensity

The attacks on computer systems can come in the form of viruses, Trojans, worms, spoofs, or hoaxes from virtually anywhere in the world. Computer viruses, ranging from devastating to simply annoying, are sent out daily by organizations and individual hackers, and intermittently by people who fail to protect their computer software. At minimum, cyberattacks can target a single individual's information or cause the physical manipulation of items connected to the network. In major cyberattacks, information can be stolen from millions of people.

Geographic Location

Cyberattacks occur virtually. They can originate from anywhere in the world and can target anywhere in the world.

History of Cyber Attacks in the UIR and Surrounding Areas

CTUIR has not been impacted by a known cyber threat to date. Public safety and government offices across Oregon have experienced dozens of cyber-attacks, including malware, ransomware, hacking, and more. A few events in recent years include:

- **June 11, 2020:** Fake email sent to Washington County Sheriff's Office calling for the Sheriff's resignation.
- **January 24, 2020**: Tillamook County's government website, computers, and phones were all taken out by a cyber-attack. The County paid a $300,000 ransom to regain access.
- **May 13, 2019:** Hackers gained access to Oregon Health Authority and Oregon State Hospital patient information through an employee's email account. This attack affected a potential 1,400 people served by the hospital each year.

There is a growing list of cyber-attacks impacting Tribal nations, including attacks on the Cheyenne and Arapaho Tribes, Seminole Nation, Nez Perce Tribe, and others in 2020-2021. Many of these attacks concentrated on casino enterprises.[147]

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Highly Likely.** The 2020 Oregon Hazard Mitigation Plan does not include any human-caused incidents; no probability ranking is available for comparison. As society becomes increasingly dependent on technology, the threat and likelihood of cyber-attacks will only increase.

Vulnerability of the UIR to a Cyber Attack

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include human-caused incidents; no vulnerability ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Cyber Attack		
Criteria	**Score**	**Description**
Deaths	1	0-1 deaths expected
Injuries	1	0-3 deaths expected
Critical Assets	2	Closed for 1-2 days
Lifelines	2	1-2 day loss of service
Property Damage	1	Minimal
Environmental Impact	1	Minimal
Economic and Social Impact	2	Temporary localized
Culture Impact	1	Minimal
Frequency Score	5	Highly Likely; expected in the next 3-9 years
Total Impact Score	**16**	**Medium Risk**

CTUIR Administration and technology services have implemented measures to protect Tribal administration from a cyber-attack, including regular scanning for viruses and suspicious activity, regular data back-ups, use of an intrusion detection system, and insurance for data breaches, among other activities.

Loss Estimates

Losses from a cyber-attack could be significant for CTUIR. Attackers could target the Wildhorse Resort & Casino or Tribal Administration operations, leading to a temporary shut-down or ransom payment. There is no clear way to estimate losses from a cyber-attack, but 6,817 victims in Oregon experienced $38,389,702 in losses in 2020 – an average of $5,600 per victim.[148] This data is based on direct reporting from individuals and may not include significant losses for private businesses or local governments.

Impacts on CTUIR Operations

Cyberattacks carried out on public infrastructure can directly impact CTUIR's ability to operate essential facilities and provide services. Forms of sabotage to computer systems include the introduction of viruses, malware or spyware that can cripple a computer network or steal private and public information. Emergency services would have difficulties because most phone lines work via the Internet. Medical response is reliant on electricity, water and information systems and the Internet to access medical records. If the Internet was not available, many information

systems would be useless and operations for many of the critical infrastructure sectors may stop altogether, causing major problems for both the public and private sector.

Impacts on Human Health and Happiness, Economics & Community

Any resident that is connected to the internet is vulnerable to cyberattacks and identify theft. These incidents have long been a growing trend along with the increasing adoption of technology. Victims are likely to experience substantial monetary loss or harassment. Any disruption to Internet service or critical infrastructure information systems could potentially threaten lives, property, the economy, and security.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

All existing infrastructure is unlikely to receive direct damages. However, the systems and technologies that are integrated within these assets will undoubtedly be affected, especially as technology becomes more advanced and automated. Furthermore, delivery systems including water, electricity, even things such as groceries rely on information systems to coordinate and complete the delivery. As technology becomes more integrated into society, the more access hackers will have to sensitive systems. Integration of systems (such as electrical grids, air traffic control centers, traffic lights, etc.) can leave these systems vulnerable to attack.

Impacts on Water and First Foods

There are no expected impacts to the environment, water, or First Foods from a cyber-attack.

3.18 Dam Failure

Dam failure is the uncontrolled discharge of a reservoir. A dam failure can cause property and environmental damage, and in severe cases, take lives. There has been an average of 10 dam failures each year in the United States, although the vast majority (some 96%) do not result in life-safety consequences or significant property damage.[149]

A dam failure is typically caused by one of five factors:[150]

- **Overtopping:** water spilling over the top of a dam, often due to an inadequate spillway, debris blockage, or settlement of the dam. Overtopping is the caused for about one-third of dam failures in the U.S.;
- **Foundation defects**: settlement and slope instability impacting the foundation leads to about 30% of all dam failures;
- **Cracking:** caused by movements such as the natural settling of a dam;
- **Piping:** seepage through the dam is not properly filtered, leading to sinkholes and internal erosion; or,
- Inadequate maintenance and upkeep.

Indian Lake Dam (Lake Hum-Ti-Pin) is the only large dam located on the UIR. The crest length of Indian Lake Dam is 560 feet, and it is 54 feet high. The dam creates an 80-acre reservoir, Lake Hum-Ti-Pin, holding approximately 1,200 acre-feet of water which fluctuates with the seasons. The dam is owned, operated, and maintained by the Bureau of Indian Affairs. The primary use of the reservoir is recreation. Indian Lake Dam is located on Jennings Creek which drains into the Grande Ronde watershed.

Safety concerns about the dam were identified by the U.S. Bureau of Reclamation during a comprehensive safety review February 21, 2008. The review revealed safety concerns about the integrity of the dam due to erosion from water flowing through the Dam and from overtopping. The dam's spillway is a concrete overflow structure with no means of significantly altering the outflow rate and the 10-inch diameter outlet pipe was plugged, cracked, and not a viable means of draining the Reservoir.

The Bureau of Reclamation has identified three Expedited Dam Safety Actions (EDSAs) associated with potential failure modes at Indian Lake Dam:

1. The dam has an unacceptably high probability of failure due to piping or internal erosion of embankment soil by seepage flow into and through the coarse-grained backfill which surrounds the outlet works conduit, or through the backfill and along the concrete encasement which encapsulates the conduit.
2. The dam has an unacceptably high probability of failure due to piping or internal erosion of embankment soil by seepage flow into the outlet works (through cracks and open joints).
3. The dam has an unacceptably high probability of failure due to elevated reservoir levels during an extreme hydrologic (storm) event that leads to embankment overtopping. The Bureau of Reclamation has recommended that the Bureau of Indian Affairs take expedited actions to address these three safety concerns.

To address these safety concerns, the Dam's outlet pipe has been sealed to prevent the leaks that were causing erosion compromising the Dam's structure and an electronic water level monitoring system was installed. Additionally, the Bureau of Indian Affairs developed an Emergency Action Plan (EAP). The EAP was last updated in 2015 and is scheduled to be updated every five years. The EAP was not updated in 2020 in accordance with this schedule.

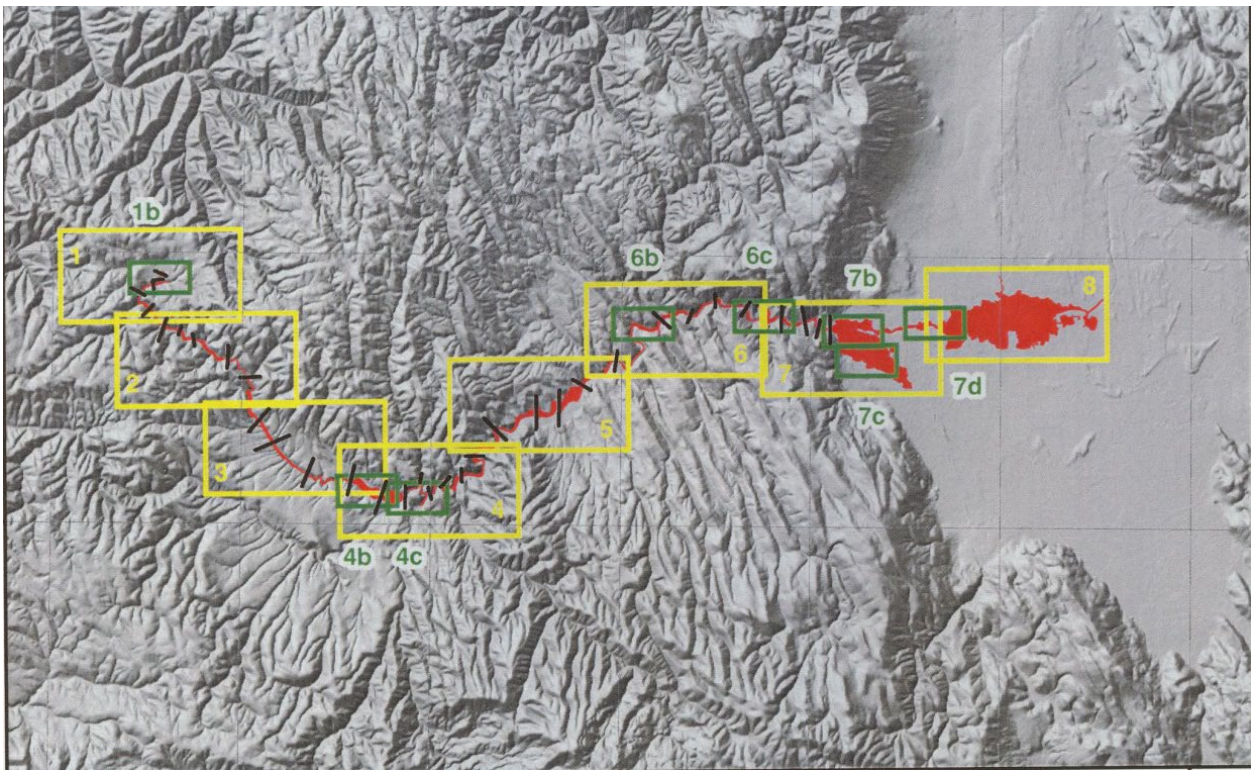
Extent and Intensity

According to the National Inventory of Dams, the Indian Lake Dam has a High Hazard Potential and was last inspected in 2012.[151] The "hazard" rating is not based on the physical attributes, quality, or strength of the dam itself, but rather the potential for loss of life or property damage should the dam fail. A dam is assigned a rating of High Hazard when its failure would probably put lives at risk. Dams with a "High" Hazard Potential Rating are required to have an EAP. There are about 15,000 dams in the U.S. that are classified as High Hazard.

Geographic Location

A failure of Indian Lake Dam would have a minor impact on UIR lands and no impact on the populated areas within the Reservation. There would be an impact to off-Reservation lands. Indian Lake Dam's 1,200 acre-feet of water would empty away from populated areas on the UIR but would create a flash flood delivering up to approximately two feet of water into the City of La Grande, Oregon. The intensity of the flood likely would be enough to damage I-84, State Route 244, and cabins located in the path of the damage. The inundation area is depicted in the figure below.

FIGURE: Indian Lake Dam Failure Inundation Area



History of Dam Failures in the UIR and Surrounding Areas

There are 869 dams in Oregon and a recorded 21 dam failures. There is no history of dam failure on the UIR, including Indian Lake Dam.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Unlikely.** The 2020 Oregon Hazard Mitigation Plan does not include any human-caused incidents; no probability ranking is available for comparison. Given the recent improvements to Indian Lake Dam and implementation of an EAP, CTUIR does not expect any failure.

Vulnerability of the UIR to Dam Failure

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Low Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include human-caused incidents; no vulnerability ranking is available for comparison. It is important to note that the Indian Lake Dam is owned and operated by the Department of Interior BIA. The federal government would assume liability for any failure or damages to La Grande and other downstream communities.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Dam Failure		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	1	Minimal
Environmental Impact	2	Localized minor
Economic and Social Impact	1	Minimal
Culture Impact	2	Localized
Frequency Score	2	Unlikely; expected every 100-199 years
Total Impact Score	**12**	**Low Risk**

Loss Estimates

There is not currently a reliable method to calculate annualized losses due to dam failure. Vulnerability, and thus potential losses, is based on the nature of downstream development and the operations and design of the dam itself. Losses due to dam failure could include loss of life, property damage, infrastructure disruption, and environmental impacts.

All losses from the failure of Indian Lake Dam would be experienced off-Reservation. Union County (City of La Grande) does not include Indian Lake Dam within its most recent multi-jurisdictional Natural Hazard Mitigation Plan.

Impacts on CTUIR Operations

As the operator of the Indian Lake Dam, CTUIR can expect increased demand on operations if additional safety concerns are discovered through future inspections. CTUIR can reduce potential impacts through regular inspection by qualified personnel and strong mitigation to correct any deficiencies.

Impacts on Human Health and Happiness, Economics & Community

A failure of Indian Lake Dam would have a minor impact on UIR lands and no direct impact on the populated areas within the Reservation.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

No critical assets within the UIR are vulnerable to dam failure. If the Indian Lake Dam were to fail, a flash flood of water from the dam would flow away from populated areas on the UIR toward the city of La Grande. I-84 and the city of La Grande would suffer the most damage from the failure of Indian Lake Dam. A dam failure could lead to major damage to I-84 and would impact the traveling public, disrupt freight delivery, and possibly impact the rail line located in the same narrow corridor and in La Grande.

Impacts on Water and First Foods

Indian Lake Dam holds 1,214 acre-feet of water. This volume of water, if released from a dam failure, would drain within the Grande Ronda River watershed. A dam failure could impact water quality, fish, game, roots, and berries located downslope from the dam or in nearby areas.

3.19 Hazardous Materials Spills

Although not common, human-caused accidents involving hazardous materials have the potential to turn into disasters. Hazardous materials possess at least one of four characteristics - ignitibility, corrosiveness, reactivity, or toxicity. These characteristics can cause death or serious injury if improperly or accidentally released into the environment. A hazardous material can be in the form of a solid, liquid, or gas and, if not properly contained, can cause long-lasting health effects, damage to buildings, homes, water bodies, First Foods, and possibly long-term contamination leaving the immediate environment toxic. Although infrequent, hazard material spills are most associated with transportation accidents occurring on highways, rail, waterways, or pipelines. However, the manufacturing and agricultural industries use hazardous materials every day and can also be a source for human-caused accidents.

Several hazardous materials are transported by rail, highway, and pipeline through the UIR, and hazardous material accidents can be difficult to contain. So much depends on conditions outside of an emergency-responders control. If a chemical spill occurs, the level of danger and type of emergency response depends on the chemical involved. If a poisonous gas is involved, weather conditions, wind direction, and speed and whether it is day or night are all variables that will affect the type of response.

Exposure to hazardous materials can result in a wide range of negative health effects on humans and animals. Hazardous materials are generally classified by their health effects. The most common types of hazardous materials are summarized below.

- **Flammable materials** are substances where fire is the primary threat, although explosions and chemical effects listed below may also occur. Common examples include gasoline, diesel fuel, and propane.
- **Explosives** are materials where explosion is the primary threat, although fires and chemical effects listed below may also occur. Common examples include dynamite and other explosives used in construction or demolition.
- **Irritants** are substances that cause inflammation or chemical burns of the eyes, nose, throat, lungs, skin, or other tissues of the body in which they come in contact. Examples of irritants are strong acids such as sulfuric or nitric acid.
- **Asphyxiants** are substances that interfere with breathing. Simple asphyxiants cause injury or death by displacing the oxygen necessary for life. Nitrogen is a good example. Nitrogen is a normally harmless gas that constitutes about 78% of the atmosphere. However, nitrogen releases in a confined space may result in asphyxiation by displacing oxygen. Chemical asphyxiants are substances that prevent the body from using oxygen or otherwise interfere with the breathing process. Common examples are carbon monoxide and cyanides.
- **Anesthetics and Narcotics** are substances which act on the body by depressing the central nervous system. Symptoms include drowsiness, weakness, fatigue, and in coordination, which may lead to unconsciousness, paralysis of the respiratory system and death. Examples include numerous hydrocarbon and organic compounds.

Extent and Intensity

Extent and intensity of any hazardous material spill or release incident depends on several factors, including:

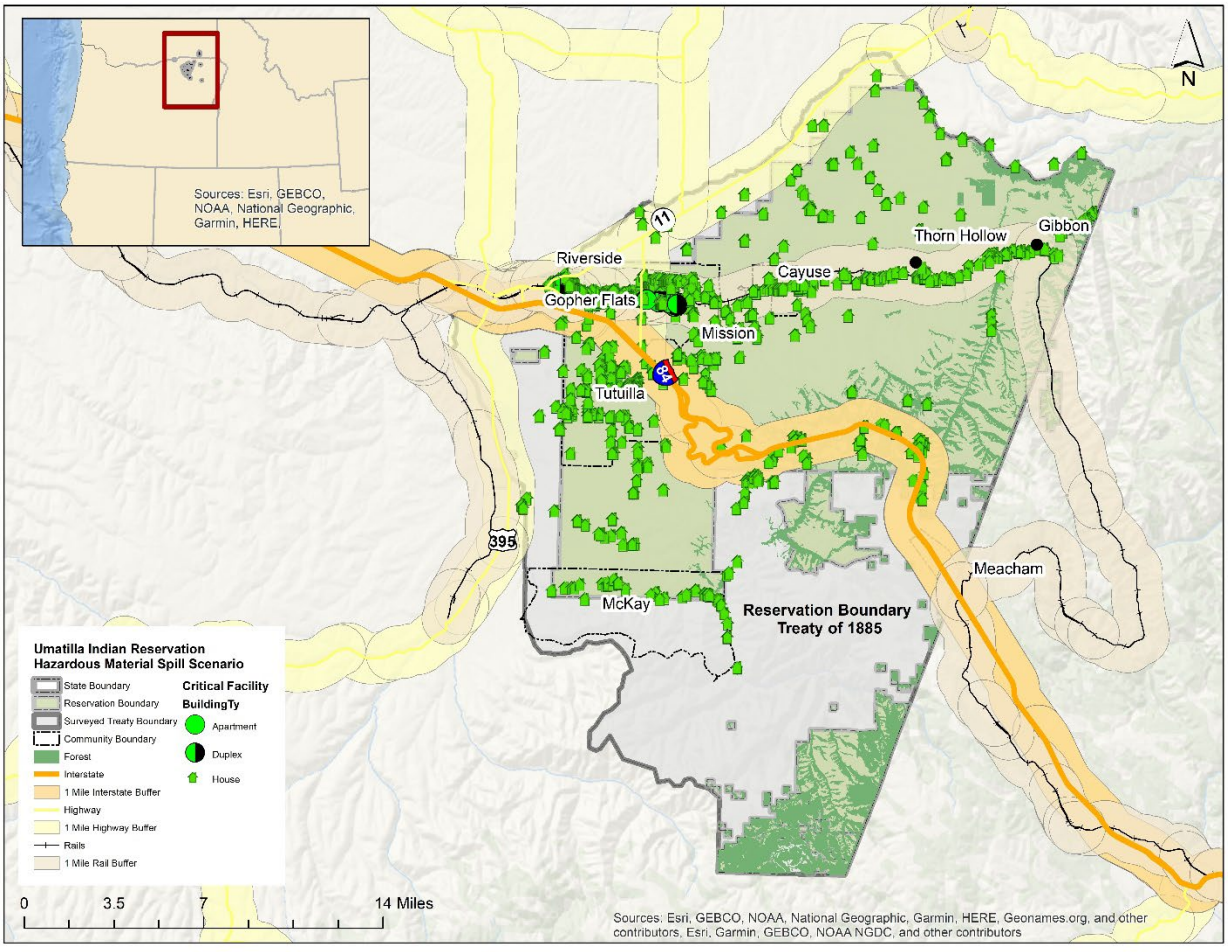
- Toxicity of the hazardous material,
- Quantity of the hazardous material spilled or released,

- Dispersal characteristics of the hazardous material,
- Local conditions such as wind direction and topography
- Location of the spill or release in proximity to sensitive environmental areas, such as a watershed that provides a community's drinking water
- Efficacy of response and recovery actions

Geographic Location

The most likely places for a hazardous material spill on the UIR would be from a truck accident on I-84 at Cabbage Hill or a train accident along the railroad corridor. Based on the initial safety distances required for most chemicals, some populated areas of the Reservation could be threatened from an incident, especially along the railroad traveling through Mission, Cayuse, Thornhollow, and Gibbon. Depending on the type of incident, greater evacuation distances may be necessary depending on wind direction and whether it is day or night. The figure below illustrates the one-mile buffer zone along the railroad, I-84, and major roadways passing through the Reservation. A complete inventory of housing units located in the buffer zone is included in **Appendix C.**

FIGURE: Hazardous Materials Spill Corridors with a 1-mile Buffer



In addition to spills along I-84 and the railway, hazardous material may be located at the following locations on the UIR:

- Umatilla Electric Coop Substation at Mission;
- The Williams Natural Gas Company has three pipelines of 30 inches, 22 inches, and 6 inches that cross the Reservation (detailed within the Natural Gas Pipeline hazard, Section 3.20);
- Cascade Natural Gas has local distribution lines of ½ inch to 4 inches that serve the Reservation (detailed within the Natural Gas Pipeline hazard, Section 3.20);
- Tesoro has two liquid petroleum pipelines of 6 and 8 inches that cross the Reservation;
- Arrowhead Travel Plaza has storage facilities for gasoline, diesel, and LPG;
- Tribal Environmental Recovery Facility (TERF) is a solid waste collection and recycling transfer station which is equipped to also accept, store and transfer household hazardous waste;
- CTUIR Department of Science and Engineering Field Station;
- CTUIR Kayak Public Transit Maintenance facility; and
- Coyote Business Park East; Kenworth Truck Repair (facility leased from CTUIR).

According to the Environmental Protection Agency Toxic Release Inventory (TRI) Program, there are three industrial facilities within 10 miles of the UIR that could experience a hazardous materials release.[152] These facilities include Smith Frozen Foods in Weston, and Lippert Components and Grain Craft in Pendleton. Smith Frozen Foods reported a 10,000 lb. release of ammonia in 2019, which can cause ocular and respiratory impacts. Other historic releases have included chromium, manganese, and lead.

History of Hazardous Materials Incidents on the UIR and Surrounding Areas

Hazardous materials are transported every day by rail, truck, river, and pipeline, and hazardous chemicals are in storage at area businesses. Thousands of hazardous materials shipments pass through the UIR on I-84 and rail lines. The companies that transport and store these chemicals are responsible for careful handling. Most hazardous material spills are small and do not require emergency precautions, such as evacuation or shelter in-home protection. Occasionally, more severe spills have affected UIR and the surrounding area.

On January 11, 2017, a Union Pacific train derailed near Gibbon on the UIR. There were no spills, no hazardous materials involved, and no reported injuries. While this incident did not lead to a hazardous materials spill, it is an example of a recent event that could escalate quickly depending on the content and type of freight.

FIGURE: January 11, 2017, Train Derailment near Gibbon

The following table identifies train accidents on public road crossings on the UIR. Two accidents at the Davis Lane rail crossing involved the transport of hazardous materials, and no spills were reported for either incident.

TABLE: Incidents at Public Rail Crossings				
Public Road – Rail Intersection	**Crossing Number**	**Past Accidents**	**Date(s) of Accidents**	**Transported Hazardous Materials**
Mission Frontage Road	748570G	0		
Davis Lane	809034J	3	9-Dec-80 10-Oct-94 24-Aug-98	Yes Yes No
Mission State Hwy 2	809036X	1	19-Jun-94	No
Parr Lane	809037E	3	4-Dec-82 8-Jun-91 13-May-98	No No No
Minthorn Niktyoway Road	809040M	2	16-Mar-91 22-Nov-95	No No
Minthorn Old River Road	809041U	1	10-Oct-85	No
Minthorn Old River Road	809044P	0	--	--
Cayuse-Adams Road	809046D	1	16-Jul-80	No
Thorn Hollow Road	809048S	0	--	--
Bingham Road @ Thorn Hollow	809051A	0	--	--
Bingham Road @ Gibbon	809211L	1	11-Jan-17	No
Cayuse Road @ Gibbon	809213A	0	--	--
Main Street Meacham	809221S	0	--	--
Old US Hwy 30 @ Meacham	809223F	0	--	--
Oregon Trail @ Meacham I-84	809224M	0	--	--

Truck traffic through the reservation via I-84 freeway presents another opportunity for a hazardous material spill. Emigrant Hill, commonly called “Cabbage Hill,” is a very hazardous part of I-84. This hill experiences some of the most changeable and severe weather conditions in the Northwest. Visibility is often limited, and road surfaces are often icy. To get down Cabbage Hill, truckers lose about 2,000 feet of elevation in six miles and twist through a double hair pin turn at a 6% downgrade. Oregon Department of Transportation (ODOT) has installed an advisory system for transponder-equipped trucks to encourage safe travel speeds. Emigrant Hill, from mileposts 219 to 228, has historically experienced a plague of accidents. In the eight-year period from 1997 through 2004, the area had 65 truck accidents, including 32 in which a truck was at-fault. The accidents resulted in a total of 24 injuries and 1 death.

Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely.** The 2020 Oregon Hazard Mitigation Plan does not include any human-caused incidents; no probability ranking is available for comparison.

Spills are most likely to occur within transportation corridors that cross the UIR. Railroad derailments and anticipated increases in oil tank cars coming through the UIR are concerns for the railroad corridor. With a recently completed double track expansion, Union Pacific noted the expected increase in the length of trains passing through the Reservation. Although there have been railroad derailments, crossing incidents and fatalities involving trains on the UIR there have been no documented hazardous materials spills.

Vulnerability of the UIR to Hazardous Materials Spills

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Medium Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include human-caused incidents; no vulnerability ranking is available for comparison.

Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Hazardous Materials Spill		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	2	Closed for 1 to 2 days
Lifelines	2	1 to 2 day loss of service
Property Damage	1	Minimal
Environmental Impact	4	Localized severe
Economic and Social Impact	1	Minimal
Culture Impact	2	Localized
Frequency Score	3	Somewhat Likely; expected once every 30-99 years
Total Impact Score	**17**	**Medium Risk**

If a hazardous material spilled or an accident occurred and the result was release of a hazardous material into the atmosphere, the danger from such an event would be possible exposure of hazardous substances to humans, animals, and First Foods. The risk to the UIR increases depending on the weather. During periods of dust storms, severe winter weather, and thick fog, the chances of traffic accidents increase significantly. Of course, the chances for accidents involving trucks transporting hazardous materials also increase.

Precautions are in place for dealing with some hazardous materials being transported through the UIR. For example, trucks that transport hazardous material are not allowed to park near the Wildhorse Resort and Casino or other critical facilities.

Loss Estimates

The UIR does not have a history or record of losses due to hazardous materials spills. Railroad operators are required to clean-up any spills along the railway, and I-84 is under ODOT jurisdiction. A major spill event could impact businesses or supply chains by shutting down I-84 for hours or days. This does not include the losses to natural resources, First Foods, and water supplies in areas surrounding spill corridors, which could be substantial.

Impacts on CTUIR Operations

A hazardous materials release can often require the deployment of special units to deal with the incident. Depending on the location and severity of the event, entire areas may need to be evacuated or quarantined, potentially shutting down operations along key roads or railways. Medical personnel may be required to respond to any injuries that may have occurred. In the event of a hazardous materials explosion or massive leak, the strain on first responders may become significant.

Impacts on Human Health and Happiness, Economics & Community

The principal modes of exposure to hazardous materials would be from:

- Inhalation of gaseous or particulate materials via the respiratory (breathing) process
- Ingestion of hazardous materials via contaminated food or water
- Direct contact with skin or eyes

Exposure to hazardous materials can result in a wide range of negative health effects including death, long-term health problems, and major and minor injuries. Vulnerable populations, including individuals with underlying medical conditions, the elderly, and children could experience more severe impacts. Hazardous materials incidents involving chemicals can lead to a situation where people must shelter in place or evacuate quickly. In some cases, people may be away from their home or business for up to a few days. People with limited mobility may not be able to evacuate quickly in the case of a nearby spill or incident.

An accident on Cabbage Hill involving hazardous waste may raise significant environmental problems but should not endanger citizens living on the Reservation. The I-84 corridor is more than two miles from residential areas.

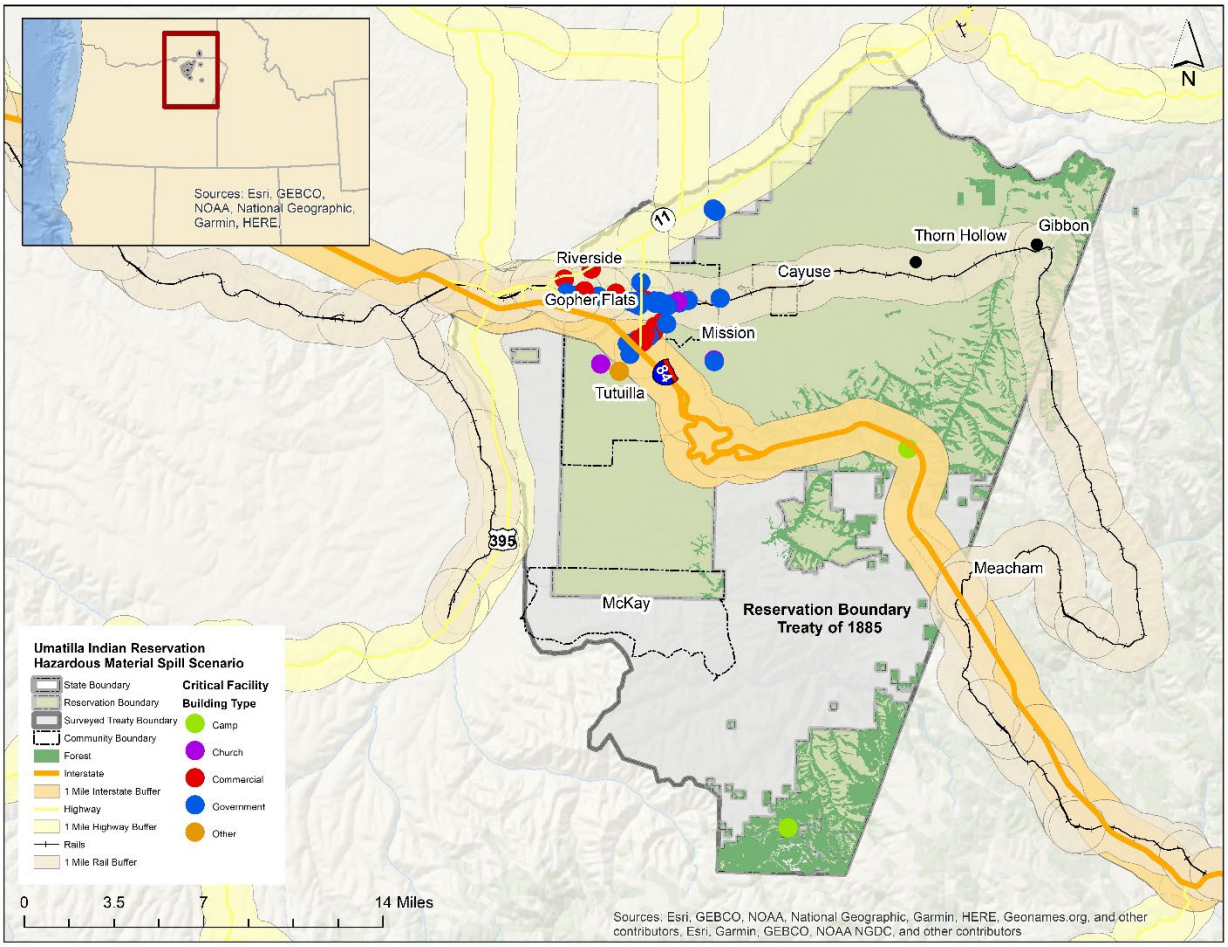
As illustrated in the previous map in the Geographic Location section, there is a significant number of housing units located in the one-mile buffer zone of spill corridors within the Reservation. There are an estimated 1,032 houses, 131 apartment or duplex units, and additional outbuildings and accessory units within the buffer zone, representing approximately 77% of residential properties on the Reservation.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

During a hazardous material release, the types of infrastructure that could be impacted include roadways, utility lines/pipes, water/wastewater assets, railroads, and bridges. The impacts on these structures include broken, failed, or impassable roadways; broken or failed utility lines (e.g., loss of power or gas to the community); and railway failure from broken or impassable railways.

The figure below illustrates the critical assets located within the one-mile buffer zone of major roadway and railroad spill corridors within the UIR.

FIGURE: Critical Assets within Hazardous Materials Spill Corridors



There are 55 critical government assets, one camp, 2 churches, 21 commercial properties, and all 5 municipal well sites are located within the buffer zone, detailed in the following table. While these facilities may not be damaged by a hazardous materials spill, individuals working within these buildings may need to evacuate, leading to a disruption of services. A major spill could impact drinking water for the UIR through well site contamination. **Appendix C** of the plan provides a list of all critical assets, including housing units, located in the spill buffer zone.

TABLE: Critical Assets within One-Mile Buffer of Spill Corridors	
Asset Type	**Asset Name**
Camp	Camp Da Kon Ya
Church	Church
Church	Seventh Day Adventist Church and School
Commercial	3 unnamed commercial properties
Commercial	American Legion Post 140
Commercial	Arrowhead Truck Plaza
Commercial	Cayuse Technology
Commercial	Dairy Queen
Commercial	Dialysis Clinic
Commercial	Go Construction Shop
Commercial	Golf Maintenance
Commercial	Kenworth Truck Company
Commercial	Mission Market
Commercial	Subway
Commercial	This is a Business of some sort
Commercial	US Forest Service
Commercial	Vacant
Commercial	Well No. 5 Pumping Station
Commercial	Wildhorse Golf Course
Commercial	Wildhorse Resort Casino
Commercial	Wildhorse Resort Hotel
Commercial	Wildhorse Resort RV Park
Government	11 unnamed buildings/structures
Government	Ag. Research Center (4 buildings)
Government	BIA Forestry (3 buildings)
Government	BIA/Interior (8 buildings)
Government	Cay-Uma-Wa Head Start
Government	CTUIR - Fire Station
Government	CTUIR Daycare
Government	CTUIR Education Center
Government	CTUIR Maintenance Office & Shop
Government	CTUIR Preparedness Building
Government	CTUIR Public Safety
Government	CTUIR Senior Center
Government	Fish Acclimation Facility

TABLE: Critical Assets within One-Mile Buffer of Spill Corridors	
Asset Type	**Asset Name**
Government	Fish Hatchery
Government	Former CTUIR Offices (5 buildings)
Government	Kayak Transit Building
Government	KCUW Radio Station
Government	Longhouse
Government	Nixyáawii Community School
Government	Nixyáawii Community School Gym
Government	Nixyáawii Governance Center
Government	Tribal Environmental Recovery Facility (TERF)
Government	Tribal Nursery
Government	Umatilla Reservation Housing Authority Office
Government	URHA Maintenance Shop
Government	Well 4 Facility
Government	Yellowhawk Tribal Health Center (2 buildings)
Water	5 municipal well sites

Impacts on Water and First Foods

A railroad accident involving hazardous materials could have severe negative environmental and cultural resource consequences. The railroad corridor is located within the floodplain of the Umatilla River and its tributary, Meacham Creek. Water, both surface and sub-surface, is sacred to the Tribal people having both religious and cultural significance. All Tribal First Foods, including fish, big game, roots, and berries, could be impacted. By Tribal standards, any potential negative impact to these resources makes the UIR highly vulnerable to a hazardous materials incident.

Animal populations can experience many of the same impacts as humans from hazardous materials spills, including death or long-term health problems from chemicals and irritants. Hazardous material spills can damage habitat and Native American cultural sites. For example, “Biscuit Root” or “Xh-oush” is an important traditional Native American food that is found in several higher elevation locations next to I-84. A large chemical spill from a traffic accident on I-84 or an accident involving the railroad could damage an important cultural food source for many years.

3.20 Natural Gas Pipeline Failure

There are two main types of pipelines, differentiated by the product they carry. Pipelines can also be defined by their function (gathering, transmission, or distribution, and geography (interstate or intrastate). The two products considered in this hazard analysis include:

- **Gas pipelines** carry natural gas and other gases that are flammable, toxic, or corrosive, such as vaporized liquefied petroleum gases (i.e., propane and butane), ethylene, and propylene. Natural gas is the predominant gas transported by and associated with pipelines.
- **Hazardous liquid pipelines** carry crude oil and refined petroleum products such as gasoline, natural gas liquids, and diesel and jet fuel. Ammonia and liquid carbon dioxide are also considered hazardous liquids and are also transported by hazardous liquid pipelines. A hazardous liquid pipeline can transport batches of different types of refined petroleum. The pipeline operator schedules and tracks the customer's batch or product through the pipeline, including tracking the product being transported, the volume of the product, where it is being transported from and to, and the owner of the product.[153]

Risks to the public from hazardous liquid and gas pipelines result from the potential unintentional release of products transported through the pipelines which can impact surrounding populations, property, and the environment, and may result in injuries or fatalities. A pipeline failure is when a break in an existing line allows the product to escape. Products are transported under pressure and a weak spot in the line, earthquake or other natural hazard, or accidental puncture could result in a break. Although lines are monitored and maintained there is no way to predict when or where a pipeline break may occur.

As reported by Pipeline and Hazardous Materials Safety Administration (PHMSA) Office of Pipeline Safety, the major causes of pipeline accidents include corrosion, excavation damage, incorrect operation, material/weld/equipment failure, natural force damage, and other outside force damage.[154]

Major natural gas transmission pipelines traverse the UIR in roughly a northwesterly to southeasterly direction. The ownership and location identification of these pipelines is described in the UIR Community Profile (Section 2).

Extent and Intensity

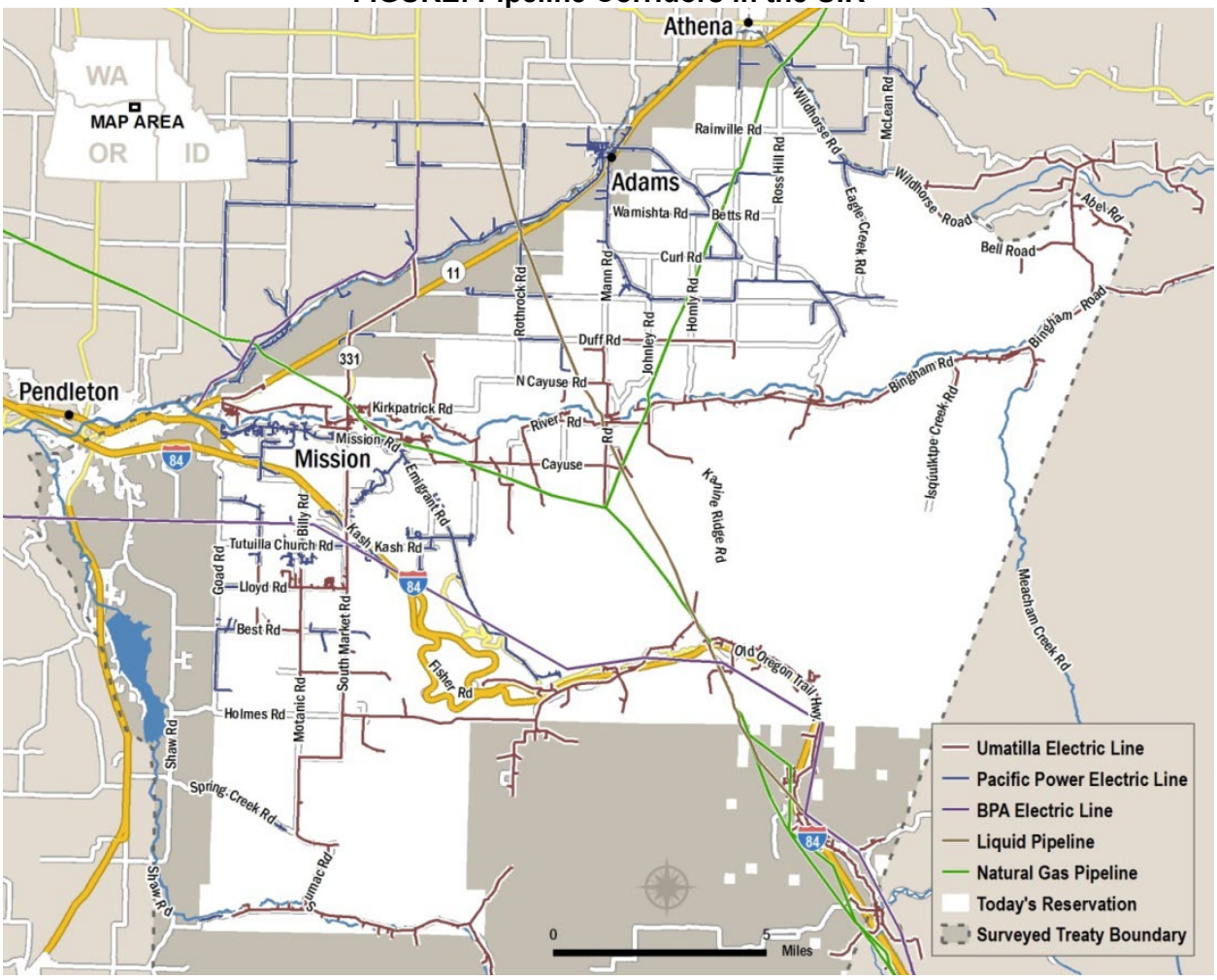
The extent of a natural gas or oil pipeline failure is confined to the immediate areas adjacent to the pipelines. A natural gas pipeline failure and possible explosion would be confined to primarily sparsely settled areas of the UIR. The intensity of a pipeline failure would intensify if occurring during the dry summer months or in conjunction with a wildfire event.

A liquid fuel pipeline failure should be much less intense (as oil is less explosive than natural gas) and would likely be confined to the area near the immediate break. The liquid fuel pipeline generally follows the I-84 corridor.

Geographic Location

The map below identifies the various pipeline corridors that cross the UIR. Although much of the natural gas pipeline route (indicated in green) is in rural areas without significant population centers, the western route does transect the Mission Community Area which as the highest population density dissecting the Mission Creek Indian housing complex. If a break were to occur in this line it could significantly impact the Tribal community.

FIGURE: Pipeline Corridors in the UIR



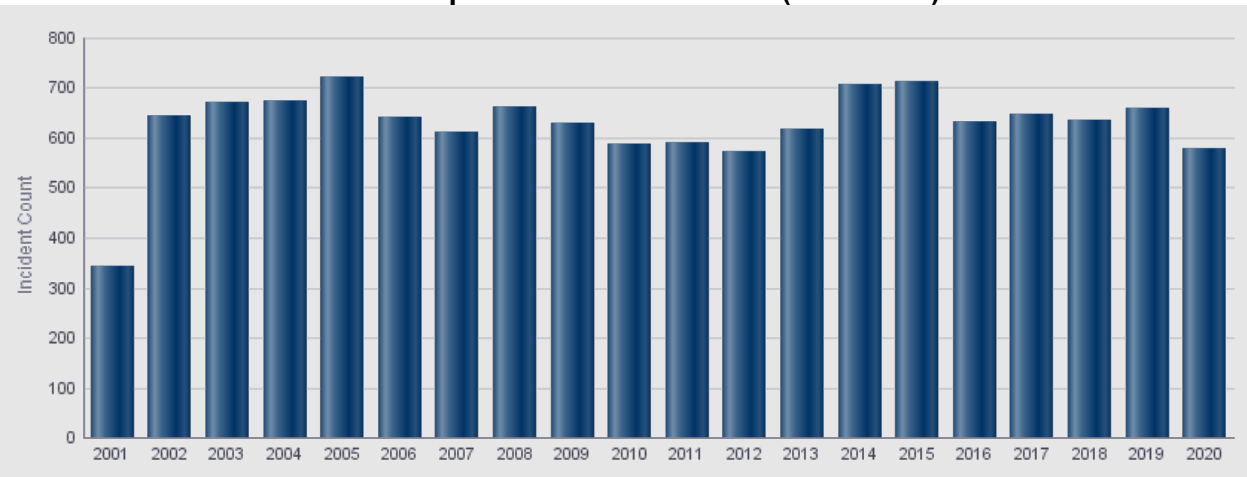
History of Gas Pipeline Failures in the UIR and Surrounding Areas

There has been one gas pipeline failure on the UIR. A gas pipeline exploded on January 2, 1999, about four miles east of the community of Mission. No one was injured and no property was damaged because of the pipeline failure. The distribution of natural gas to Walla Walla, Washington, and natural gas users north of the Reservation were without natural gas while the pipeline was being repaired. There has not been a liquid fuel pipeline failure on the UIR.

PHMSA is the federal agency responsible for pipeline safety and monitors pipeline incidents throughout the U.S. There were a reported 578 serious pipeline incidents across the country in 2020, with trends over the last 20 years illustrated in the figure below. The five-year average (2015-2020) was 630 incidents causing 16 fatalities and 56 injuries. Reported incidents in

Oregon are much less common, with a five-year average of one incident causing zero fatalities and zero injuries. The last pipeline incident to cause any fatalities in Oregon was in 2009.[155]

PHMSA Pipeline Incidents: Count (2001-2020)



Future Probability

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), this hazard is **Somewhat Likely.** The 2020 Oregon Hazard Mitigation Plan does not include any human-caused incidents; no probability ranking is available for comparison. Both liquid and gaseous pipelines cross the UIR. Although these lines are monitored and maintained, there is no way to predict when or where a pipeline break may occur.

Vulnerability of the UIR to Natural Gas Pipeline Failure

Based on the Risk Assessment, detailed in Section 3.2 (methodology) and Section 3.3 (results), the UIR has a **Low Risk** to this hazard. The 2020 Oregon Hazard Mitigation Plan does not include human-caused incidents; no risk ranking is available for comparison. The majority of the three pipeline facilities crossing the UIR are in unpopulated areas posing little direct impact to people and property, and there have been few historical incidents of pipeline failures.

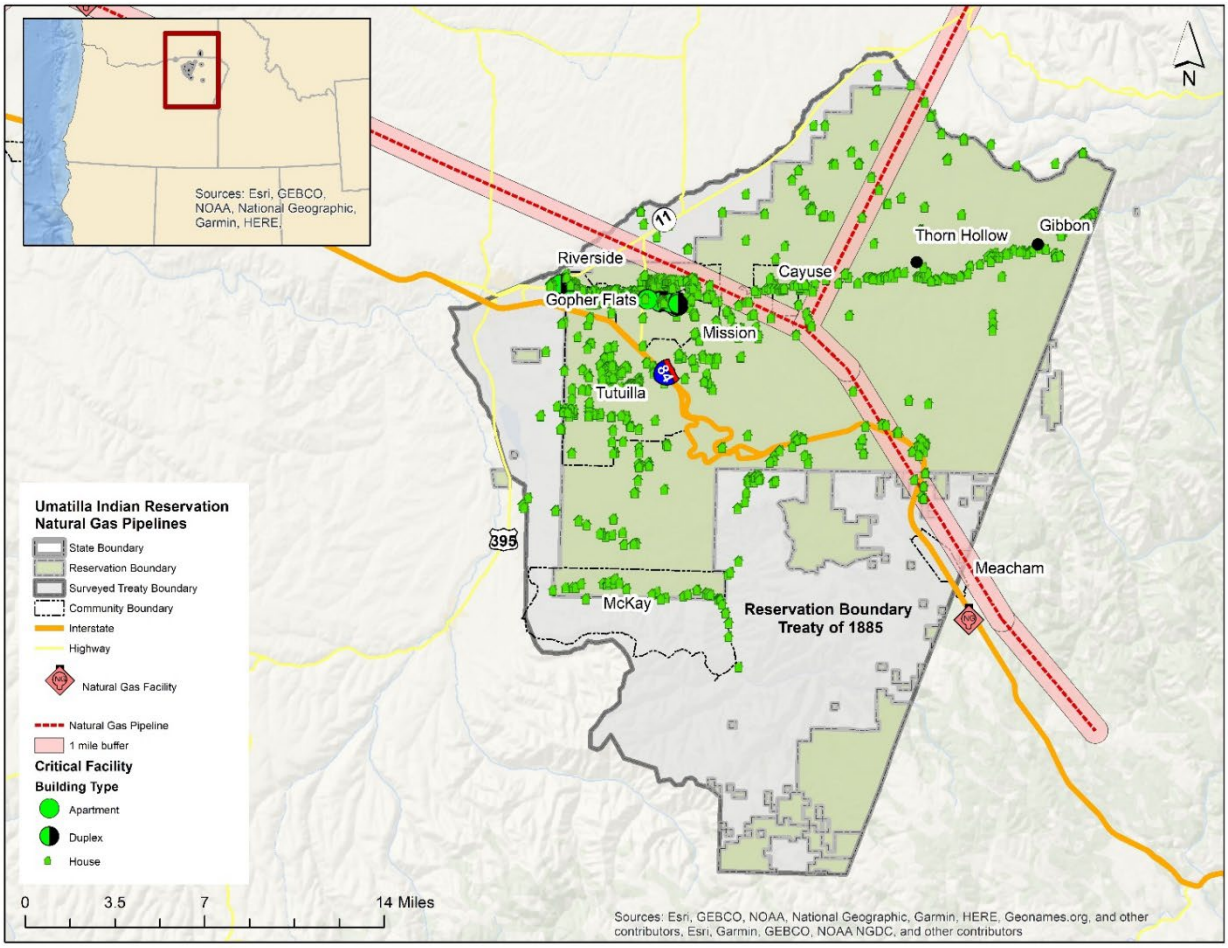
Based on the identified impacts, the following scores have been assigned to this hazard:

TABLE: Impact and Consequence Assessment Results – Natural Gas Pipeline Failure		
Criteria	**Score**	**Description**
Deaths	1	0-1 death
Injuries	1	0-3 injuries
Critical Assets	1	Closed for less than 12 hours
Lifelines	1	Interrupted for less than 12 hours
Property Damage	2	Localized minor
Environmental Impact	4	Localized severe
Economic and Social Impact	1	Minimal
Culture Impact	1	Minimal
Frequency Score	3	Somewhat Likely; expected every 30-99 years
Total Impact Score	**15**	**Low Risk**

Loss Estimates

The figure below illustrates a one-mile buffer around the two natural gas pipelines that travel through the UIR overlaid with housing assets. There are a total of 65 housing units within the buffer zone, representing approximately 4% of residential properties on the Reservation. While a pipeline explosion would not damage all homes within the buffer zone, all 65 homes could be at risk to damage or would require evacuation. These loss estimates do not include impacts to the natural environment, First Foods, water sources, or other important resources that lie within the buffer zone. Critical assets within the buffer zone are detailed on the following page. **Appendix C** of the plan provides a list of all critical assets, including housing units, at risk to a natural gas pipeline break.

FIGURE: Housing Units within a One-Mile Buffer of Natural Gas Pipelines



Impacts on CTUIR Operations

A pipeline break along Interstate 84 and subsequent road closure could lead to localized and regional impacts. A pipeline break would place increased demand on Tribal public safety and responder resources before the operator was able to repair any long-term damage and stop the leak or rupture.

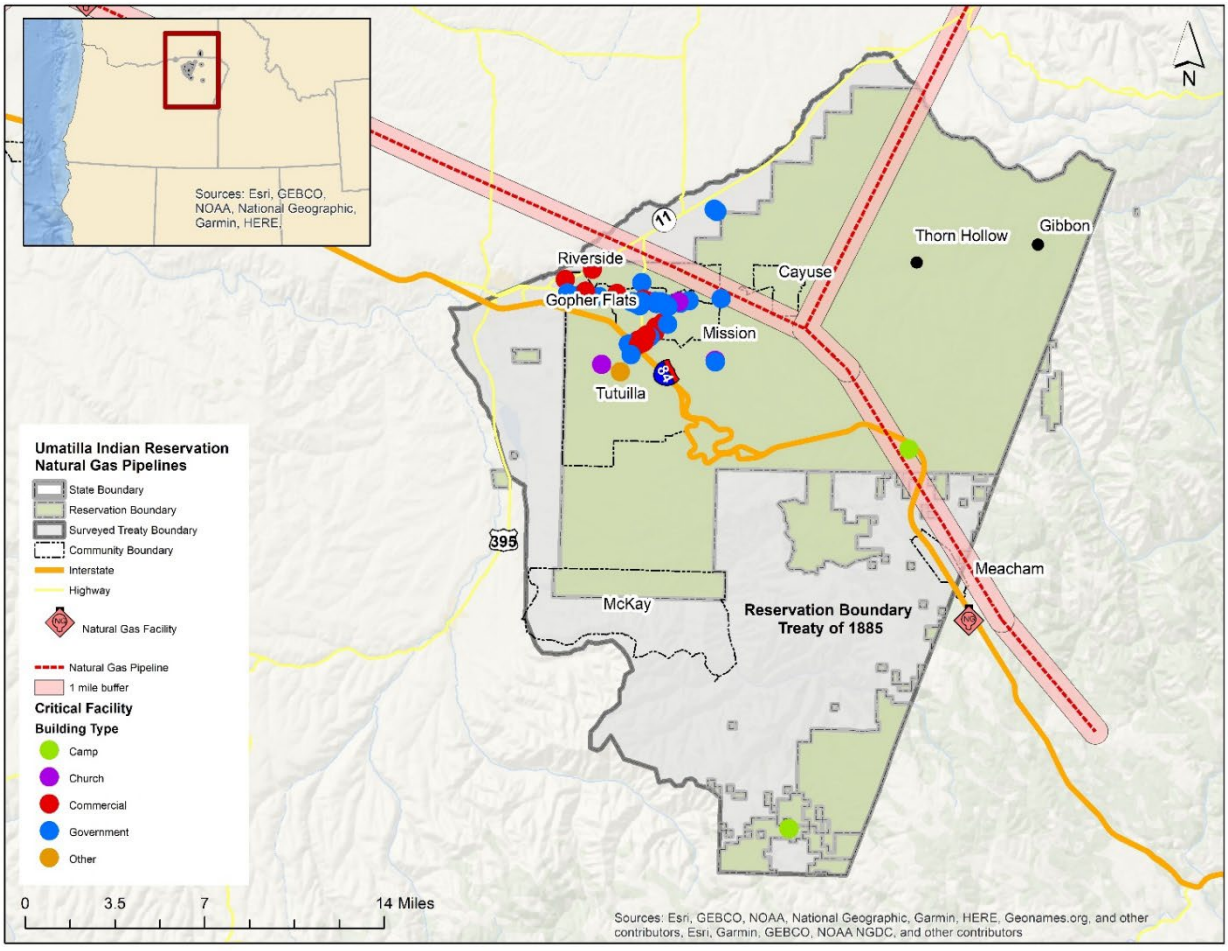
Impacts on Human Health and Happiness, Economics & Community

The impacts of a natural gas pipeline rupture depend on where the failure occurs. If a failure occurred within a populated area, loss of life and serious property damage is possible. If the failure occurs in a rural area, as was the case in the only pipeline rupture that occurred on the UIR, no loss of life or property damage will occur. In any case, loss of natural gas service until the pipeline is repaired could result in loss of heat and energy to residents, businesses, and industries dependent on natural gas.

Impacts on Critical Infrastructure, Built Systems, and Energy Production & Use

Again, dependent on the location of the explosion, a pipeline break could lead to damages to commercial and industrial structures, as well as other infrastructure. The figure below illustrates a one-mile buffer around the two natural gas pipelines that travel through the UIR. Two critical facilities fall within the buffer zone – Camp Da Kon Ya along I-84 towards Meacham (green dot) and a Fish Hatchery on Cayuse Road (blue dot). These facilities could be threatened by an explosion or require evacuation if there were to be a pipeline break.

FIGURE: Critical Facilities within a One-Mile Buffer of Natural Gas Pipelines



Impacts on Water and First Foods

A liquid fuel pipeline failure would likely cause environmental damage to immediate area surrounding the break. A break could lead to contamination of waterways and drinking water sources, and contamination of culturally important areas. A liquid fuel pipeline break would affect First Foods including fish, game, berries, and roots. A compressed gas natural pipeline break would have minimal impacts outside of the immediate explosion area.

Section 4. Hazard Mitigation Strategy

This section of the plan contains the HMP mission statement and goals along with mitigation measures and their implementation. The mission, goals, and mitigation measures (or action items) are the heart of a hazard mitigation plan and together serve as the mitigation strategy.

Hazard mitigation is "*any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards*."

Hazard mitigation goals are the guiding principles of the plan that provide the "vision" for success for all actions taken under the plan. The goals help align mitigation measures to ensure that efforts are focused and coordinated toward the desired outcome.

Hazard mitigation measures are specific actions that, if implemented, will (1) reduce the chances of damage from one or more hazards; (2) protect people living and working on the Reservation from the effects of hazards; and (3) make the Reservation more resilient and able to recover more quickly from the effects of hazards.

Types of Mitigation Actions

There are several types of mitigation actions that can be used to help reduce or eliminate the effects of hazards on both existing and new buildings and infrastructure. FEMA has described six categories of mitigation measures.

- **Public Education and Awareness** – actions to inform and educate citizens, property owners, renters, businesses, tribal officials, and other stakeholders about potential risks from hazards and potential ways to mitigate them.
- **Prevention –** regulatory actions or processes that influence the way land and buildings are developed and built; such as acquisition, elevation, relocation, flood proofing.
- **Structural Projects –**actions that involve the construction of new structures to reduce the impact of a hazard; such as storm water detention reservoirs, levees and floodwalls, channel modifications, drainage and storm sewer improvements, and improvements to designated community shelters.
- **Property Protection –** actions to existing buildings or infrastructure to protect them from a hazard or remove them from the hazard area.
- **Emergency Services –** include preparedness information, threat recognition, warning signs, response, critical facilities protection, and mitigation.
- **Natural Resources Protection –** actions minimize hazard losses and preserve or restore the functions of natural systems. These actions may include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management and wetland restoration and preservation.

Projects that fall under one of the preceding categories **may** qualify for funding from the Federal Emergency Management Agency (FEMA) or other funding sources. Generally, projects should:

- Be compatible with goals and objectives of this Plan;
- Be compatible with goals, objectives, and mitigation strategies of adjacent or other regional hazard mitigation plans;
- Consider the affect the action would have on other jurisdictions within the region;
- Consider the cost/benefit of potential actions.

4.1 Mission Statement

It is the mission of the CTUIR HMP to substantially reduce the risks and impacts of natural and human-caused hazards on the UIR. This plan is designed to help protect human and natural resource assets located on the Reservation from all natural and human-caused hazards. Implementation of this plan will help the Reservation become more resistant to disasters and enable it to “rebound” more quickly after a disaster or emergency event.

4.2 Hazard Mitigation Goals

The CTUIR HMP has four goals which are as follows:

1. Reduce the impact of hazardous events on people living and working on the reservation, to travelers, on assets located on the Reservation, and on the Reservation's natural resources.
2. Promote resilience, as an ethic of the UIR, to ensure the tribal government, economy and health care system can withstand the effects of disaster and emergency events.
3. Increase the level of coordination within the Tribal government and between the Tribe and federal, state, nearby jurisdictions, and private service providers to promote joint natural hazard mitigation programs.
4. Enhance public awareness about hazards and activities that reduce the impact of natural and human-caused hazards.

4.3 Hazard Mitigation Measures

The mitigation measures identified in this section will help reduce the effects from all the identified hazards described in Section 3. Some of the mitigation measures are multi-hazard measures that address more than one hazard. Some of the mitigation measures are designed to reduce the effects of hazards on new and existing structures and infrastructure. For example, planning, zoning, and building code mitigation measures will help reduce or eliminate the impacts from hazards on **new** structures and infrastructure. Other mitigation measures, such as raising or removing homes in the floodplain, fixing culverts to reduce flooding and strengthening power lines, are focused on reducing damage to **existing** structures and infrastructure.

The following table identifies action items/measures specific to the UIR that have been identified and prioritized by the Planning Committee. If completed, these items would minimize the impact of natural and human-caused hazards to the CTUIR government, Reservation residents, visitors, and natural and cultural resources. Each mitigation measure includes the following information:

- Relevant Hazard
- Identifying number
- Description
- Lead CTUIR Agency for Implementation
- Supporting CTUIR Agencies
- Supporting Outside Partners
- Timeframe
- Estimated Cost
- Priority Level
- Associated Mitigation Goal(s)

To improve readability, the mitigation strategy in the table below includes a simplified version of the strategy. The complete strategy is available as **Appendix D** to the HMP.

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
				Inside CTUIR	**Outside CTUIR**	
PUBLIC EDUCATION and AWARENESS						
Multi-Hazard	PE-1	Prepare and distribute hazard and safety preparedness information. Use website, brochures, events, and public announcements to disseminate information. Expand current efforts to include human-caused hazards.	Public Safety	Police, Fire, Public Works, Tiicham SWCD, Communications	Umatilla County, State of Oregon, FEMA, NRCS	High
Multi-Hazard	PE-2	Prepare a Business Continuity Plan that helps maintain the Tribe's economy during and after a disaster. Assign task to a department or hire a consultant.	Economic & Community Development	WRC, Mission Market, Arrowhead	-----	High
Multi-Hazard	PE-3	Prepare a Government Continuity Plan that details how core governmental operations will be maintained during an emergency. Assign task to a department or hire a consultant.	CTUIR Executive Director and Administration	All CTUIR Departments and entities	-----	High
Multi-Hazard	PE-4	Maintain a hazardous events section on the CTUIR website. Identify and describe the types of hazards that have an impact on the UIR and how to report.	Public Safety	DNR, Yellowhawk, BIA, Wildhorse Gaming Resort (WGR)	ODOT, Pacific Power, Umatilla Electric, Williams Gas Pipeline, OEM	High
Multi-Hazard	PE-5	Identify opportunities for partnering with citizens, private contractors, and other jurisdictions to increase availability of equipment, manpower and other resources for efficient responses to hazardous events, including mutual aid agreements.	Public Safety	Public Works, CNR, Water Resources, Finance, DOJ, WGR, Cayuse	City of Pendleton, Umatilla County, USFS, ODFW	High
Multi-Hazard	PE-6	Collaborate with neighboring jurisdictions to create a regional emergency management and information hub. Allows for coordinated response to hazardous events and cost sharing in maintaining a single emergency management center.	Public Safety	Admin. and Communications Dept.	Umatilla County, possibly Union and Morrow Counties and neighboring cities	Low
Multi-Hazard	PE-7	Work with the National Weather Service to maintain StormReady Certification, including renewal in 2022.	Public Safety	Admin. and Communications Dept.	NOAA, City of Pendleton, County	High

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
				Inside CTUIR	**Outside CTUIR**	
Multi-Hazard	PE-8	Establish an Emergency Operations Center for CTUIR disaster response operations.	Public Safety	CTUIR Administration	OEM, FEMA	Medium
Multi-Hazard	PE-9	Develop a hazardous weather plan that includes trainings and exercises.	Public Safety	Planning	OEM, FEMA	Medium
Multi-Hazard	PE-10	Consider entering FEMA Community Rating System, which rewards jurisdictions that are pro-active in public awareness and pre-hazard mitigation. Develop application meeting Program requirements and implement.	Public Safety, Planning	Admin. and Communications Dept.	OEM, FEMA	Medium
Multi-Hazard	PE-11	Develop and implement a curriculum and training session for the Emergency Operations Plan (EOP) to ensure coordination and understanding of the responsibilities of all participants.	Public Safety	All CTUIR Depts. and Programs	OEM, City of Pendleton, Umatilla County	High
Multi-Hazard	PE-12	Make presentations in local schools on the types of hazards predominant to the UIR and ways to mitigate.	Public Safety, Education	Fire, Police, YellowHawk, WGR	State Police	Medium
Active Shooter	PE-13	Conduct complex-wide active shooter exercise annually, preceded by education on procedures.	Public Safety	CTUIR Administration, Education, Public Works	Local and Umatilla County Police (SWAT)	Medium
Active Shooter	PE-14	Establish lock-down procedures for the CTUIR Government Center, including use and testing of panic buttons.	Public Safety	All CTUIR Departments and Programs	Cayuse Technologies	High
Earthquake	PE-15	Participate in the “Great Shake Out” to educate and remind residents how to prepare for and respond to an earthquake event	Public Safety	Education, CTUIR Administration	OEM	Medium
Extreme Heat	PE-16	Provide early notification and education for members and residents in advance of extreme heat events, including home preparation guidance, cooling, and hydraftion strategies.	Public Safety	CTUIR DCFS, Housing, Communications	Local Media	High
Flooding	PE-17	Assist home owners that have previously flooded to protect their structures from future damage.	Planning, Public Safety	DNR, Communication GIS, Housing	FEMA, OEM	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
				Inside CTUIR	**Outside CTUIR**	
Flooding	PE-18	Maintain compliance with current NFIP regulations to make flood insurance available to property owners in the UIR.	Planning	-----	FEMA	High
Fog	PE-19	Expand the radio frequency traveler's information program to inform the public of road conditions on I-84.	Public Safety	Fire	ODOT	Medium
Natural Gas	PE-20	Coordinate with the pipeline company operators to provide pipeline safety education forums.	Public Safety	Education, CTUIR Admininstration, Fire	Tesoro, NW Pipeline	Medium
Spring/Summer Storm	PE-21	Install lightning detectors for early notification and warning at major outdoor gathering areas (pow wow grounds and July grounds).	Public Safety	Communications	FEMA, BIA	Low
Wildfire	PE-22	Coordinate with and support prevention and education efforts identified in the BIA WFPP.	Public Safety	Fire	BIA, ODF	High
Wildfire	PE-23	Identify and inform property owners about bridges that cannot support weight of emergency vehicles.	Public Safety	Fire	BIA, ODF	Medium
Wildfire	PE-24	Promote risk reduction strategies for homes in WUI areas, including using noncombustible materials, creating defensible space, and reducing smoke infiltration.	Public Safety	Fire	BIA, ODF	High
Wildfire Volcanic Activity	PE-25	Encourage use of air quality monitoring systems to identify poor air quality days and notify residents of safe gathering conditions.	Public Safety	Yellowhawk, Housing, CTUIR DCFS, DNR - EESP	EPA	High
Wind Events	PE-26	Conduct community education and outreach about wind impacts to Treaty Rights.	DNR - Cultural Resources, Water Resources, Fisheries	Communications, Confederated Umatilla Journal (CUJ)	BIA	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
PREVENTION MEASURES						
Multi-Hazard	P-1	Amend the CTUIR Comprehensive Plan to include objectives that recognize and encourage hazard mitigation measures that will make the reservation more disaster resistant. Ensure all CTUIR functional plans adopted consider mitigation measures to address relevant hazards.	Planning	Board of Trustees, Police, Fire, Public Works	-----	High
Multi-Hazard	P-2	Update the CTUIR Land Development Code as necessary to include development standards to minimize risk to structures from natural hazards.	Planning	Board of Trustees	FEMA	Medium
Multi-Hazard	P-3	Ensure new development complies with the most current International Building Code to help make new or renovated structures more disaster resistant.	Planning	Inspection Services	-----	High
Multi-Hazard	P-4	Partner with Energy Trust of Oregon to advance energy resilience planning & solar+storage microgrid feasibility studies for key facilities.	Public Works	DNR - EESP	Energy Trust of Oregon, OR Department of Energy, FEMA	High
Multi-Hazard	P-5	Update the 2006 CTUIR Water and Wastewater Master Plan.	Public Works	Planning, DNR - Water Resources	Indian Health Services	High
Multi-Hazard	P-6	Develop a Travel and Access Management Plan to identify and address roadways experiencing erosion or other hazards.	Public Works, Planning	DNR, Public Safety, OIT - GIS	Umatilla County, ODOT	Medium
Communicable Disease	P-7	Conduct an after-action review of CTUIR operations during the COVID-19 Pandemic to understand successes and challenges and what can be learned from response.	CTUIR Administration	YellowHawk, Public Safety	Umatilla County Public Health, FEMA, DHS, Oregon Health Authority	High
Communicable Disease	P-8	Create a Pandemic and Communicable Disease Plan using lessons learned from COVID-19. Convene a 'whole community' group to ensure the plan addresses mitigation, prevention, and operational changes.	YellowHawk	CTUIR Administration, Public Safety, Planning, Schools	Umatilla County Public Health, FEMA, DHS, Oregon Health Authority	High

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
Cyber Attack	P-9	Implement critical action items to address security vulnerabilities as described in the 2021 CTUIR IT Assessment. Review and revise the assessment regularly.	IT Department	CTUIR Administration	----	High
Cyber Attack	P-10	Invest in improved cyber system redundancies and incorporate into continuity planning (PE-2 and PE-3).	IT Department	CTUIR Administration	----	Medium
Dam Failure	P-11	Implement the Indian Lake Dam EOP and ensure five-year updates in partnership with BIA.	DNR - Water Resources	DECD, Public Safety	BIA	High
Drought	P-12	Advance the Water Conservation Action Plan to reduce peak demands and improve water efficiency of the Tribal water system.	Public Works	DNR-Water Resources	NRCS	High
Drought	P-13	Develop a comprehensive plan for wastewater re-use to meet renewable water performance standards as established by CTUIR.	Public Works	DNR-Water Resources	NRCS	High
Drought Wind Events	P-14	Provide technical assistance and low-interest loans to farmers and ranchers to develop livestock watering systems.	DNR - Range, Ag & Forestry	DNR - Water Resources, Economic & Community Development, CTUIR Farming	NCRS, Tiicham Conservation Dist., ODOT	Medium
Earthquake	P-15	Conduct a study to determine which buildings and infrastructure on the UIR face a risk from earthquakes.	Public Safety	Planning	FEMA	Low
Earthquake	P-16	Monitor earthquake activity; establish and implement an infrastructure inspection process and standard procedures for the community water and sewer system; and retrofit as needed.	Public Works	Public Safety, URHA	USGS, FEMA	Medium
Flooding	P-17	Purchase and remove existing structures in flood hazard areas as funding and willing sellers allow.	Land Acquisition, Planning	DNR Programs, Public Safety	FEMA	High

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
Flooding	P-18	Include properties located within the Flood Hazard Overlay Zone as a priority in the CTUIR Land Acquisition Strategy Plan as funding and willing sellers allow.	Economic & Community Development	Planning, DNR - Cultural Resources	FEMA	High
Flooding	P-19	Work with local, state, and federal jurisdictions to install, maintain and operate stream gauging stations on the UIR.	DNR - Water Resources	DNR Programs	US F&W, Oregon F&W	High
Fog Wildfire Volcanic Activity	P-20	Provide additional cameras to monitor adverse travel conditions on I-84 and OR 331.	Public Safety	-----	ODOT	Medium
Fog Wildfire Volcanic Activity	P-21	Work with ODOT on the deployment and installation of road safety signs.	Public Safety	-----	ODOT	Medium
Landslide Wildfire	P-22	Consider measures to ensure future development is protected from landslides and is defensible from wildfires, helping to protect existing and future development from hazard events.	Planning	GIS, DNR - Range, Ag & Forestry	Umatilla County, ODF, USFS	Medium
Spring/Summer Storm	P-23	Consider measures to ensure all future development over a certain height is required to install lightning arrestors.	Planning	----	----	Low
Wildfire	P-24	Evaluate all new development within the designated high and medium WUI areas for fire hazard.	Public Safety, Fire	Planning, DNR - Range, Ag & Forestry	BIA, ODF, USFS	Medium
Wildfire	P-25	Within designated WUI and at risk WFPP areas ensure adequate access/egress for fire-fighting vehicles.	Public Safety	DNR - Range, Ag & Forestry, Public Works	BIA, ODF, USFS	Medium
Wind Events	P-26	Explore methods of improving communication of hazardous blowing dust conditions with local public safety and law enforcement agencies.	Public Safety	CTUIR Farming	BIA, NRCS	Medium
Winter Storm	P-27	Expand the NOAA emergency management signal covering the UIR.	Public Safety	Police, Fire	Nat'l Weather Service, ODOT	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
STRUCTURAL PROJECTS						
Multi-Hazard	S-1	Bury, replace, or improve power utility lines to reduce the risk of power outages.	Public Works, DECD	SAA, DNR - Cultural Resources	Umatilla Electric, Pacific Power	Low
Multi-Hazard	S-2	Construct a back-up storage facility that is outside of the floodplain to reduce risk of disruption and loss of connectivity for essential communications infrastructure.	OIT	Public Works, CTUIR Administration	----	Medium
Drought	S-3	Increase storage of water and improved instream flow through enhanced maintenance to ensure beneficial use by Farming Enterprise and First Foods.	DNR - Range, Ag & Forestry	DNR - Water Resources	NCRS, Tiicham Conservation Dist.,	High
Drought	S-4	Increase storage capacity and supply of potable water to the CTUIR Community Water System which is at capacity. Identify a secondary water supply, such as back-up wells.	Public Works	DNR - Water Resources	----	High
Flooding	S-5	Identify and implement measures to mitigate erosion of roads on the Reservation (CTUIR-owned and County-owned), including the upper McKay Creek and others from recent flood events.	Public Works	Planning, DNR	Umatilla County	Low
Flooding	S-6	Conduct a drainage assessment and augmentation in the “July Grounds” area to mitigate for mold and rot associated with the high-water table hazard.	Public Works	Planning, DNR	Umatilla County Public Works	Medium
Winter Storm	S-7	Install a second substation to provide a secondary service route to the power grid system.	Economic & Community Development	Planning	ODOT	Medium
Winter Storm	S-8	Develop additional semi-truck parking near Arrowhead to address safety issues with I-84 winter closures.	WGR & Casino, Arrowhead	Planning, Public Works	Umatilla Electric, Pacific Power	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
PROPERTY PROTECTION MEASURES						
Flooding	PP-1	Move the affected people out of danger by relocating or elevating threatened homes in the floodplain.	Public Safety	Planning, DNR	FEMA, BIA	Medium
Flooding	PP-2	Consider climate change projections into flood mitigation action items.	DNR - Water Resources	GIS	-----	Medium
Flooding	PP-3	Conduct an environmental assessment and reconstruction of Spring Creek to mitigate the July Grounds flooding.	Public Works	DNR - Water Resources	----	Medium
Flooding Wildfire	PP-4	Develop a plan for emergency slash management (pickup, chipping, burning, and reuse program) in WUI designated areas and after flooding events.	Public Safety	Public Safety, DNR-RAF, Fire, Economic & Community Development, TERF	ODF, BIA	Medium
HazMat	PP-5	Increase inspection of Casino and Arrowhead parking areas for leaking materials or when I-84 is closed.	Wildhorse Security	Public Safety, Police	ODOT	Medium
Landslide	PP-6	Conduct a study of hillsides at high-risk to sliding to identify priority areas for reinforcement and re-vegetation projects. Areas may include those with recent flooding, Cayuse Road and some Umatilla County roads.	DNR	Public Works, Public Safety, Planning	DOGAMI, USFS, OR F&W, BIA, USGS	Medium
Wildfire	PP-7	Acquire a heavy-duty chipper for use in slash management to reduce fuel loads.	Public Safety	Public Safety, DNR-RAF, Fire, Economic & Community Development, TERF	ODF, BIA	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
EMERGENCY SERVICES MEASURES						
Multi-Hazard	ES-1	Annually review the Emergency Operations Plan (EOP) with individuals and agencies responsible for implementation.	Public Safety	Police, Public Works, WGR	OEM, City of Pendleton, Umatilla County	High
Multi-Hazard	ES-2	Expand the use of Emergency Alert System (EAS), AlertSense, and Camp Crier mobile application to provide timely information to the traveling public about hazardous driving conditions.	Public Safety	Police, Fire, Public Works, Communications	ODOT, State Police	High
Extreme Heat	ES-3	Develop a Water and Cooling Distribution Plan.	CTUIR Administration	Public Safety, CTUIR DCFS, Yellowhawk	----	Medium
Extreme Heat	ES-4	Introduce a policy to limit outdoor work for CTUIR employees during extreme heat periods, including flexible hours.	CTUIR Administration	Housing, Yellowhawk	OSHA	Medium
HazMat	ES-5	Coordinate with the Union Pacific Railroad for local response to derailments and spills.	Public Safety	Police, Fire, DNR - Cultural Resources	EPA, USFS	Medium
HazMat	ES-6	Add lockers along I-84 and other major travel routes with pigs, pads, and boom to mitigate spread of spills in vulnerable areas.	Public Safety	-----	ODOT	Low
Wildfire	ES-7	Within designated WUI and at risk WFPP areas provide emergency access/egress road signs and maps for homeowners.	Public Safety	Police, Public Works	ODF, BIA	Medium
Wildfire	ES-8	Develop a process to encourage private property owners to upgrade their bridges to support the weight of fire trucks and emergency vehicles.	Public Safety, Fire	Planning, DNR - Water Resources	-----	Medium
Wildfire Volcanic Activity	ES-9	Designate clean air shelters and community gathering spaces with air purification systems and quality ventilation. Purchase and install air purification systems and improve ventilation as needed in CTUIR buildings.	Public Safety	DNR - EESP	OEM	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
Wildfire Volcanic Activity	ES-10	Identify resources and a strategy to purchase, store, and disperse emergency smoke mitigation systems (masks, air purifiers, eye protection, respirators, etc.) to ensure access to First Foods during wildfire/poor air quality events. Educate vulnerable community members on purchase and use of personal systems and protective measures.	DNR - Cultural Resources	Public Safety, Yellowhawk, CTUIR DCFS	FEMA, DHS, OHS	High
Wildfire Volcanic Activity	ES-11	Develop a CTUIR Emergency Operations Plan Annex for Poor Air Quality response.	Public Safety	Police, WGR, CTUIR Administration, Communications	OEM, City of Pendleton, Umatilla County	Medium
Winter Storm	ES-12	Work with existing utility companies providing services within the UIR to coordinate emergency response to address power outages.	Public Safety	Police, Public Works, WGR	Umatilla Electric, Pacific Power	Medium
Winter Storm	ES-13	Develop a plan, in coordination with ODOT, for abandoned vehicle removal on I-84 during and after severe storms.	Public Safety	Public Works	ODOT	Medium

TABLE: 2021 CTUIR HMP Mitigation Strategy						
Hazard	**#**	**Action Items**	**Responsible to Implement**	**Coordinating Partners**		**Priority**
NATURAL RESOURCE PROTECTION MEASURES						
Drought	NR-1	Identify and restore normative Umatilla River ecosystem processes.	DNR - Cultural Resources, Water Resources, Fisheries	-----	-----	Medium
Flooding	NR-2	Pursue vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the flood plain and watershed, including natural armoring and restoring meanders.	DNR - Cultural Resources, Water Resources, Fisheries	Planning, Public Works, Public Safety	USF&W, Oregon F&W, FEMA	Medium
Flooding	NR-3	Restore hydrologic connectivity of the floodplain with the channel by removal of artificial structures (dikes, levies, etc.)	DNR, Public Works	-----	-----	Medium
Wind Events	NR-4	Develop a Rangeland Management Plan for the UIR to include soil retention best management practices.	DNR - Range, Ag & Forestry	CTUIR Farming	BIA, NRCS	High

The mitigation strategy presented in the 2021 HMP update reflects progress by CTUIR in advancing mitigation efforts across many programs and departments. Many of the action items from the 2016 CTUIR Hazard Mitigation Plan continue to apply in 2021 and beyond as long-range ongoing actions, thus the Planning Committee chose to retain many items from the 2016 Plan. Additionally, some action items that were removed because they have been completed, are no longer relevant, or were amended to reflect new information and supporting efforts. The table below contains a summary of items/measures from the 2016 Plan that were not carried forward into this plan.

TABLE: Completed or Removed Actions from 2016 CTUIR HMP			
Hazard	**2016 Plan #**	**Action Item Description**	**Revisions and Comments for 2021**
Actions Completed			
Multi-Hazard	ES-6	Ensure all critical facilities are equipped with emergency backup generators and fuel supply.	Completed.
Multi-Hazard	PE-8	Research Emergency Alert System/mass communication products, costs, and methods. Coordinate with neighboring jurisdictions.	Completed. CTUIR Public Safety worked with Cayuse Technology to develop and implement AlertSense and Camp Crier phone application to use for mass communication and notification.
Wildfire	PP-1	Inventory existing water supplies within the UIR suitable for use in fighting wildland fires.	Completed. Public Safety has introduced a process to inventory water supply every 1-2 years in partnership with ODF.
Wind Events	P-11	Develop an Agricultural Management Plan for the UIR to include soil retention best management practices.	Completed.
Actions Removed			
Multi-Hazard	PE-8	Expand and use the EAS to provide information to the traveling public about blowing dust conditions.	Combined with another action about alert/warning.
HazMat	PP-2	Provide an enclosed and “haz mat ready” safety facility for trucks with leaking loads near the most accident-prone area of I-84 within the Reservation boundaries.	Determined not to be feasible.
Severe Winter Storm	S-2	Replace existing power lines with heavier T-2 line, shorter spans, and heavier poles and crossbars.	Removed, combined with following action item (S-2B).
Wind Events	P-10	Provide technical assistance and low-interest loans to farmers and ranchers to develop livestock watering systems.	Duplicate action with Drought
Fog	P-7	Work with ODOT and State Police to provide a lead car to guide vehicles on Cabbage Hill during times of dense and freezing fog.	Through discussions with ODOT and Oregon State Police, this action has been determined not to be feasible.

TABLE: Completed or Removed Actions from 2016 CTUIR HMP			
Hazard	**2016 Plan #**	**Action Item Description**	**Revisions and Comments for 2021**
Flooding	P-5	Pursue vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the flood plain and watershed;	This action is a duplicate of a later action in Natural Resource Protection category.
Multi-Hazard	ES-1	Amend the EOP as necessary to keep current.	Combined with another action for clarity
HazMat	ES-5	Develop a response training program with UPRR and Umatilla County for use of specialized equipment.	After further consideration, an HM Technician is required to use specialized equipment.

4.4 Mitigation Measure Prioritization

Implementation of mitigation measures hinges on several factors, thus a flexible prioritization process works best due to the numerous diverse CTUIR departments and programs capable of implementing the mitigation measures identified. This process provides the ability to add a mitigation component to other projects that may not be identified in this plan. The key to success for the CTUIR HMP is to make hazard mitigation an "ethic" to be considered in all future CTUIR projects and planning efforts. The development of a "rigid" prioritization process could serve to reduce possible mitigation opportunities.

Future mitigation measures/action items in the CTUIR HMP may be suggested or requested by any UIR member; CTUIR staff, committee/commission member or elected official; or local, state, or federal agency in writing along with a proposed funding source. The proposed item shall be submitted to the CTUIR Public Safety Department Director who will schedule the proposed measure for review by the Planning Committee.

Depending on the proposed project's purpose and the possible methods for implementation, more than one funding source may be considered. Several of the possible funding sources are identified in Section 6.

Mitigation Measure Parameters

Each mitigation measure includes three important parameters that inform prioritization: timeframe, estimated costs, and potential benefits.

Timeframe

While the preference is to provide definitive project completion dates, this is not possible for every mitigation action. Therefore, the parameters for the timeline are as follows:

- Short Term = to be completed in 1 to 5 years
- Long Term = to be completed in greater than 5 years
- Ongoing = currently being funded and implemented under existing programs, and/or is seeking funding and necessary approvals.

Estimated Cost

While the preference is to provide definitive costs for each mitigation action, this is not possible for every mitigation action. Therefore, the estimated costs for the mitigation initiatives identified in this Plan were summarized across five categories.

- Very Low: Less than $10,000
- Low: $10,000 to $25,000
- Medium: $25,001 to $100,000
- High: $100,001 to $ 250,000
- Very High: Greater than $250,000

Potential Benefit

Potential benefit for each action item was assessed using a qualitative framework that considers the following factors:

- Eliminates Repetitive Loss
- Greatest Economic Impact
- Greatest Good for Most People
- Least Expensive Option
- Funding Is Secure or Easy to Obtain

- Can Fund Sooner
- Has Greater Public and Political Support
- Benefits More Than One Jurisdiction
- Addresses Two or More Goals
- Local Ability to Perform Project

Prioritization Process

The implementation of the mitigation plan is critical to the overall success of the mitigation planning process. The first step is to decide, based upon many factors, which action will be undertaken first. The mitigation action must be prioritized according to a benefit/cost analysis of the proposed projects and their associated costs. The benefits of proposed actions were weighed against multiple factors as part of the project prioritization process. The benefit/cost analysis was not of the detailed variety required by FEMA for project grant eligibility under the Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) grant program. A less formal approach was used because some actions may not be implemented for up to 10 years, and associated costs and benefits could change dramatically in that time.

Prioritization is based on the combination of several factors – the three parameters listed above, as well as the well-established STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria, described in the table on the following page. Mitigation actions with the highest STAPLEE scores, when combined with the timeframe, cost, and benefit parameters, represent those mitigation measures that represent the highest priority. The detailed mitigation strategy with each of these parameters listed is included as **Appendix D.**

TABLE: STAPLEE Prioritization Table	
Item	**Score**
Social: Do you agree or disagree that the mitigation action is more likely to: be acceptable to the community; does not adversely affect a particular segment of the population; does not cause relocation of lower income people, and is compatible with the community's social and cultural values.	• Strongly Agree = 5 • Agree =4 • Neither Agree or Disagree = 3 • Disagree = 2 • Strongly Disagree = 1
Technical: Do you agree or disagree that the mitigation action is technically effective in providing a long-term reduction of losses and has minimal secondary adverse impacts.	
Administrative: Do you agree that your jurisdiction/organization has the necessary staffing funding to carry-out this mitigation action.	
Political: Do you agree or disagree that the mitigation action has the support of the public and stakeholders who have been offered an opportunity to participate in the planning process.	
Legal: Do you agree or disagree that the jurisdiction or implementing agency has the legal authority to implement and enforce the mitigation action.	
Economic: Budget constraints can significantly deter the implementation of mitigation actions. Do you agree or disagree that the mitigation action is cost-effective, as determined by a cost-benefit review, and is possible to fund.	
Environmental: Do you agree or disagree that the mitigation action is sustainable and does not have an adverse effect on the environment, complies with federal, state, and local environmental regulations, and is consistent with the community's environmental goals.	
TOTAL	**Total Maximum Score is 35**

As the Committee decides to move forward with mitigation measures, the department or program responsible for implementing the measure will be responsible for taking further action. If the mitigation grant is from the FEMA, a full benefit-cost analysis that meets FEMA's requirements may be necessary. The coordinating department or program will be responsible for documenting the success of the grant project upon its completion and providing the Committee with periodic progress reports. The coordinating department or program will also be responsible for closing out the grant and satisfying all grant requirements.

A copy of the report prepared to close out the grant will also be sent to the Public Safety Director to be scheduled for review by the Committee. The Committee will review the issues surrounding grant applications at one of their regularly scheduled meetings. A representative of the coordinating department or program will be invited to attend the Committee meeting to share knowledge and/or experiences. This process will afford greater coordination and make the CTUIR's grant process more efficient. The Committee will review and decide of support or non-support by most members present at the meeting and provide a written recommendation to the Board of Trustees. This letter can be utilized in grant applications to show community support for the mitigation action.

CTUIR's leadership has the option to implement any of the mitigation measures at any time, (regardless of the prioritized order). This allows for the consideration of mitigation strategies as new opportunities arise, such as funding for mitigation measures that may not be of the highest priority rank. This methodology will be used to prioritize the plan's action items during the annual review and update process.

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Section 5. Mitigation Strategy Implementation and Integration

This section will describe CTUIR's capacity and capability to implement the mitigation measures outlined in Section 4. The essential components to successful implementation are funding, resource allocation, and organizational capacity. The previously described mitigation strategy identifies the principle CTUIR departments or programs that would be responsible to implement each identified action item. The mitigation strategy was revised to reflect progress in ongoing mitigation efforts. The strategy also considers other CTUIR departments and programs as well as local, state, or federal partner agencies for collaboration.

FEMA requires the evaluation of existing hazard management policies, programs, and capabilities that exist and could be used to implement the mitigation strategy. There are several CTUIR departments and programs that help reduce losses from hazardous events on the Reservation and have the capacity for contributing to the implementation of the measures. This section identifies existing plans, programs, and procedures employed by CTUIR that help make the Reservation more disaster resilient. This section also describes CTUIR's ability to manage governmental affairs and its capacity to pursue and manage grant funds in support of this hazard mitigation plan.

5.1 Pre-Disaster Policies, Programs and Procedures

The following section describes the relevant policies, programs, and procedures within CTUIR that can support mitigation planning integration and implementation. The information is summarized in the table below, which includes key factors for Legal and Regulatory capabilities.

TABLE: CTUIR Legal and Regulatory Capability Assessment Summary		
Indicator	**Available**	**Comments**
Codes, Ordinances & Requirements		
Building Code	Yes	CTUIR adopted the 2018 International Building Code as well as other specific Tribal area building code supplements.
Zoning	Yes	The CTUIR Tribal Planning Office manages and enforces the Land Development Code, last revised in 2020.
Subdivisions	Yes	CTUIR adopted an updated Subdivision Manual in 2020. This effort is managed and regulated by the Tribal Planning Office.
Stormwater Management	Yes	Sewage systems are regulated by the Environmental Health and Safety Code (2012) and domestic water systems are regulated by the Water Code (2005). Additionally, CTUIR has a Water and Wastewater System Master Plan last updated in 2006.
Growth Management	Yes	Long-term land use and growth management planning is guided through the CTUIR Comprehensive Plan (2018) and Mission Community Plan (1998).
Public Health and Safety	Yes	Public health efforts are led by the Yellowhawk Tribal Health Center and public safety efforts led by the Public Safety Office. CTUIR has adopted several health and safety codes.
Planning Documents		
Comprehensive	Yes	The CTUIR Comprehensive Plan was last updated in 2018. This process is led by the Tribal Planning Office.
Environmental Protection	Yes	CTUIR has a highly capable Department of Natural Resources. The Department is in the process of developing a Climate Change Adaptation Plan at the time of HMP development. Additional plans protect water resources, range and agricultural resources, cultural resources, and First Foods.
Transportation	Yes	CTUIR is updating the Transportation System Plan (TSP) at the time of plan development. The last TSP was developed in 2001. This effort is led by the Tribal Planning Office and Public Works.
Response/Recovery Planning		
Comprehensive Emergency Management Plan	Yes	CTUIR last updated the Emergency Operations Plan in 2020. This effort is led by the Public Safety Office. The final plan is pending adoption due to final revisions from the 2020 flooding event after-action review.
Community Wildfire Protection Plan	Yes	CTUIR is included in the wildfire planning led by the Bureau of Indian Affairs. The Umatilla County WFPP was last updated in 2005, which included Reservation lands.
Continuity of Operations Plan	No	CTUIR does not have a COOP or COG in place at this time.

Tribal Planning Office

All lands within the UIR have assigned zoning which is implemented through the CTUIR Tribal Planning Office Land Development Code (LDC) along with a permitting and building inspection program. CTUIR-owned trust lands outside the UIR boundaries are also managed for land use through the CTUIR Department of Economic and Community Development and the Tribal Planning Office. The Tribal Planning Office implements the International Building Codes inspection program on both the UIR and on off-Reservation CTUIR-owned trust lands through the permitting process.

The CTUIR planning program can:

1. Help direct future development away from certain hazard areas where a hazardous event could damage structures; or
2. Require that certain standards be met to reduce or prevent damage from future hazards.

For example, the CTUIR has incorporated FEMA's National Flood Insurance Program (NFIP) floodplain development standards into its LDC requiring structures located in the Flood Hazard Overlay Zone to be elevated above the base flood elevation. The CTUIR is recognized as a Community in the NFIP (Community ID# 410012).

The Mission Community Plan (1998) is the long-term land use functional plan which includes land use policies for agricultural, general rural, rural residential, community residential, commercial, industrial, open space, cultural, water and sewer service area, fire protection and emergency services, police protection, solid waste management, roads and transportation, parks and recreation, environmentally sensitive areas and on land acquisition. The Community Plan also identifies existing and future zoning for Reservation lands within the Mission Community Planning Area.

The Tribal Planning Office provides long-range planning assistance to multiple departments within the CTUIR governmental structure.

Building Code

The CTUIR Tribal Planning Office houses a building permit and inspection program applying International Building Codes; electrical, plumbing, structural, mechanical and fire. The CTUIR Board of Trustees has increased the level of protection from hazards that can damage buildings by changing from using the Uniform Building Code standards to the current International Building Code (IBC). In its resolution adopting the IBC, the CTUIR Board of Trustees amended Chapter 4 of the LDC to require that:

> *"All buildings and facilities constructed on the Umatilla Indian Reservation and on off-Reservation trust lands owned by the CTUIR shall comply with the latest edition of the following codes and standards, including any amendments thereto."*

The Tribal Planning Office reviews and inspects all proposed projects for adherence to the following building codes:

- 2018 International Building Code
- 2018 International Fire Code
- 2018 International Plumbing Code
- 2018 International Mechanical Code
- 2018 National Electric Code
- 2018 International Residential Code
- 2018 International Fuel Gas Code
- 2010 Oregon Manufactured Dwelling and Park Specialty Code
- Oregon Energy Efficiency Specialty Code
- NFPA 13 Standard for the Installation of Fire Sprinkler Systems
- NFPA 101 Life Safety Code

The following are CTUIR supplements to the International Building Code:

- Wind standard:
  - Prescriptive Residential: 105 mph 3 second gust, wind speed 90mph; exposure B or C
  - Engineered Designs/Commercial Wind Standard: Wind Speed based on attached Map & Building Risk Category, designed in accordance with ASCE 7 (2010)*
- Snow load standard: 25 pounds per square foot for roof
- Frost depth standard: 24 inches
- Earthquake design data shall be shown as indicated in Sec. 1603.1.5 IBC.
- Building envelopes, heating and cooling ducts shall meet the requirements of the Oregon Department of Energy Conservation Code. The Reservation land is in Climate Zone 2.
- Parking spaces shall be constructed to the Oregon Department of Transportation Disabled Parking Standards.
- Mobile homes shall be set up and installed to the requirements of the current Oregon Manufactured Dwelling and Parks Specialty Code.
- In residential dwellings constructed under the International Residential Code, Automatic Fire Sprinkler Systems (IRC Section R313) shall not be required.
- For residential dwellings, the 2008 IRC braced wall method may be used as an alternate to the new braced wall method.
- Hazardous Material Transport: Trucks carrying hazardous materials are prohibited from parking on the Wildhorse Casino and Resort property, which is the highest occupancy facility on the Reservation. Trucks carrying hazardous materials are allowed to park at the Arrowhead Travel Plaza. The Oregon Department of Transportation (ODOT) oversees the transportation of hazardous materials by railcar under authority of Oregon Administrative Rules, Division 510 Oregon Railroad Hazardous Materials Transportation (OAR 741-510-0010) adopted under authority 824.080 through 824.092. ODOT adopted the US Department of Transportation Rules as they apply to railroads and railroad shippers in Title 49 CFR, parts 107 through 180 Hazardous Materials Regulations.

Department of Natural Resources

The CTUIR Department of Natural Resources manages a variety of environmental and cultural resource protection programs that are relevant to natural hazard mitigation planning. The department works to protect, restore, and enhance First Foods using both traditional ecological and cultural knowledge and science to accomplish this work.

Relevant to hazard mitigation planning is an ongoing effort to develop a Climate Change Adaptation Plan which builds on a previous Climate Change Vulnerability Assessment. Additionally, the department is in the process of developing an Agricultural Management Plan which will help to mitigate some hazards related to agricultural development and rangelands.

Maintaining and enhancing cultural resources is of paramount importance to the UIR and the Tribes that make up the CTUIR. The importance of certain cultural resources is expressed in the “CTUIR Department of Natural Resources First Foods” prepared by Eric J. Quaempts. The First Foods strategy is significant to the UIR Hazard Mitigation Plan because it identifies the location of several important cultural resources scattered across the Reservation and to lands beyond.

In 2009, the CTUIR Tribal government adopted an Energy Policy and formed an Energy Policy Staff Team to implements its goals. The goals also contain action items that address the development of alternative fuels, transportation of hazardous (and radiological) materials through the Reservation, climate change and energy self-sufficiency. This team is in the process of developing a Strategic Energy Plan which will be relevant to future hazard mitigation efforts.

Public Health and Safety

The CTUIR Department of Public Safety is responsible for emergency management for the Reservation. The department leads the update of the CTUIR Emergency Operations Plan (EOP) and this hazard mitigation plan. The EOP was updated in 2020 and is pending adoption after incorporating revisions from the 2020 flooding event after-action review. The EOP describes how various agencies and organizations within the CTUIR will coordinate resources and activities with other Federal, State local and private-sector partners. It is an all-hazard plan that is based on Tribal authorities and Federal law and designed to be consistent with State of Oregon, CTUIR Statutes and other applicable regulations, plans and policies.

Additional CTUIR adopted codes and policies related to public health and safety include:

- 2018 3rd Edition Model Aquatic Health Code
- 2017 FDA Food Code
- 2014 CTUIR Integrated Waste Management Plan
- 2012 CTUIR Environmental Health & Safety Code
- 2009 Fire Prevention and Emergency Services Code
- 2005 CTUIR Water Code
- 1999 Mission Community Water System Code
- EPA Safe Drinking Water Act
- Occupational Safety & Health Administration (OSHA) Code

Additionally, the Yellowhawk Tribal Health Center is responsible for protecting the health of CTUIR members and the broader community. Yellowhawk led significant planning and protection efforts during the COVID-19 pandemic, as well as other public health emergencies. Yellowhawk manages its own Emergency Preparedness Plan, last revised in December 2019 and to be updated again in 2021.

Department of Public Works

The CTUIR Public Works Department is responsible for the infrastructure and utility services provided on the Reservation. This work includes water, sanitary, and storm sewer systems for the Mission Community, management of CTUIR facilities, and maintenance of BIA and Tribal-owned roadways as indicated by the Indian Reservation Roads inventory. The department is engaged in hazard mitigation work, identifying opportunities to increase the resilience of CTUIR-owned infrastructure and critical facilities, and ensuring the safety of members and residents through maintenance and improvement projects. This includes the ongoing Transportation System Plan update.

Additionally, the department manages the CTUIR Water and Wastewater System Master Plan. This plan consists of an evaluation of the existing infrastructure, systems' analysis for capacity and need, operations and maintenance processes, and emergency preparedness. The water system portion of this Master Plan is implemented through the Mission Community Water System Code (1999). Both the Master Plan and Water System Code are in need of updating to current systems and standards. Additional plans developed and referenced in the Master Plan are the water system Emergency Response Plan (2004) and the Drinking Water Assessment and Protection Plan.

5.2 Post-Disaster Policies, Programs, and Procedures

CTUIR has adopted several policies and programs to support post-disaster recovery. At the time of HMP development, CTUIR was in the process of determining strategies to improve disaster recovery efforts given the 2020 flooding event and disaster declaration.

Inclement Weather Policy

The CTUIR has policies in place directing governmental operations during times of bad weather. These policies save lives and reduce property damage by allowing people to delay traveling to work or excusing them from coming to work during inclement weather.

Fog, ice, and snow storms are covered under the CTUIR Inclement Weather Policy which is as follows: CTUIR Personnel Policies Manual, Section 4.16 (A)(1), CTUIR employees may be granted Administrative Leave by the Executive Director due to the "inability to travel to work safely because of unusually severe weather or natural disaster."

Emergency Response Leave and Administrative Leave Policies

The CTUIR Emergency Response Leave Policy within the Personnel Policies Manual encourages and supports those employees able to assist those in need during a disaster or hazardous event. This policy is as follows:

4.16.1 EMERGENCY RESPONSE LEAVE

CTUIR Employee Volunteers. In order to help accommodate the emergency response capabilities of the Tribe, any Tribal employee who is a volunteer member of the Tribal Fire Department, or any other Tribal emergency response group, may immediately and without question leave their duty station when called to respond to an emergency situation during their normal working hours. Such calls may be direct verbal communication or by electronic means, (i.e. beeper, radio, etc.). The employee will receive their normal compensation and benefits as if they were at their duty station during the time they are responding. In no event will a Tribal employee who is a volunteer member of the Tribal Fire Department receive compensation in excess of their normal working hours or be eligible for compensatory time for the time spent responding to the emergency, unless authorized by the Executive Director.

CTUIR Employees. In the event of a Reservation declared emergency (fire, flood, etc.) the Incident Commander, with concurrence of the Executive Director, may direct a Tribal employee to assist in an emergency response based on their expertise and skills. This could include everything from basic tasks such as answering phones in an emergency operation center to more technical tasks such as engineering a flood levy. An emergency response situation will take precedent over the employee's normal day-to-day work. Also, the Incident Commander, with concurrence of the Executive Director, may direct a department to release the use of special equipment needed in emergency response situations. If authorized by the Executive Director or his designee, an employee may receive compensation in excess of their normal working hours or eligible for compensatory time for the time spent responding to the declared emergency.

Tribal Repair Fund

The Tribe has a fund for maintenance and replacement of most houses owned by the CTUIR that are leased or rented to Tribal members.

Cultural Response to Disasters

Although not a formal policy or program, enrolled Tribal members of the CTUIR have cultural ties to one another that bring members of the Reservation together to assist during times of need. Caring for one another is a cultural ethic that needs to be recognized as a “post-disaster” response.

5.3 Other Programs, Plans and Studies Supporting Hazard Mitigation

Other emergency management plans and policies that apply to the UIR include:

- Upper Umatilla River Flood Study: CTUIR and Corps of Engineers, U.S. Army (1999)
- BIA Wildland Fire and Aviation Program Management and Operations Guide
- CTUIR Indian Lake Dam, Emergency Action Plan (2014)
- CTUIR Transit Plan, Safety, Security and Emergency Preparedness Plan (SSEPP) (2014)
- Hanford Emergency Management Plan, Department of Energy
- Northwest Area Contingency Plan, Oil Spill and Hazardous Substance Release Response (2006)
- ODOT Emergency Operations Plan
- State of Oregon Emergency Operations Plan
- Umatilla County Emergency Operations Plan
- Umatilla County Community Wildfire Protection Plan (2005)
- USDI Bureau of Indian Affairs, Umatilla Agency, Wildland Fire Prevention Plan (2012-2016)
- Wildhorse Resort and Casino Emergency Response Plan (2012)
- CTUIR Mutual Aid Agreement(s)
    - Oregon State Fire Mobilization Plan (2021)
    - Umatilla Morrow Radio & Data Distribution Subscriber Agreement (2019)
    - TriCounty Mutual Aid Agreement, Fire Department
    - BIA Deputization Agreement between the Office of Law Enforcement Services and Security and the confederated Tribes of the Umatilla Indian Reservation (2005)
    - Intergovernmental Agreement for Mutual Aid and Interagency Cooperation among Law Enforcement Agencies location in Umatilla County, Oregon
    - Umatilla Agency Standard Operation Procedure Law Enforcement Wildland Fire Investigation

5.4 Plan Integration Strategy

Plan integration is the process by which communities look critically at their existing planning framework and align efforts to build a safer, smarter community. Plan integration involves a two-way exchange of information and incorporation of ideas and concepts between the HMP and other community plans. Specifically, plan integration involves the incorporation of hazard mitigation principles and actions into community plans and community planning mechanisms.

The table below summarizes this two-way exchange of information, detailing existing plans that were integrated within the Hazard Mitigation Plan and opportunities where the HMP may inform ongoing or future planning efforts. This table is not inclusive of every relevant planning effort, but rather the priority items for integration.

TABLE: Plan Integration Strategy

Year	Plan Title	HMP Planning Integration	Future Integration Potential
2021	Umatilla County Natural Hazard Mitigation Plan (DRAFT)	The project review team considered hazard identification and risk assessment as was available during plan development. The CTUIR Public Safety Director participated in the committee for the County NHMP.	CTUIR and Umatilla County representatives should continue to collaborate on plan development and partner on relevant mitigation action items. Umatilla County is listed as a potential collaborator on several action items.
2021	CTUIR Climate Change Adaptation Plan (DRAFT)	The Adaptation Plan goals and strategies informed the HMP Mitigation Strategy. Projected climate impacts from the Plan were incorporated into hazard profiles (future conditions). The Adaptation Strategy provided a framework for the vulnerability and impacts section of each hazard profile.	Phase 3 of this project is a Climate Change Implementation Strategy. The HMP should be incorporated within this effort.
2020	Oregon State Hazard Mitigation Plan	The Oregon HMP was used as a primary resource for hazard identification and risk assessment, specifically the Region 5 and Umatilla County analysis.	The State uses local mitigation plans for each HMP update, and will complete a review of the 2021 CTUIR HMP.
2020	Land Development Code and Zoning Ordinances	Relevant zoning codes were incorporated within the Capability Assessment.	• Include zones that limit development in areas identified as facing hazard impacts. • Include requirements about keeping flood- or other hazard-prone areas as open space.
2015	CTUIR Emergency Operations Plan (EOP)	The EOP provides a baseline for the CTUIR capability assessment. EOP updates were considered for the mitigation strategy.	Mitigation actions should be reviewed and incorporated within future EOP updates.

TABLE: Plan Integration Strategy			
Year	**Plan Title**	**HMP Planning Integration**	**Future Integration Potential**
2018	CTUIR Comprehensive Plan	The CTUIR Comprehensive Plan outlines future land use and development trends and needs which were incorporated into the Community Profile. This plan also informed the mitigation strategy.	Future Comprehensive Plan updates should include a review the risk assessment results and direct future growth into areas that are not likely to be damaged in a hazard event. Additionally, the plan should Include the mitigation plan goals in the future vision.
2018	Walla Walla County (WA) Hazard Mitigation Plan	This HMP covers the off-Reservation lands in Washington. Details and hazard rankings are included in the HIRA as relevant.	With appropriate capacity, CTUIR could consider participating in future updates to the Walla Walla HMP as future development is considered for off-Reservation lands.
2018	CTUIR Mission Community Master Plan	The Mission Master Plan includes future land use and development trends and needs, especially as some of the planning area falls within the 500-year floodplain.	Like the Comprehensive Plan, the HMP should be used to inform future development and growth management strategies in the Mission Community planning area.
2018	Building Code	Relevant building codes were incorporated within the Capability Assessment.	Include requirements for building design standards to withstand hazard events, such as elevating homes in the floodplain, fortifying roofs, or using earthquake-resistant materials.
2017	Comprehensive Economic Development Strategy (CEDS)	The CEDS informed development of the Community Profile. Additionally, the plan includes a Resilience Element within its goals and strategies that was reviewed as a part of plan development.	• Review the HMP and guide private investment into areas that are safe from known hazards. • Incorporate the mitigation strategy's goals and actions to encourage a more resilient economy that can quickly recover from a disaster.
2015	CTUIR Climate Change Vulnerability Assessment	The plan was integrated within the hazard identification and risk assessment, including climate change projections. Additionally, climate change plans supported the development of the mitigation strategy.	----

TABLE: Plan Integration Strategy			
Year	**Plan Title**	**HMP Planning Integration**	**Future Integration Potential**
2012	Umatilla Agency and Confederated Tribes of the Umatilla Indian Reservation Wildland Fire Prevention Plan	The WFPP is incorporated within the Wildfire hazard profile, including hazard description, vulnerability, and geographic location.	Future updates of all wildfire and wildland-urban interface plans should consider the HMP mitigation strategy.
2005	Umatilla County Community Wildfire Protection Plan	The WFPP is incorporated within the Wildfire hazard profile, including hazard description, vulnerability, and geographic location.	Future updates of all wildfire and wildland-urban interface plans should consider the HMP mitigation strategy.
2001	CTUIR Transportation System Plan (ongoing update)	Look at the planned transportation investments with the risk assessment and mitigation strategy to avoid building infrastructure that may be damaged during a hazard event.	• Include hazard vulnerabilities in the decision to invest in extending or building new roads and utilities. • Include prioritization or budgeting requirements that new community facilities be resistant to hazards.
1998	CTUIR Mission Community Plan	The Community Plan includes a wetlands and riparian areas element, including policies to restrict development in the floodplain. Additionally the plan identifies critical assets.	Like the Comprehensive Plan, the HMP should be used to inform future development and growth management strategies in the Mission Community planning area.
	Capital Improvement Plan	----	• Include hazard vulnerabilities in the decision to invest in extending or building new roads and utilities. • Include prioritization or budgeting requirements that new community facilities be resistant to hazards.
	Indian Housing Plan	----	• Include hazard vulnerabilities in the decision to invest in extending or building new roads and utilities. • Include prioritization or budgeting requirements that new community facilities be resistant to hazards.
	Continuity of Operations Plan (COOP)	----	Development of a COOP and Continuity of Government Plan is a high priority action item within the mitigation strategy.

5.5 CTUIR Grant and Program Management Capacity

The CTUIR is a sovereign legal entity that governs all activities within the boundaries of the UIR. Its governmental structure consists of multiple departments employing more than 450 people, not including CTUIR enterprises. CTUIR has managed grants since the 1970's and has an excellent rating for its fiscal management. CTUIR managed nearly $32 million in general fund and grant funds in 2020, which supported several federal, state, local government, and other initiatives. CTUIR is an active participant in a wide range of programs and has the administrative and fiscal capacity to successfully manage grants and programs.

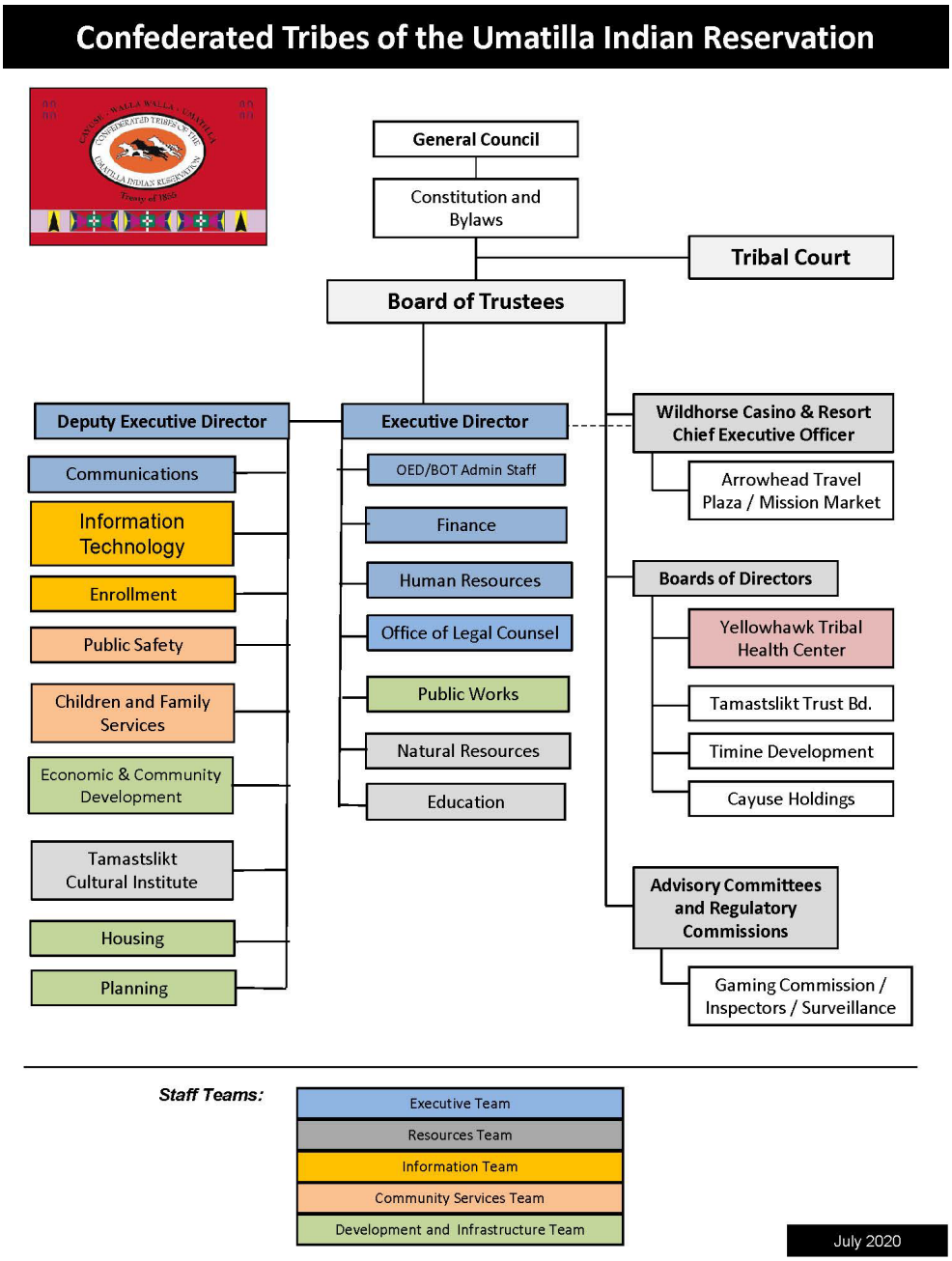
The table below provides a summary of Administrative and Technical capability of CTUIR staff members relevant to hazard mitigation efforts:

TABLE: CTUIR Administrative and Technical Capability Assessment Summary		
Capability Indicator	**Available**	**Comments**
Planners or engineers with knowledge of land development and land management	Yes	The Tribal Planning Office includes experienced planning staff.
Engineers or professionals trained in building or infrastructure construction	Yes	Contracted Services
Planners or engineers with an understanding of natural hazards	Yes	Contracted Services
Surveyors	Yes	Contracted Services
Personnel skilled or trained in GIS	Yes	CTUIR's Department of Information Technology includes a GIS Program.
Emergency manager	Yes	The Public Safety Director serves as the emergency manager for CTUIR.
Grant writers	Yes	Many CTUIR departments manage grant programs, including various federal and state funding streams.

5.6 CTUIR Government

The following organizational chart outlines the overall governmental structure, including Departments and Boards. Each Department has its own organizational chart outlining its various Program functions. For example, the Public Safety Department has four Programs; Umatilla Tribal Police, Umatilla Tribal Fire Department, Emergency Management and Domestic Violence.

FIGURE: CTUIR Organizational Chart



The CTUIR has taken over all programs that were once managed by the US Department of Interior, Bureau of Indian Affairs and now manages its own affairs. However, the Umatilla Agency Superintendent maintains a presence on the UIR to provide oversight of activities to ensure the federal trust responsibilities to Native Americans is achieved.

Section 6. Hazard Mitigation Funding

There are several current and potential grant programs that help jurisdictions implement hazard mitigation measures. The Federal Emergency Management Agency (FEMA) administers many of the grant programs listed below.

FEMA is not the only source of funding for mitigation assistance. There are other agencies involved in funding projects that can also serve to reduce risks from disasters and emergency events. These agencies include but are not limited to the Department of Homeland Security, the US Army Corps of Engineers, the Environmental Protection Agency, and the US Department of Agriculture. Many of the potential sources of funds that can be used for mitigating hazards are identified below.

Many of the grants require the receiving jurisdiction to provide a certain percentage of “match” which is usually dollars or in-kind services. For example, a grant from FEMA usually requires a 25% match. In very few cases, grant money may be used as match. The CTUIR are eligible for Bureau of Indian Affairs and the Federal Department of Transportation funds that can be used for matching other federal grant dollars under appropriate circumstances.

6.1 Federal Emergency Management Agency Grant Programs

The following grant programs are made available through the Stafford Act:

Building Resilient Infrastructure and Communities (BRIC)

FEMA has developed the Building Resilient Infrastructure and Communities (BRIC) program through the Disaster Recovery Reform Act to address National Public Infrastructure Pre-Disaster Hazard Mitigation. BRIC replaced the Pre-Disaster Mitigation (PDM) program. BRIC supports states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards through capability- and capacity-building; encouraging and enabling innovation; promoting partnerships; enabling large projects; maintaining flexibility; and providing consistency.

Hazard Mitigation Grant Program (HMGP)

FEMA's Hazard Mitigation Grant Program (HMGP) was created in November 1988 under the authority of the Stafford Act, Section 404. The HMGP assists states and local governments to implement long-term hazard mitigation measures following a Presidential major disaster declaration. Initially, the federal cost share for projects 75% of a project's total eligible costs. Objectives of HMGP include:

- Preventing loss of lives and property due to disasters;
- Implementing state and local hazard mitigation plans;
- Enabling mitigation measures to be implemented during immediate recovery from a disaster; and
- Providing funding for previously identified mitigation measures that benefit the area.

Public Assistance (PA)

The objective of the Federal Emergency Management Agency's (FEMA) Public Assistance (PA) Grant Program is to aid states, Native American tribes, local governments, and certain nonprofit organizations to alleviate suffering and hardship resulting from major disasters or emergencies declared by the President. Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The Federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration.

6.2 National Flood Insurance Act Grant Programs

The following grant programs are available under the National Flood Insurance Act.

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 permitting; and complementing other federal and state mitigation programs with similar, long-term mitigation goals.

There are three types of FMA Program grants:

- planning grants to assist the state and communities in developing flood mitigation plans;
- project grants to fund eligible flood mitigation projects that will greatly reduce or eliminate the risk of flood damage - “non-structural” hazard mitigation measures such as the elevation, relocation, or acquisition of flood-prone structures are encouraged; and
- technical assistance grants provide guidance to applicants in applying for the program or in implementing approved projects.

All FMA Program grants are offered on a cost-share basis requiring 25% non-federal match.

Repetitive Flood Claims (RFC)

The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Up to $10 million is available annually for FEMA to provide RFC funds to assist States and communities reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP).

Severe Repetitive Loss (SRL)

The Severe Repetitive Loss (SRL) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004, which amended the National Flood Insurance Act of 1968 to provide funding to reduce or eliminate the long-term risk of flood damage to severe repetitive loss (SRL) structures insured under the National Flood Insurance Program (NFIP). SRL properties are residential properties that have:

- At least four NFIP claim payments over $5,000 each, when at least two such claims have occurred within any ten-year period, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments have been made with the cumulative amount of the building portion of such claims exceeding the value of the property, when two such claims have occurred within any ten-year period.

Aspects of the SRL program are as follows:

- Purpose: To reduce or eliminate claims under the NFIP through project activities that will result in the greatest savings to the National Flood Insurance Fund (NFIF).
- Eligible flood mitigation project activities: Floodproofing (historical properties only), Relocation; Elevation; Acquisition; Mitigation reconstruction (demolition rebuild); and Minor physical localized flood control projects.
- Federal / Non-Federal cost share: 75 / 25 %; up to 90 % Federal cost-share funding for projects approved in States, Territories, and Federally recognized Indian tribes with FEMA-approved Standard or Enhanced Mitigation Plans or Indian tribal plans that include a strategy for mitigating existing and future SRL properties.

6.3 Other Federal Grant Programs

U.S. Army Corps of Engineers: Eligible projects include levee rehabilitation and repair of flood control works damaged by floods. Technical engineering assistance is also available.

U.S. Environmental Protection Agency

- **State/Tribal Wetland Planning Grants:** Assists states and tribes to develop watershed based comprehensive land use plans and technical tools that can be applied to integrate protection and restoration of wetlands and other water resources.
- **Wetland Protection, Restoration, and Stewardship Discretionary Funding Program:** This program provides support for studies and activities related to implementation of Section 404 of the Clean Water Act for both wetlands and sediment management. Projects can support regulatory, planning, restoration, or outreach issues.

USDA - Rural Development Agency: Develop essential public facilities in rural areas and towns of less than 20,000 people. Construct, enlarge, or improve community facilities for health care, public safety, and public service.

USDA - Natural Resources Conservation Service

- Wetlands Reserve Program: This program offers landowners the opportunity to receive payments for restoring and protecting wetlands on their property. Landowners are provided cost-share funds to restore wetlands.
- Wildlife Habitat Incentives Program: This program is a voluntary program for people who want to develop and improve wildlife habitat primarily on private lands. It provides both technical assistance and cost-share payments to help establish and improve fish and wildlife habitat.

U.S. Small Business Administration Loan Program

Through its Office of Disaster Assistance (ODA), the SBA is responsible for providing affordable, timely and accessible financial assistance to homeowners, renters and businesses following a disaster. Financial assistance is available in the form of low-interest, long-term loans.

SBA's disaster loans are the primary form of federal assistance for the repair and rebuilding of non-farm, private sector disaster losses. For this reason, the disaster loan program is the only form of SBA assistance not limited to small businesses.

Bureau of Indian Affairs (BIA)

The mission of the Bureau of Indian Affairs (BIA) is to enhance the quality of life, promote economic opportunity, and carry out the responsibility to protect and improve the trust assets of American Indians, Indian Tribes, and Alaska Natives. The BIA budget supports continuing efforts to advance self-governance and self-determination, fosters stronger economies and self-sufficiency, and supports safe Indian communities through a wide range of programs for Tribal government; social services; law enforcement; infrastructure; and stewardship of the land, water, and other natural resources in Indian Country.

Indian Health Services (IHS)

IHS is an operating division within the U.S. Department of Health and Human Services. IHS provides health care directly on reservations, subsidizes tribes which provide their own health care and subsidizes the urban Indian health providers.

6.4 Other Sources

Other agencies to contact regarding possible grants to help implement hazard mitigation plans are the Department of Homeland Security and U.S. Fire Administration.

Federal agencies are not the only sources for funds. The states of Oregon and Washington and other nongovernmental organizations may also be able to assist in the implementation of hazard mitigation measures by providing technical assistance, grants, or additional resources. It may be possible to add a mitigation component to specific projects or complete a grant project the also proves to help reduce the impacts from the identified hazards even if that is not the project's main objective.

Section 7. Plan Monitoring and Evaluation

Effective planning does not end with the creation and adoption of an initial plan. Successful plans are monitored, reviewed, and re-evaluated periodically by policy and decision-makers to be sure they continue to provide the guidance envisioned when the plan was created.

The Disaster Mitigation Act of 2000 requires the monitoring, evaluation, and updating of the hazard mitigation plan every five years. This hazard mitigation plan is designed to be a “living” document and therefore will be reviewed and updated within five years from its approval date. The CTUIR Public Safety Director and Tribal Emergency Response Commission (TERC) will provide leadership and guidance throughout the plan’s life cycle. The TERC is a staff committee responsible for planning and coordination for emergency and disaster events that threaten the safety of people, property, and natural resources on the UIR.

The following plan maintenance process will support the CTUIR in effectively reducing the risks associated with potential natural and human-caused hazards.

7.1 Plan Maintenance Process

The CTUIR HMP will be reviewed annually by the TERC, consisting of representatives from Public Safety, Finance, Natural Resources, Public Affairs, and other departments responsible for mitigation strategy implementation. The HMP will be reviewed and revised every five years to determine the effectiveness of programs and to reflect changes that may affect mitigation priorities.

The Public Safety Director will be responsible for contacting the TERC members and organizing the review. Members will be responsible for monitoring and evaluating the progress of the mitigation strategy. Monitoring the plan will allow CTUIR to assess the progress made in implementing the plan's mitigation measures and fulfilling grant funding obligations through review of grant "closeouts."

Annual review of the plan will allow the CTUIR to make "mid-course" corrections to the plan and consider additional funding opportunities. Evaluation of the plan provides the opportunity to:

- Incorporate new information and updated scientific data about hazards that can affect the Reservation;
- Coordinate mitigation efforts with local, state, and federal agencies as well as internal CTUIR Departments/Programs;
- Modify the plan's goals; and
- Devise new hazard mitigation measures that more effectively address the identified risks.

During annual plan review meetings, CTUIR departments responsible for the various action items will report on the status of the projects, the success of various implementation processes, difficulties encountered, the success of coordination efforts, and which strategies should be revised or removed. Each annual mitigation meeting must be documented, including the plan evaluation and review of mitigation actions.

As part of the Federal Emergency Management Agency (FEMA) hazard mitigation planning process, FEMA expects plans to be monitored, evaluated, and re-submitted to FEMA for review and approval. All updates or amendments to this Plan must be submitted to FEMA for review and approval. This entire HMP must be updated and reapproved within 5 years from the plan's original adoption date.

7.2 Public Involvement

Public involvement will be continued during the plan update and evaluation process. The CTUIR Department of Public Safety Director is responsible for continuing the ongoing public involvement process by providing opportunities for people living and working on the Reservation to be involved in plan updates and the evaluation of the Plan. The Director will inform citizens about hazard mitigation activities by:

- Coordinating with other CTUIR departments and commissions;
- Preparing articles for publication in the Confederated Umatilla Journal that inform residents and members about upcoming meetings where the hazard mitigation plan will be reviewed or evaluated; and
- Updating information about the Plan on the Public Safety Department section of the CTUIR website so interested citizens can be informed about changes made to the plan.

During the evaluation of the Plan, the Director will advise the General Council and the Board of Trustees about any proposed changes to the plan and the overall status of the evaluation. The Director may hold one or more “open houses” to:

- Obtain additional input from those living and working on the Reservation regarding the effectiveness of the plan;
- Receive suggestions for amending the plan; and
- Receive proposed mitigation measures.

7.3 Annual Plan Evaluation

During each annual plan maintenance and evaluation meeting, the TERC will be responsible for a brief evaluation of the HMP, review progress on mitigation actions, and close-out any successfully completed mitigation projects. The following questions are for use in evaluating the HMP. Answers to these questions will help the Public Safety Director identify the initial hazard mitigation plan's strengths and weakness and help in focusing on the portions of the plan needing to be amended.

Public Involvement

- Has an article been printed in the Confederated Umatilla Journal describing the plan evaluation process for the UIR Hazard Mitigation Plan?
- Does the article invite members to participate in the evaluation process?
- Has the CTUIR website been updated to indicate that the Director is preparing to evaluate the CTUIR HMP and that members and community members are invited to participate in either of these processes?
- Has the General Council been notified that the HMP will be evaluated by the Public Safety Director and that citizens are welcome to participate in the review and evaluation of the Plan?

Coordination

- Have the applicable local, state, and federal agencies been invited to participate in the evaluation of the CTUIR HMP?
- Are there other jurisdictions, agencies, and interested persons that should be invited to participate in the plan's evaluation?
- Have the Oregon State Hazard Mitigation Plan or the Umatilla County Hazard Mitigation Plan been amended since the CTUIR HMP was adopted? If yes, how do those amendments affect the Plan?

Pre-Evaluation Information Update

- Have the Federal Emergency Management Agency's hazard mitigation planning requirements changed since the Plan's adoption?
- Have any laws changed that would affect the hazard mitigation plan, goals, and mitigation projects?
- Are there new local, regional, state, or federal policies addressing natural hazards that should be addressed?

Risk Assessment

- Have new issues or hazard-related problems been identified that would cause the hazard mitigation plan's risk assessment (Section 3) to be revised?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters since the plan was adopted?
- If yes, did the HMP accurately anticipate the impacts from this event?
- Is information available to update the vulnerability of existing types and numbers of buildings, infrastructure, and critical facilities located in identified hazard areas?

- Is information available to update the vulnerability of future types and numbers of buildings, infrastructure, and critical facilities located in identified hazard areas?
- Is information available to estimate potential dollar losses in structures and infrastructure that are vulnerable to identified hazards?
- Can it be determined (in estimated dollars saved) whether implemented mitigation measures have reduced possible damage from hazardous events?

Goal and Mitigation Measure Implementation

- Are the goals of the plan being achieved through successful mitigation measure implementation?
- Is each of the hazard mitigation plan's goals still relevant and consistent with the policies of the CTUIR?
- Do the HMP goals provide adequate guidance for future actions?
- How many of the mitigation measures have been implemented since the plan was adopted?
- Have implemented mitigation measures achieved the desired results?
- How many of the mitigation measures have been implemented through other tribal commissions or programs?
- How successful have the implemented mitigation measures been at preventing disasters? At minimizing disaster-related damage?
- Are there any Tribal programs or practices that have hindered or limited the effective mitigation of hazards?
- Are the existing mitigation measures still appropriate, given current resources and changes made to the risk assessment?
- Do any of the remaining mitigation measures need to be reprioritized?

Grant Administration

- How many mitigation measures were funded through federal grants or other grant sources?
- Was the grant closeout process successfully completed for each grant?

Responses to these questions will help the Public Safety Director and TERC determine which components of the hazard mitigation plan need updating and will help identify the adequacy of public and CTUIR department involvement in the evaluation process. The Public Safety Director will be responsible for updating any deficiencies found in the plan based on the evaluation.

7.4 Five-Year Action Plan

This section outlines the implementation agenda the TERC should follow five years following the adoption of this Plan, and then every five years thereafter. It should be noted that the schedule below can be modified as necessary and does not include any meetings and/or activities that would be necessary following a disaster event (which would include reconvening the TERC within 90 days of a disaster or emergency to determine what mitigation projects should be prioritized during the community recovery). If an emergency meeting of the TERC occurs, this proposed schedule may be altered to fit any new needs.

Year 0:

- **April – September 2021:** Update Hazard Mitigation Plan, including a series of planning team meetings & public meetings. Submit 2021 Multi-Hazard Mitigation Plan for OEM and FEMA approval.
- **October 2021 - December 2021:** Obtain OEM and FEMA approval; formally adopt the Plan by resolution. Work on mitigation actions. TERC will stay in contact with lead departments to keep tabs on mitigation project status and progress.

Year 1:

- **January – March 2022:** Prepare for and promote the first annual plan review and public meetings. Departments will provide a status update for each mitigation action/project.
- **April 2022**: Reconvene TERC for first annual mitigation meeting. Introduce the concept of mitigation plan integration with other planning documents. Host first annual public meeting.
- **May – December 2022:** Work on mitigation actions. TERC will stay in contact with lead departments to keep tabs on mitigation project status and progress. Encourage plan integration efforts.

Year 2:

- **January – March 2023:** Prepare for and promote second annual plan review and public meetings. Departments will provide a status update for each mitigation action/project.
- **April 2023:** Reconvene TERC for annual mitigation meeting. Review plan integration efforts. Host annual public meeting.
- **May – December 2023:** Work on mitigation actions. TERC will stay in contact with lead departments to keep tabs on mitigation project status and progress. Encourage plan integration efforts.

Year 3:

- **January – March 2024:** Prepare for and promote second annual plan review and public meetings. Departments will provide a status update for each mitigation action/project.
- **April 2024:** Reconvene TERC for annual mitigation meeting. Review plan integration efforts. Host annual public meeting.
- **May – December 2024:** Work on mitigation actions. TERC will stay in contact with lead departments to keep tabs on mitigation project status and progress. Encourage plan integration efforts.

Year 4:

- **January – March 2025:** Prepare for and promote annual plan review and public meetings. Departments will provide a status update for each mitigation action/project.
- **April 2025:** Reconvene TERC for annual mitigation meeting. Review plan integration efforts. Host annual public meeting.
- **May – December 2025:** Work on mitigation actions. TERC will stay in contact with lead departments to keep tabs on mitigation project status and progress. Encourage plan integration efforts.

Year 5:

- **January – December 2026:** Update 2021 Hazard Mitigation Plan, including a series of mitigation planning team meetings and public meetings.
- Submit 2026 Multi-Hazard Mitigation Plan for OEM and FEMA approval. Repeat.

7.5 Meeting Documentation

Each annual mitigation meeting must be documented, including the plan evaluation and review of mitigation actions. The tables on the following pages can be used to guide and document plan maintenance and evaluation, updates to mitigation actions, and on-going public involvement. The workbook is designed to provide clear guidance for each annual mitigation meeting with an outline of key tasks.

Documentation for the TERC key tasks should include:

- **Committee Meeting Date:** Record the date, time, and location of the Mitigation Committee Meeting in the plan maintenance table. Capture meeting minutes as a separate document.
- **Description of Mitigation Action Changes:** Ask each department or participant to provide a status update on mitigation actions. Record revisions, completed actions, or proposed additions. Consider the following questions: 1) Have the mitigation actions been implemented as planned? 2) Have the outcomes been adequate? 3) What problems have occurred during implementation? Include a summary of mitigation action status updates in the plan maintenance table.
- **Description of Plan Integration Strategies:** Ask each department to describe how the HMP has been integrated into other planning and/or policy efforts. Reference the Plan Integration section of the plan for guidance. Include a summary of ongoing plan integration strategies in the plan maintenance table.
- **Description of Plan Evaluation Results:** Facilitate a conversation with the TERC to evaluate the HMP. Consider the following questions: 1) Are the goals and objectives still relevant? 2) Is the risk assessment still appropriate, given recent events or changes in vulnerability? 3) Are current resources appropriate for implementation? 4) Have lead agencies participated as proposed? Include a summary of the plan evaluation in the plan maintenance table.

Documentation for Public Involvement key tasks should include:

- **Public Comment Period:** Record the dates that the Plan was posted for public review.
- **Public Meeting Date:** Record the date, time, and location of the Annual Public Meeting below. Capture meeting minutes as a separate document.
- **Description of Public Involvement Activities:** Describe the opportunities for public involvement in plan review, including the required public meeting. Consider posting the Executive Summary and/or a summary of previous plan evaluation for more accessible comment and review.
- **Description of Public Involvement Results:** Describe how the feedback received from the public will be incorporated into future plan updates or applied to the TERC plan evaluation process.

HMP Update Annual Plan Maintenance - Tribal Emergency Response Commission						
Year	**Key Tasks**	**TERC Meeting Date**	**Participating Jurisdictions**	**Mitigation Action Changes**	**Integration Strategies**	**Evaluation Results**
2022	1) Host meeting; 2) Department updates to mitigation actions; 3) Review plan integration opportunities; 4) Request complete NFIP data from FEMA; 5) Evaluate key plan sections and submit amendment with NFIP data and any other needed changes; 5) Submit plan review summary to OEM and/or FEMA.					
2023	1) Host meeting; 2) Department updates to mitigation actions; 3) Review plan integration opportunities; 4) Evaluate key plan sections and consider amendments; 5) Submit plan review summary to OEM and/or FEMA.					
2024	1) Host meeting; 2) Department updates to mitigation actions; 3) Review plan integration opportunities; 4) Evaluate key plan sections and consider amendments; 5) Secure resources for plan update (scope, funding, contractor, etc.); 6) Submit plan review summary to OEM/FEMA.					
2025	1) Host meeting; 2) Department updates to mitigation actions; 3) Review plan integration opportunities; 4) Secure participants for plan update; 5) Consider new hazard events; 6) Review 2025 Oregon HMP; 7) Request RL/SRL data; 8) Submit plan review summary to OEM/FEMA.					
2026	1) Solicit participation from all TERC members and relevant departments; 2) Actively solicit public involvement in plan update process; 3) Request input from neighboring jurisdictions; 4) Complete plan update; 5) Submit to OEM and FEMA for Approval					

HMP Update Annual Plan Maintenance - Public Involvement					
Year	**Public Involvement Key Tasks**	**Public Comment Period**	**Public Meeting Date**	**Public Involvement Activities**	**Public Involvement Results**
2022	1) Post plan for public review and comment; 2) Host public meeting				
2023	1) Post plan for public review and comment; 2) Host public meeting				
2024	1) Post plan for public review and comment; 2) Host public meeting				
2025	1) Post plan for public review and comment; 2) Host public meeting				
2026	1) Public meeting to review the hazards and introduce plan update (invite neighboring jurisdictions and OEM); 2) Public survey; 3) Neighboring jurisdictions invited to review plan; 4) Public Meeting to review plan draft; 5) Post plan for public review				

7.6 Plan Revisions or Amendments

Corrections or amendments to this plan shall be reviewed by the TERC for a recommendation to the Board of Trustees. The Board of Trustees is the formal decision-making body to approve any corrections or amendments to this plan. Should the TERC recommend amendments to any CTUIR Statute to implement this plan, application shall be made to the appropriate Department or Commission that administers that Statute. Additionally, all corrections and amendments to this Plan will be provided to the FEMA Regional Office for review and approval.

For example, proposed changes to policies identified in the CTUIR Comprehensive Plan or to provisions of the Tribal Planning Office Land Development Code, the Public Safety Director shall submit an amendment application to the Tribal Planning Office or request the Tribal Planning Office to initiate the amendment. Comprehensive Plan or Land Development Code amendments shall follow the process as prescribed in the UIR Land Development Code Chapter 9 which includes a public hearing before the Natural Resources Commission and final approval by the Board of Trustees.

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