



Multi-Hazard Mitigation Plan

December 2018

Nespelem, Washington 99155

This plan was prepared with the assistance of funding provided by the Federal Emergency Management Agency (FEMA) of the Department of Homeland Security (DHS), under FY2014 Pre-Disaster Mitigation Grant # EMS-2015-PC-0002.

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Chapter 1: Introduction: Why establish a Hazard Mitigation Plan?

From July 2012 to May 2018, five disasters occurred upon the Colville Indian Reservation (hereafter "reservation") for which Presidential Declarations of Disaster (PDD) were issued. One of these, the 2015 fires, included the loss of approximately 30 homes as well as the burning of almost 20% of the entire land mass of the reservation. In both 2014 and 2015, fires across Washington State set new records for size. The 2015 fires on the reservation, by themselves, nearly equaled that new statewide record set in 2014.

These were not the only hazards or disasters to which Tribal members, residents, and the natural and cultural resources of the reservation were exposed. Significant events occurring during this time period included:

The July 2012 wind storm, which destroyed homes and other property, put millions of board feet of timber on the ground, and left part of the reservation without any power for more than a week (PDD issued);

The loss of the Tribal headquarters building and all of its records, which burned down in July 2013;

Another windstorm, in July 2014, which damaged many structures and again left part of the reservation without power for more than two days;

The Carlton Complex and Devil's Elbow Fires in July 2014 (PDD issued);

A gasoline tanker transportation accident in May 2015, which spilled more than 3,000 gallons of fuel within approximately two dozen feet of the Sanpoil River; and

A flood exceeding the 50-year frequency level, which began in February 2017 but did not recede until May 2017 (partial PDD issued).

In 2018, the third-highest flood level ever recorded (and the highest water flow in fortysix years) occurred on the Okanogan River, requiring significant effort by the Tribe to protect lives and property. The river stayed above flood stage for twenty-three days. (PDD issued)

Many lesser incidents have occurred. A small dam failed in April 1999, damaging State Route (SR) 155, the major highway for the western portion of the reservation. Landslides coming

after the filling of Lake Roosevelt behind Grand Coulee Dam, and caused by that dam, caused significant landslides beginning in 1942; some of those slides caused inland (or "lake") tsunamis. During the 2017 floods, rain runoff caused Owhi Lake to rise within inches of the level where an uncontrollable release could have started erosion closely downstream from the dam abutment.

Recorded history reports other events in the more distant past. The 1700 Cascadia subduction zone earthquake was felt east of the Cascade mountain range, as evidenced by oral history from within the Yakima Valley. A Cascade Range volcanic eruption in the summer of 1800 caused ashfall across what is now the Colville Indian Reservation, followed by famine (Hunn, 1990). The 1872 Lake Chelan earthquake caused massive ground changes on the current reservation, as chronicled by a Jesuit missionary on the reservation at the time. It also caused a landslide which blocked the Columbia River near Entiat. The only recorded fatality from that earthquake occurred near the mouth of the Spokane River, during the aftershock period (Nisbet, 2015).

Multiple tribes in the Columbia River Basin have legends about great floods. These may be a reference to the series of floods that took place more than ten thousand years ago, when ice age lakes such as Lake Missoula and Lake Spokane drained in a series of floods as ice dams broke and reformed. Those are the floods that produced the "channeled scablands" that are such a distinctive geologic feature of Eastern Washington.

When both recent and historical events are considered, it should be clear that hazards to the members, residents, and natural and cultural resources of the reservation need to be both identified and mitigated.

Some hazards may be highly mitigatable: avoiding constructing structures in high-risk flood plains, on soils known to be unstable and subject to liquefaction during earthquakes, or in an area where modern septic systems should not be installed (to protect surface waters from contamination), will limit future losses from disasters as well as protect tribal resources.

Other hazards may only be partly mitigatable: wildland fire protection, for example, will always be a balancing act in a wildland environment such as the reservation. Even so, there are actions that can be taken to mitigate the losses from wildland fire; setting fire-safe standards for new construction is one example.

Conflicting or overlapping regulatory jurisdictions sometimes cause issues making mitigation more difficult. An example follows, where lack of septic system compliance resulted in sewage runoff into the Sanpoil River.

The photos below involve fee land where an entire slope (where a trailer park once stood at the top) has eroded away. The flat above the cliff once sloped down to the river; when the river changed course, it began eroding the slope away, resulting in the cliff face seen in the photos.

Ferry County is primarily responsible for septic compliance on fee lands within the county. During the winter 2017 flooding, the exposed septic tank shown in the 2015 photo eroded away completely (along with the shed at the back of the structure) and collapsed downslope. Even after the 2017 flooding this structure continued to be occupied without a working septic system. The Tribe has limited ability to stop unlawful sewage disposal on fee land that will eventually make its way into the river. The county, acting upon a request from the Tribe, began working on this issue in 2018.





Home on the Sanpoil River, south end of Keller Community, 7 February 2015

Exposed septic tank at bottom left

Some hazards may be mitigatable, but require funding beyond the financial means of the Tribe. This brings up another reason to prepare a Hazard Mitigation Plan (HMP): once an HMP is in place and approved by FEMA, the Tribe is eligible to apply for pre-disaster mitigation grants to minimize risks. These can be for such purposes as armoring bridge abutments to prevent floodrelated damage; relocating structures out of flood plains; installing emergency generators in structures used as emergency shelters; and improving the Tribe's capacity to prepare for, and respond to, disasters. When such grants are received, the Tribal match is 25% of the full cost of the project.

Chapter 2: Planning Process

A. Introduction

A useful concept for hazard planning is that some risks or threats are "low frequency but high impact" while others are "high frequency but low impact." A low frequency but high impact occurrence would be a severe earthquake. The last severe earthquake to strike the reservation was in 1872; as evidenced by the survey and results presented later in this section, few residents are concerned about the risk of earthquake. Discussed within the earthquake section is information about how destructive the 1872 earthquake was and what the consequences might be if it occurs again.

Another low frequency but high impact occurrence would be a significant volcanic eruption with ashfall. The survey results indicate that few residents are concerned about volcanic eruption. Yet following the last major eruption circa 1800, so much ash fell on the reservation that the population starved from lack of food. While starvation may no longer be an issue in an era with a robust supply chain delivering to grocery stores, an eruption could severely impact the availability of traditional foods and affect Tribal life.

Floods are a relatively common event that could be either high frequency/low impact or the reverse. The Okanogan River reaches flood stage many years, but rarely reaches major flood stage. An "ordinary" flood (when the river reaches flood stage but causes little or no damage) is a high-frequency but low-impact occurrence. More severe flooding, as in 2018 where that river reached and remained at the "major" flood stage for twelve days, is a low-frequency/high-impact event.

Power failures are another example of an occurrence that could fit in either category. A major concern of those living on the reservation, as shown by survey results, is that of long-term power failure. Short term failures are common: a windstorm causes power lines to touch and short out, a wildland fire burns down a few poles and wires, or winter storms cause an ice-loaded tree limb to fall across power lines. These are relatively high-frequency/low-impact issues. Power is often restored within a few hours to overnight.

A. Plan Development

The Tribe applied for a pre-disaster mitigation grant, or PDMG, in early 2014. A grant was awarded to the Tribe in May 2015. Due to repeated disasters, including the catastrophic fires of 2015 and their long aftermath, work on the Hazard Mitigation Plan did not begin until the fall of 2016. The project was initially managed out of the Tribe's Emergency Management Services/Fire/Rescue Department. Project leadership was provided from the Office of Public Safety.

The formal hazard mitigation planning effort began on November 9, 2016, with a kick-off and scoping meeting held at the Tribal government center beginning at 1 p.m. on that date.

The kick-off meeting was advertised in the October 28th edition of the local newspaper, The Tribal Tribune, and announced through e-mails and internal announcements to Tribal employees and to other interested parties including the BIA and IHS. Announcements and invitations were e-mailed to the leaders of every school district on the reservation, city and town government officials, cooperating agencies including local sheriff's offices and county emergency managers, the local Washington State Police office, local fire districts and departments, public and private utility providers, cooperators such as the conservation district and WSU extension, and to major private sector employers.

Because of the nature of Tribal sovereignty and Tribal governments, a Tribal hazard mitigation planning project has fundamental differences from those conducted by counties. In order to be eligible for pre-disaster mitigation grants from FEMA, a city or town must be covered under a FEMA-approved HMP. Within Okanogan County, every city or town—including all five of those entirely, or partially, within the reservation boundary—is already a signatory to the county's HMP. None of them needed to participate in the Tribe's planning effort in order to be covered under an HMP. None of them chose to participate at any level with the Tribe's HMP.

For the Okanogan County HMP, all of the fire districts and city fire departments participated in the HMP process for the county and were listed as cooperators. They are a part of the county's HMP. Every such department within the reservation was invited to participate in the Tribe's HMP. None chose to participate. For the one fire district for which an e-mail address could not be located, telephone calls were made to the fire chief to ensure that department had the opportunity to participate.

Another difference is that county and city governments have access to comprehensive data about property values within their jurisdictions. Tribes generally do not assess the value of homes and other improved property within reservations. Because Tribe does not levy property taxes, it does not have the same need to know the value of lands and improvements. Even if a Tribe did assess property, a comparison to other jurisdictions would be meaningless. Off reservation, property ownership can be transferred freely. Within the reservation, the value of Tribal trust land (which is not freely transferable) cannot be compared in a meaningful way with land values outside of the reservation.

Arizona State University maintains a planning data set known as SHELDUS, which aggregates past disaster history along with insurance claims and property damage reports, including crop insurance claims caused by drought, hail, or fire. It maintains that data by county and charges fees to provide it. Because it does not separate Tribal lands data from county-wide data, it was not useful for this planning effort.

The private sector economy within the reservation is also significantly different from that in the outside world. The Tribe has a business arm, the independent Colville Tribal Federal Corporation (CTFC), which operates businesses that would be privately owned within other jurisdictions. A few of these businesses are located on trust lands outside of the reservation boundaries. These include gas stations with convenience stores, three casinos, a security company, and grocery stores. The Tribe itself provides services such as residential trash pickup, and operates two medical clinics, that elsewhere could be run as private businesses.

The three largest employers within the reservation were, in no particular order, the CTFC and its subsidiaries, the Omak Wood Products Mill, and Gebbers Farms. All were invited to participate. A representative from the mill did attend the public meeting in Omak to provide input; that mill has since shut down. The other two business entities did not participate.

Within the Tribal government, participation from some programs was either required or strongly encouraged by the respective division directors. This included tribal law enforcement, occupational safety and health (TOSHA), and the environmental trust program.

The agenda on November 9th consisted of a short power-point presentation, containing an explanation of the expected planning effort, followed by a short question and answer period. Next was the audience participation portion, where attendees were asked to make their way around sixteen separate stations in the room. Attendees were asked to identify their three highest-priority issues, among those that were grouped under broad headings, to help generate a "heat map" to establish priorities. Eighteen persons signed in to that meeting; fourteen of them took HMP surveys, and ten surveys were returned by the end of the session.

Following the November 9 meeting, a public meeting was held in each of the four districts on the reservation: Nespelem on November 15th, Inchelium on November 17th, Omak on

November 21st, and Keller on November 29th. Despite the public announcements and reminders sent before each meeting, the turnout for these follow-up meetings was low. Five persons (out of six present) signed in to the Omak meeting, four of whom returned HMP surveys. Only two persons came to the Nespelem meeting (no surveys returned) and the Inchelium meeting (two surveys returned). Although additional flyers were posted in the community to encourage attendance, no one came to the Keller meeting.

Meetings were held with the Okanogan County planning director (on March 30, 2017) and with Ferry County planning director (on April 4, 2017). These meetings were held at their offices in Okanogan and Republic, respectively. The purpose was to give their departments an opportunity to provide input into Tribal planning, and to encourage them to participate in reviewing the draft of the Tribal HMP when it became available.

B. Survey Results

The survey was not intended to be a scientific, statistically valid sampling of member and resident knowledge of hazards relevant to mitigation planning. The major flaw of the survey is that of potential bias, because persons completing the survey were self-selected. The participants, because they either stopped at an informational booth, attended a public meeting, or downloaded the form from the Tribal web page or an email, tended to be those with an interest in the subject. Regardless of potential participant bias, some worthwhile information came from this survey.

That information included the following about this group's experiences on the reservation:

53% do not have fire insurance 71% do not have flood insurance

31% have experienced a drought on the reservation
37% have experienced an earthquake on the reservation
47% have experienced a power failure lasting more than 24 hours
76% have experienced a wildland fire
81% have experienced severe weather

73% are "not at all prepared" or "somewhat prepared" for a disaster26% are "adequately prepared" or better

68% have received first aid training

61% have taken some preparatory steps, such as installing smoke detectors

In order to rank the participant's perception of the most serious hazards, the numbers of those who declared themselves "concerned", "very concerned", or "extremely concerned" about specific hazards are shown in the left column. The right column shows the number for just "very concerned" and "extremely concerned."

Wildland Fire	95	80
Severe Weather	89	59
Power Failure	71	45
Household Fire	71	45
Drought	62	41
Climate Change	59	41
Hazardous Materials	60	33

Survey participants expressed the least concern, ranked from the lowest level of interest upward, with volcanic eruptions and earthquakes. Landslides, floods, and dam or levee failure were all next with essentially similar scores.

The heat map exercise was reasonably consistent with the results of the survey. The four highest-ranking threats to the reservation and its people were identifed, in order from most to least severe, as:

Severe Storm Power Failure lasting longer than 24 hours Climate Change and Wildland Fire (tie)

Although these were the most serious concerns ranked by the heat map exercise, all except Severe Storm (at top) were essentially interchangeable in priority. A single vote could have changed their order.

The next tier of concern, with tied scores, included Animal and Plant disease, Hazardous Materials, and Active Shooter incidents. The lowest-ranked concerns, in no particular order, were Dam/Levee Failure, Volcanic Eruption, and Winter Storm.

The tabulated results of the survey, a summary of individual comments received, and a copy of the "heat map" results with all comments are found in Chapter 6, "Supporting Documentation."

C. Capability Assessment and Assets

The Tribe has shown that it is capable of responding to and recovering from major disasters. A partial listing of the Tribe's physical response assets follows. Following the list of physical assets is a listing of other Tribal capabilities in terms of policy, planning, and existing guidance.

Public Safety assets:

- A Tribal Police Department with more than thirty officers, with a full-time 24-hour/7 day per week dispatch that has an emergency generator.
- A command post vehicle with radios and work space, which can be used as an alternate dispatch center.
- A Tribal EMS/Fire/Rescue department, with full time staffed fire stations in Nespelem and Inchelium; an unstaffed but equipped fire station at Keller; and additional fire engines at homes in Wildland-Urban Interface (WUI) zones including the Kartar Valley and Disautel. Assets include two almost-new structural fire engines, two water tenders with initial attack capability, an almost-new ladder truck, and two almost-new rapid response brush-type fire apparatus.
- Two ambulances at each of the full-time fire stations.
- A full-time Tribal jail.
- A Natural Resources Enforcement department, with sworn law enforcement officers who patrol on as well as off reservation in places where the Tribe has land and land use rights.
- An identified location for a Tribal EOC, with computers and supplies to set up and open within a few hours of need.
- An emergency management cache with generators, water pumps and hoses, traffic control supplies, spill adsorbents, emergency lighting, and other emergency response equipment.

Community assets:

- A community center in each district, suitable for use as an emergency shelter.
- A longhouse in each district, suitable for use as an emergency shelter.
- A senior meal site in each district, suitable for mass feeding and for a shelter.
- At least one school in each district, which could be used as an emergency shelter.
- Two Tribally-operated medical clinics, one each in Keller and Inchelium, both of which have emergency generators.

- A Tribally-operated Convalescent Center, which has an emergency generator.
- Two IHS clinics, neither of which has an emergency generator.
- Grocery stores in Nespelem, Keller, and Inchelium, each with fuel pumps as well.

Heavy equipment:

- A Tribal Department of Transportation, which works in cooperation with the BIA roads department, with access to dump trucks, snow plows, and other heavy equipment.
- A Public Works department with access to a dump truck, backhoe, excavators, and other heavy equipment.
- A Fish and Wildlife Department that owns trucks and trailers, backhoes, forklifts, and other equipment useful for disaster response.

Transportation assets:

- The Tribal Department of Transportation operates small commuter buses across the reservation
- The Tribal Head Start program has small buses for its students, and buses may be available in emergencies from local schools as well.
- There are local schools with buses in Omak, Paschal Sherman/Mission campus area, Nespelem, Keller, Coulee Dam, and Inchelium.

BIA and other outside agency assets:

- Wildland fire fighters from Mt. Tolman Fire Center, during fire season.
- Fire fighters from county fire districts that have response areas within the reservation.
- Fire support, both for structural and wildland fires, under a mutual aid agreement between the Tribe and every fire district or department in Okanogan County. Written mutual aid agreements are pending with Grand Coulee-area departments in Grant and Douglas counties and with Ferry County departments.

The Tribe is NIMS-compliant; appropriate management officials attend Incident Command System training to the Intermediate (ICS-300) or Advanced (ICS-400) levels. At least one class per year is offered in the area by Tribal staff.

The Tribe has, either on its own or in conjunction with the BIA where that agency takes the lead role:

- Adopted both the International Building Code and the International Residential Code.
- Adopted a Comprehensive Emergency Management Plan (CEMP), with annexes that constitute an Emergency Operations Plan (EOP) for specific disasters such as floods, winter storms, etc.
- A Wildfire Prevention Plan.
- A Fire Management Plan.
- A Forest Management Plan.
- An Agricultural Management Plan.
- A Range Management Plan.
- A Community Economic Development Strategy.
- A completed Threat and Hazard Identification and Risk Assessment (THIRA), which includes an assessment of emergency management training needs tied to the FEMA Resource Typing system.
- An Integrated Resource Management Plan.

The Tribe has established zoning, and a permit process is in place for new construction as well as for remodeling existing facilities. The Tribe has building inspectors and a fire marshal.

The Tribe participates in the National Flood Insurance Program, with a registration date of October 13, 2006.

D. Hazard Identification Process

The first stage of the hazard, vulnerability, and risk assessment (or "threat" assessment) began on December 6, 2011. All Tribal government departments, and cooperators including the Bureau of Indian Affairs (BIA) and the Indian Health Service (IHS), were invited to a scoping meeting held at the Children and Family Services conference room, Colville Agency campus, Nespelem. Comments and guidance were solicited as the first stage of emergency planning began: gathering information for the Hazard and Vulnerability Assessment (HIVA, at that time the standard for a threat assessment) and for a Comprehensive Emergency Management Plan (CEMP).

Following that meeting, the HIVA/CEMP author conducted interviews with individual program managers and many of their subordinates. These included the managers overseeing: Tribal Information Technology (IT); the BIA fire management program; the police department; the corrections department; Tribal Occupational Safety and Health (TOSHA); Tribal Health; public works, particularly about sewage and water infrastructure; community centers; Natural

Resources Enforcement, which is responsible for search and rescue; and the EMS/Fire/Rescue program. The HIVA was completed in March 2012. Within weeks, it was superseded for emergency planning purposes by a new FEMA standard, the Threat and Hazard Identification and Risk Assessment (THIRA). A THIRA was later completed, submitted to FEMA in December 2014, and accepted.

The HIVA was written with another use in mind: that it could be used as the basis for a future Hazard Mitigation Plan (HMP). In many instances when hazards and vulnerabilities were discussed, mitigation strategies were included. Although it was not specifically designed as an HMP, it was a precursor to this project and was intended for use in the eventual creation of the HMP.

Outreach to update that hazard and risk assessment began again at the 2016 annual Tribal membership meeting, which was held at the Nespelem Community Center on October 8, 2016. A table staffed by the public safety program was in place throughout the meeting that day, and copies of the "Hazard Mitigation Survey" were first distributed there. Forty-six members spoke with public safety staff about the HMP, and eighteen of them returned the first surveys; only sixteen attendees signed the participation log. Fliers were distributed announcing the next public meetings, requesting members to come to one or more of those meetings. Several hundred people attended the annual membership meeting.

Tribal notices were sent out in order to obtain more survey responses. An additional sixty-eight surveys were received, either by fax, e-mail, or interoffice mail by April 2017. In all, one hundred and three surveys were returned.

The survey results were used, in part, to determine which threats and hazards needed to be addressed in this plan. This plan addresses fourteen separate hazards; the Okanogan County plan, in comparison, addresses five.

Chapter 3: Community Profile

Physical and Political Geography:

The Colville Indian Reservation ("reservation") is bounded on the south and east by the Columbia River; on the west, by the Okanogan River; and on the north, by an arbitrary line drawn at the northern boundary of Township 34 of the public lands survey system.

Geographically, most of the reservation is part of the Okanogan Highlands; the remainder is part of the Okanogan Valley.

Elevation levels range from a low of approximately 780 feet in the southwest corner of the reservation, to over 6700 feet at the summit of Moses Mountain; the average is above 3,000 feet. Elevation generally increases from south to north and from west to east. The predominant terrain features were carved by glacial erosion. The Sanpoil River drains much of the eastern interior of the reservation south to the Columbia River; the Nespelem River basin, and many additional creeks, drain into the Columbia River; and additional creeks drain into the Okanogan River.

The populated area along the eastern edge of the reservation is separated by two mountain ranges from the Tribal and BIA administration at the Colville Agency. During winter the roads across those two ranges can sometimes be traversed only with difficulty.

The reservation is bisected by the boundary between Ferry County (on the east) and Okanogan County (on the west). There are two incorporated towns entirely within the reservation: Elmer City and Nespelem. There are three incorporated cities or towns located partially within the reservation: Coulee Dam, Okanogan, and Omak. There are three additional "Census Designated Places" (CDPs) used for gathering census data: Disautel, Inchelium, and Keller.

Within the reservation boundary, in addition to privately-owned fee lands, the Army Corps of Engineers (ACOE), Bureau of Indian Affairs (BIA), and Bureau of Reclamation (BOR) own land. For the construction of both dams, trust lands were taken by the federal government up to a specified elevation level; in the case of Grand Coulee Dam and Lake Roosevelt, all trust lands up to the 1310-foot elevation line became BOR land. Some private land parcels that extended both above and below that elevation line, however, were bought out in their entirety.

Under the terms of the 1990 Lake Roosevelt Management Agreement, the Tribe manages the BOR lands within the "reservation zone" defined in that agreement. This includes most BORowned lands within the reservation boundary upstream from the immediate area of the dam. "Management" rights, however, do not authorize the Tribes to exercise general law enforcement authority on those lands except when violations are committed by Tribal members.

Because of the risk of landslide due to slope undermining by the newly impounded waters behind Chief Joseph Dam—which also happened after the filling of Grand Coulee Dam—the ACOE appropriated easements across trust lands within the reservation. Although the ACOE



did not acquire fee simple ownership of those lands, the easements it required limit the uses to which affected lands can be put.

The Tribe is governed by an elected Colville Business Council, under a Tribal Constitution approved in 1938. There are fourteen members, one of whom is chosen as the Chairman. Politically, the reservation is divided into four districts; council members are elected by district.

Source: CCT GIS, October 11 2018

The Inchelium and Keller districts are located

within Ferry County; the Nespelem and Omak districts are within Okanogan County.

History:

Much of the reservation boundary, as it exists today, was established in 1872 by an executive order issued by President Grant. At that time the reservation covered approximately 2.8 million acres. Members of twelve different tribal groups were either already present within, or later moved onto, the reservation.

In 1892, by act of Congress the reservation was cut approximately in half; the current reservation is the south half of the original reservation. The "north half" was opened to homesteading, mining, and to other public lands uses. The Tribe retained hunting, fishing, and gathering rights on the federal lands within the north half. Some lands in the north half had already been allotted to individuals, and remained in tribal trust status. The Tribe has been purchasing lands in the north half when funds and land availability allow, and is returning these purchased lands to trust status. One of the larger pieces of land returned to tribal ownership includes the Chopaka Crossing, a former railroad border crossing located directly upon the U.S.-Canada border.

Beginning in 1916, the south half of the reservation was opened to "settlement" under the public land laws. Lands within the reservation not already allotted to Tribal members were open to mining claims and patents, homesteading, and even to cash purchases. Large areas of the reservation, particularly in the southwest, passed out of trust status and into private non-member ownership. The map below shows the approximate extent of trust (blue) versus private and government ownership (yellow). Government ownership on the reservation includes federal lands owned by the Bureau of Reclamation and the Army Corps of Engineers;

state lands managed by Washington state parks as well as highway maintenance sites; and county or other local government lands, including fairgrounds and lands used for road maintenance.



Source: Tribal GIS program, March 2018. Non-trust lands are yellow, trust lands shown in blue.

The reservation was withdrawn from entry under the public lands laws in 1934; there were no more mining, homestead, or cash purchase entries within the reservation after that year. The last of the legacy mining claims established during the public lands era on the reservation lapsed in 1993. However, even after 1934 fee lands, allotted trust lands, and tribally owned lands within the reservation were taken by the federal government for the construction and operation of Grand Coulee and Chief Joseph Dams.

As with the north half areas, when land is available and funding permits the Tribe purchases land within the reservation boundary and returns it to trust status. In addition to lands within the reservation boundary and the north half, there are other parcels of trust lands located in several counties. These include such lands as the Mill Bay Casino in Chelan County, a former USFS site in Okanogan County, and others.

The Tribe has continued to lose access to lands in the North Half due to federal government actions. For example, during the 25-year period from 1983 to 2008, the Bureau of Land Management transferred 3,868 acres of north half lands within Ferry County out of federal

ownership. This action effectively eliminated Tribal hunting, fishing, and gathering rights on those lands.

Demographics:

As of 2018 there are approximately 9,500 enrolled members of the Confederated Colville Tribes. Many enrolled members reside just outside of the reservation boundaries in communities such as Coulee Dam, Grand Coulee, Wilbur, Okanogan, and Omak. The total enrolled membership does not include a substantial population of descendants who, although not members, have both a family and cultural affiliation to the Tribe and receive some services from both the Tribe and IHS. It also does not include non-members who are married to members.

The 2010 decennial census collected data on persons residing within the external boundaries of the Colville reservation, as well as those residing upon affiliated Tribal trust lands outside the reservation boundary. This census data showed 7,687 residents; approximately 2,360 were non-Tribal. School-age persons (17 and under) were counted at 2,102; persons aged 65 and older were counted at 1,032.

Rural populations generally, and Tribal populations specifically, have been consistently undercounted during past national census data collections. One U.S. Census Bureau report addressing Oklahoma issues identified undercounting by as much as 27% of the Tribal population (Moore, 1992). An Eastern Washington University presentation stated that the Native American undercount during the 1990 census was 12%, varying by reservation (Winchell, 2015). Based upon the 1992 study, there may be as many as 9,600 people resident within the Colville Indian Reservation.

The Tribal experience during the 2015 fires showed that there were residents who lost homes which had not even been mapped under the 911 addressing system. It wasn't known by the Tribe, or by Okanogan County, that the homes had even existed until after they had burned down and the residents displaced.

Further, in any widespread natural or other disaster, members and descendants from adjacent communities may also need assistance. Although the Tribe is not responsible for disaster relief services outside the reservation (except when they involve off-reservation trust lands), as a practical matter those Tribal members may work within the reservation. Further, if their homes outside the reservation are damaged, they may temporarily reside with relatives within the reservation whose homes are intact.

There are a substantial number of people visiting the reservation for recreation every summer. Within the reservation there are: resorts at Twin Lakes; people with summer homes; campgrounds; and boating users and beach campers along the Tribe's Columbia River shoreline. The NPS figures for Lake Roosevelt indicated that, on average, more than 7,000 people visited the park each day during June through August of 2016. Even if only one out of ten visited the reservation, that would still increase the transient population of the reservation by an average of more than 700 persons per day.

Finally, there are two state highways (SR21 and SR155) and one U.S. Highway (US 97) traversing the reservation. All of them serve as trucking corridors; US 97 in particular is used for international trade with Canada. Each highway has significant daily traffic across the reservation.

For these reasons, the census data does not adequately reflect the population which may need to be served in the event of a natural or other disaster. For planning purposes, the population within the reservation on any given day is considered to exceed 10,000 people.

Economy—Government Sector:

The largest single employment sector within the reservation is government, in particular the Tribal government and the Bureau of Indian Affairs (BIA). The five different school districts within the reservation also constitute a significant employment source. Both Grand Coulee and Chief Joseph Dams are partially located within the reservation, and their employees should also be considered as part of the government employment sector.

The Colville Tribal Federal Corporation runs the casinos, community stores, most fuel stations and convenience stores on the reservation, as well as subsidiaries performing work both on and off reservation. This includes fuel stations and convenience stores located in both Ferry and Grant counties, and a casino in Chelan County, all of which are outside the reservation boundary. At the Tribal membership meeting held in October 2016, it was announced that approximately 1,200 persons worked for the Tribal government or its business operations.

Economy—Agricultural Sector:

Agriculture, in the form of orchards and forage crops as well as livestock production, is a significant contributor to the local economy. At one time the Nespelem area was extensively farmed, but the former irrigation works (including diversion dams and weirs) have been largely

abandoned. Large orchards exist along the Columbia and Okanogan rivers in the southwest portion of the reservation; as of 2012, they covered 12,040 acres within the reservation. These attract a seasonal labor force for harvests, and have resulted in the construction of temporary housing for seasonal workers. State and county authorities allow such temporary housing to be constructed without requiring sprinkler systems or other fire protection measures (such as hydrants or fire standpipes).

Based upon current data, it is difficult to tell the scope and extent of private sector employment within the reservation. Gebbers Farms is a major employer, but has not responded to a request for information about the scope of their activities on the reservation. Because they have orchards and other agricultural interests both on and off reservation, sometimes within a few miles of each other, it may be difficult to separate their data between the two.

In addition to orchards, other documented crop production includes corn (920 acres); other forage crops (11,296 acres); and wheat (13,367 acres) [Census of Agriculture, 2012].

There is one aquaculture operation, raising farmed salmon within netted pens in the Columbia River. This is a public-private partnership between the Tribe and an outside corporation.

According to BIA statistics from 2011, between 7,000 and 8,000 cattle are grazed on range units within the reservation each year. (A cow-calf unit is considered one head of cattle for grazing purposes, so the actual number of animals is higher.) No sheep were under permit on the reservation, and 200 horses were permitted. One horse grazed under permit is considered to be consuming the same forage as 1.5 cow-calf units.

Every five years, the U.S. Department of Agriculture conducts a "Census of Agriculture." The most recent one was conducted in 2012, and the results were released in 2014. That census showed an "inventory" of 13,444 cattle and calves, as well as 520 horses. This showed an increase of over 2,000 cattle, but a decrease of 1,653 horses, from the 2007 census. The cattle and horse figures do not match those provided by BIA for 2011. The discrepancy in cattle numbers with those of the BIA is likely due to the BIA keeping records by cow-calf "unit" rather than by animal. For horses, it is likely that many horses are maintained on private lands rather than range units.

Although only 200 horses are grazed under permit, livestock counts in 2010-2011 showed as many as 600 horses on range units. Historically there were a small number of wild horses on the reservation—a 2012 Tribal management plan placed their number at 200 and set that as the goal for wild horse management---but the additional 200 animals were suspected to be

"estray" horses turned loose by their owners. These wild and estray horses consumed the same forage as 600 cow-calf units, amounting to between 7% and 8% of the total amount authorized under permit at that time. The forage they consume is not available for either wildlife or to cattle grazing, and affects both the Tribe's economy and culturally important access to wildlife.

Since 2011, resource damage from wild and feral horses has become more acute. As of March 2018, the Tribe's natural resource manager estimated that there were approximately 2,000 of these horses on the reservation. A roundup in 2015 resulted in the capture of 423 horses, although Tribal land managers wanted to remove 1,000. The current estimate of 2,000 horses across the reservation translates into the consumption of enough forage to support 3,000 cattle.

Both the livestock industry and crop production on the reservation is susceptible to drought, wildland fire, and disease. Livestock grazing was heavily impacted by the 2015 fires. In addition to the loss of cattle in the fires, leased Tribal range lands had to be rested to allow recovery following the fires. This reduced the grazing land available for three years post fire.

Economy—Timber Sector:

Historically timber production has been a major economic resource within the reservation, but the last sawmill operating within the reservation shut down in 2017 after little more than three years of operation. Both tribally-owned timber mills (the Omak Wood Products Mill and the former Colville Indian Precision Pine plant, also near Omak) shut down in the wake of the Great Recession that began in 2008. The Omak mill later reopened, but shut its doors again in 2017. There is significant timber production from within the reservation, but logs are now transported to outside mills for processing.

The 2015 fires devastated the timber industry, burning an estimated 22% of the marketable timber within the reservation. This amounted to approximately 800 million board feet of timber burned, about ten years' worth of full production. Although there was a short-term increase in the amount of logging, as salvage logging took place to bring damaged but still usable trees to market, that timber was salable only at reduced prices.

A significant source of income to sustain the Tribal government and its membership consists of revenues from timber production. The timber losses from the 2015 fires, especially when combined with the destruction of marketable timber during the 2012 windstorm, reduced long-term timber resources. This left the Tribe facing a dilemma; increasing the timber cut to sustain

revenue would result in reduced harvests in future years. Reducing the timber cut immediately, to support longer-term sustainability, would cause an abrupt decrease in Tribal revenue in the short term.

In any case, the outlook for long-term sustained yield timber production will likely decrease over the economic projections made prior to 2014.

Chapter 4: Hazards, Threats, and Mitigation Strategies

A. Introduction

Tribal members are survivors. Despite:

- the invasion of traditional territories by "settlers" moving in and taking Tribal lands;
- the federal government's attempts to terminate Tribes and their governments as sovereign entities, and to assimilate Tribal members; and
- the deliberate suppression of Tribal languages and culture,

The Confederated Colville Tribes have endured and prevailed. The Tribes have resisted threats to Tribal sovereignty, regained primary control over law enforcement on the reservation, and established an economy in which the members manage their own natural resources.

A Tribal Hazard Mitigation Plan, while it may address many of the same issues as an HMP prepared for other jurisdictions, differs in at least one major respect from them. Tribal governments approach some issues from a different angle, because preserving not just the natural environment but traditional uses and cultural resources are critically important goals. As just one example, a non-Tribal government might pursue salvage archeology if a planned road building project would disrupt an archeological site, rather than alter road building plans. A Tribal government might re-route the road despite the extra cost, or even cancel road construction altogether, rather than damage or destroy a significant cultural resource.

Virtually every Tribal government decision takes into account the effects on hunting, fishing, gathering, protection of and access to traditional sites, and other traditional uses of land within the reservation. This type of deliberate approach may be less common with other governments. It may also result not just in a slower pace of governance, but in decisions different from those a non-Tribal government would make.

A requirement of a hazard mitigation plan is that the identified natural disaster hazards and threats must be evaluated and rated. Detailed information about each hazard or threat can be found in its respective section; at the end of each section will be listed possible mitigation strategies. These are not strategies that the Tribe is required to implement; these are ideas for what can be done when funding is available and Tribal leaders approve a project.

The summary hazard rating follows, below. The rating criteria for each aspect of these ratings can be found in Chapter 5, section C.

Hazard	Location (Geographic Area Affected)	Maximum Probable Extent (Magnitude/Strength)	Probability of Future Events	Overall Significance Ranking
Communications Failure	Significant	Severe	Likely	Medium
Dam Failure:				
Chief Joseph	Significant	Extreme	Unlikely	Low
Grand Coulee	Significant	Extreme	Unlikely	Low
Owhi Lake	Negligible (<10%)	Weak	Occasional	Low
Twin Lakes	Negligible (<10%)	Weak	Occasional	Low
Upriver Dams	Significant	Moderate to Extreme	Unlikely	Low
Disease, Animal	Extensive	Weak	Occasional	Low
Drought	Extensive	Moderate	Likely	Medium
Earthquake	Extensive	Extreme	Unlikely	Low
Extreme Heat	Significant	Weak	Likely	Low
Flood	Limited (<25%)	Moderate	Likely	Medium
Landslide	Significant	Severe	Likely	Medium
Severe Winter Weather	Significant	Moderate	Likely	Medium
Severe Storm:				
Wind	Significant	Severe	Likely	High
Rain	Significant	Severe	Likely	High
Tornado	Negligible	Severe	Unlikely	Low
Utility Failure (Power Grid and subsequent)	Significant	Moderate	Likely	Medium
Volcanic Eruption	Significant	Moderate	Unlikely	Low
Wildfire	Extensive	Extreme	Highly Likely	High

B. General Mitigation Strategy for All Risks and Hazards

Mitigation is not new to the Tribe. The Tribe has followed mitigation strategies when possible, even before this Hazard Mitigation Plan began. When the Tribe acquired equipment to set up an Emergency Operations Center (EOC), it was mitigating future risks by increasing the Tribe's ability to respond to disasters. The Tribe has long pursued increasing the resiliency of its Information Technology infrastructure. When damaged roads are repaired, culvert or drain sizes are evaluated and increased if necessary. All of these issues are examples of mitigation in action.

The Tribe's general mitigation strategy is to plan and prepare for disasters and issues that could occur, whether for a major earthquake, the slower disaster of a drought, or the potential generations-long hazard of climate change affecting natural resources central to Tribal life. Where possible, this includes making physical changes to infrastructure, or creating infrastructure to protect against future damage. There are three general ways in which the Tribe carries out this overall strategy.

The first mitigation strategy is that of basic emergency planning. Some disasters are appropriately planned for and managed through the Tribes' existing Comprehensive Emergency Management Plan (CEMP). Natural disasters including earthquakes, volcanic eruptions, and flood, and technological disasters such as major power failures, are addressed within individual Emergency Operations Plans (EOPs). The Tribe's EOPs are found as the functional annexes that are a part of the CEMP.

In some cases there may not be an individual EOP; catastrophic wildland fire is an example of a regularly recurring hazard for which there is no separate EOP. The primary reason for that is because the responsibility to prevent, and fight, wildland fire currently rests in the hands of a federal agency (BIA) rather than with the Tribal, state, or county governments and agencies.

The Bureau of Indian Affairs, within the Colville Indian Reservation:

- sets the wildland fire strategy through its fire staff;
- suppresses wildland fires;
- controls forestry issues such as the development of dog-hair thickets and other successional changes that create unhealthy forests, and increase the risk of catastrophic fires;

- decides when and where to conduct prescribed burns;
- manages the fire prevention program; and
- manages timber practices and logging, including fire risks caused by industrial logging operations.

Although the Tribe may not have its own wildland fire EOP, it has plans to address the consequences of major fires. These plans include evacuation and sheltering plans to meet the needs of members and residents threatened by wildland fire.

The second way is through long-term planning independent of the CEMP and EOPs. The Tribe is currently working its way through developing a climate change strategy, in cooperation with the University of Washington. This Tribal partner, and others, has assisted the Tribe with the scoping and the development of a climate change report. Although the climate change report identifies some of the threats posed to the Tribe and its members by climate change, by its nature this Hazard Mitigation Plan only surveys this long-term threat. Until the larger effects of climate change are more clearly understood, this HMP cannot include a comprehensive mitigation strategy. Those strategies will emerge as the problem continues to be studied, and will be included into future revisions of this HMP.

The Tribe is integrating hazard mitigation into other planning efforts. The Tribe is nearing completion of a draft Community Economic Development Strategy (CEDS). Any work towards creating a more robust local economy will increase the resilience of the Tribe and its members in the face of disaster, enabling a faster recovery. After meeting with the CEDS planning team leader, the Tribe's current THIRA and 2012 HIVA were provided to the CEDS team for partial incorporation into the CEDS. The intent is to identify areas where economic development grants can also serve mitigation strategies.

The Tribal building permit process now includes a hazard mitigation review. Every permit application is sent to Emergency Management to ensure that hazard mitigation is considered. Hazard mitigation review of new construction permit applications now includes a review of liquefaction maps and known flood risks.

As Tribal plans come up for renewal, hazard mitigation will be incorporated into them wherever possible. Examples of such plans including the various Tribal transportation plans, BIA's Fire Prevention Plan, Tribal Integrated Resource Management Plan, etc. Long-term transportation plans, in particular, are an opportunity to identify infrastructure problems such as inadequate road culverts, landslide mitigation to protect roads, and other measures to prevent stormwater runoff damage. Identifying the scope of the problem is a first step towards resolution.

The third general strategy is to identify lessons learned from incidents and disasters, and to apply them to future activities. Some examples of this approach follow.

During the period from December 2008 to August 2018, six presidential declarations of disaster were issued because of disasters occurring within the Colville Indian Reservation. For the first one in 2008, the Tribe was reimbursed for only a fraction of its losses. This is because the reservation, divided as it is between two counties, was dependent upon those counties to apply for disaster assistance. When Okanogan County did not pursue a disaster declaration, the Tribal damage within the Okanogan County portion of the reservation could not be addressed under the Stafford Act.

As a result of that experience, the Tribe aggressively pursued disaster declarations in all subsequent disasters. For three of the next four declarations, the Colville Confederated Tribes were specifically listed as an affected jurisdiction in addition to listing the counties. In the fourth instance (2017 floods), the Tribe's FEMA-reimbursable losses were included within the county-wide total, to help the county reach the disaster declaration threshold. In the fifth instance (2018 floods), the Tribe received a disaster declaration directly from the president without being part of a state declaration.

Significant effort has been dedicated to learning from disasters, to better prepare for the future. For example, the two images below are from a slide presentation prepared for an after-action review of the 2012 storm response:

Positive Outcomes	Lessons Learned	Positive Outcomes	Lessons Learned
• We had a plan.	 No plan survives contact with reality. 	State emergency management support was	 Federal agencies did not provide the same level of
• We could hire emergency staff for immediate needs.	 We were not prepared for non-ICS trained responders. 	outstanding.	support.
We knew what we needed to do	 We had little outside logistical support and hit surprising 	People donated both time and money.	 Tribal fiscal system not prepared for donation management.
10 00.	procurement roadblocks.	 Despite hazardous working conditions, there were no 	We needed more field
We expected communications problems.	We expected communications problems. • We weren't expecting the communications "black hole" we encountered.	significant injuries among response staff. >46,000 staff hours were worked during the incident.	safety officers than we had available.

Learning from experience, and incorporating those lessons learned into policy and procedure, resulted in a re-write of the Tribe's 2012 Comprehensive Emergency Management Plan and the

approval of a new plan in 2014. The next rewrite, scheduled to occur in FY2019, will incorporate lessons learned from the 2014 and 2015 fires as well as the 2016, 2017 and 2018 floods.

The systemic approach laid out in this introductory section is an integral part of the Tribe's overall hazard mitigation process and applies to all hazards. Additional mitigation strategies for specific hazards are laid out in the following sections.

C. Technological and Other Hazards

"Technological and Other Hazards" are not always addressed as part of Hazard Mitigation Plans. Unlike the hazard mitigation plans produced by some other jurisdictions, this plan does not address terrorist or civil disorder threats. It does address one potential threat or hazard that is unique to Tribes: the possibility that unfavorable government actions at the national level may cause difficulty for the Tribe and its members. Protecting Tribal members and Tribal sovereignty are high priorities.

The primary cause of many of the technological hazards identified here is likely to be a natural hazard. Earthquakes could cause dam failures. Wildland fire, earthquake, windstorms, severe winter storms, and floods could all trigger technological hazards. These hazards are listed here to discuss them in a single location within this plan, rather than repeatedly describing them under each possible category of natural disaster. When each natural disaster hazard is discussed, following, that section will cross-reference "second order" effects such as a wildland fire (first order effect) destroying power lines and knocking out the power supply (second order effect). Second order effects are sometimes referred to as "cascading" failures.

1. Loss of Public Utility Services

In this section we are concerned not just with electrical power but with communications, potable water, and sewage disposal. All of these are dependent upon uninterrupted electrical power. While loss of utility services can occur in isolation—a well pump breaks, an electrical transformer catches fire, etc.—major failures are likely to be a second order effect from another disaster.

There are no pipelines crossing the reservation; all fuel deliveries are made by tanker trucks. The Cascade and Columbia River Railroad, a short line operating on what was once a Burlington Northern right of way along the western edge of the reservation, transports bulk propane and bulk diesel fuel by rail car to local distributors. It also delivers bulk agricultural chemicals to an agricultural supply business within the reservation, near the Okanogan River between Omak and Okanogan.

Electrical Power

Electrical power on the reservation comes from four different providers:

- Okanogan County Public Utility District (PUD) #1, along the western reservation including eastward along SR 155 from Omak to the Paschal Sherman/Mission area;
- Nespelem Valley Electric Cooperative;
- Ferry County PUD, primarily in the Sanpoil Valley; and
- Avista Energy, for the eastern reservation including Inchelium and Twin Lakes.

Power distribution lines throughout the reservation are above-ground, and many of them run through forested areas. Winter storms can cause ice buildup that cause power lines to break under the strain, or they can be knocked down by ice-encased falling trees or tree limbs. Wind storms can cause power lines to touch and arc; lines to break and fall; or blow over trees or their limbs onto power lines, any of which can cut electrical power. Other accidents can cause power outages; the Tribal Police Department discovered that their dispatch emergency generator was not fully functional when a crop duster aircraft struck a power line in June 2012, interrupting power to Nespelem. That issue was quickly resolved.

The power supply to the Inchelium and Twin Lakes area is at the edge of the Avista Energy distribution network; during widespread power outages due to storms, such as the 2008-2009 severe winter storm and the 2012 and 2014 summer windstorms, power restoration to the edges of their network took longer to accomplish than in their core service areas.

Even when the area involved is not at the far edge of a distribution network, restoration may take time due to the vulnerability of the power infrastructure. During the 2012 windstorm, the entire Sanpoil Valley and all areas fed from it went dark. More than 45 miles of power lines were down, with breaks in multiple locations. Ferry County PUD, which services the area from a Keller substation (fed from Grand Coulee Dam), had to replace poles and restring line throughout the entire valley. It took more than two weeks to restore power to everywhere it had been lost.

Wildland fire is a common cause of power failure. The 2015 fires cut power to huge swaths of land both within and outside of the reservation. It took days to replace burned power poles and to restring lines along the new poles. The SR 155 corridor to the Disautel area required more than a week to return power just to those areas immediately along the highway, and longer until power was restored to areas further from the highway.

Within the reservation, community centers are the first choice for evacuation shelters; longhouses and schools are also available for that purpose. However, none of the longhouses or community centers has an emergency generator, and only the Paschal Sherman Indian School (PSIS) has a generator. PSIS is not usable as a shelter except during summer, as it is a boarding school during the school year. Outside of that single school, there are no other public buildings immediately suitable for a shelter when power is out. The only kitchens that can be used for emergency feeding if power fails reservation-wide are the ones at the PSIS and at the Tribal Correctional Facility, which does have an emergency generator.

A reservation-wide power failure is one of the higher-impact disasters that could affect the Tribe. As mentioned above, power failures are often a second order effect from another cause. But electrical power supplies can fail entirely on their own, without a triggering wind or ice storm. A region-wide heat wave causing heavy stress on electrical supplies, coupled with a transmission system incident causing a cascading series of failures within the regional distribution network, could cause a major regional power outage.

Many other low-probability but high-impact disasters could cause region-wide power failures affecting Tribal members. A major Cascadia Subduction Zone earthquake is forecast to shut down power distribution networks as far east as Montana, and require up to a week to restore power in eastern Washington. A volcanic eruption could cause power outages due to heavy ash fall; a major solar storm, such as the 1989 event that left the entire province of Quebec without power for nine hours, could shut down a regional power grid. While longer-term power failures are usually considered low-frequency/high-impact occurrences in any single location, they have been common world-wide. The North American power grid is susceptible to major power grid failures.

The Tribe is not adequately prepared to deal with the consequences of a wide-spread winter power failure, requiring protective sheltering of a significant population from the cold. It is also not adequately prepared to deal with long-term power failures in terms of providing potable water, or solving fuel distribution issues, to members and residents.

Water and Sewage

All public utilities on the reservation are highly dependent upon uninterrupted electrical power; none have a backup generator, or are pre-wired to accept an emergency generator.

The reservation is served by a number of small water systems. These include local tribally or Colville Indian Housing Authority (CIHA) owned and operated systems for the Nespelem Agency area, Mt. Tolman Fire Center, Keller community, and HUD housing communities; municipal systems in Coulee Dam-Elmer City, Okanogan, Omak, and Nespelem; a privately-operated water system for homes in the Twin Lakes area; and a privately-operated local water and sewage district for the Inchelium area. Every water system on the reservation is dependent upon electrical power to operate wells. When power fails, the water system fails when water pumped into storage tanks is used up. Estimates of the time before water tanks empty, under normal demand, range from one day (Nespelem) to three days (Keller). Outside the areas covered by these systems, residents rely on electrically-powered well pumps for individual residential water supplies.

Waste water treatment systems operating within the reservation include:

- Coulee Dam-Elmer City, operated by the Town of Coulee Dam;
- Nespelem and Agency campus areas, operated by the Tribe;
- City of Omak;
- City of Okanogan; and
- A privately-operated sewage system in the Inchelium area.

Everywhere else on the reservation on-site-septic systems are in use, including some of the larger operations (such as the Twin Lakes Resort, the Paschal Sherman Indian School and the Mission campus).

None of the water or sewage systems on the reservation have emergency power capability. If power fails, the systems will shut down until either line power is restored or an emergency generator is located and installed. Such a power outage may greatly hinder firefighting efforts. In 2015, the Paschal Sherman Indian School stopped fire apparatus from refilling their water tanks when the power went out, to preserve water supplies in the storage tanks for defending the school from nearby fires.

In the case of a sewage system, a power failure can have significant environmental impacts. The system built in the 1970's for the Nespelem and Agency Campus areas includes five sewage lift stations; none of them has an emergency generator. If a power outage occurs, the sewage lift stations in the Nespelem and Agency campus areas cannot pump sewage uphill to the sewage lagoons for treatment.

A power outage for as little as one hour, during peak daytime use of the system, may cause sewage to begin backing up. One of the lift stations is automatically set to drain into former sewage ponds. If a septic pump truck is available, the full-time use of that truck to pump from other lift stations and transport to the sewage lagoon has been able to keep up with the sewage flow. If no pump truck is available, it may be necessary to open valves to dump raw sewage into the Nespelem River drainage to avoid sewage flow into residential areas.

In the case of water systems, it is not just electrical power failure that could have significant adverse effects. During the 2015 fires the fire hydrants for the Town of Nespelem failed due to age-related water main damage. Tribal firefighters in 2015 were faced with the task of defending a town, without working fire hydrants, in the face of forecasted 40 MPH winds driving the North Star Fire into the town.

Communications

Even where there are buried telephone lines, many people do not have land-line telephones. There is no longer a network of pay phones within the reservation, even in places such as the Sanpoil Valley where they would constitute the only reliable emergency communications infrastructure for the public. Parts of the telephone network on the reservation are still installed on above-ground poles vulnerable to windstorms, winter storms, and wildland fire in the same manner as electrical lines. Much of the telephone network off-reservation is also above ground, and failures outside of the reservation impact the reservation's phone network as well. In 2014, during the Carlton Complex series of wildland fires the Okanogan County 911 system failed due to widely separated system damage at two different locations.

Cellular telephone coverage is inconsistent. Two providers--AT&T and Verizon--have towers on the reservation. Their reliable coverage is limited to the Okanogan Valley along the river, some of the Nespelem area, and some of the Inchelium area. Everywhere else, including along the SR 155 corridor, cellular telephone coverage can best be described as sporadic. Text messages often go through when cellular telephone calls do not.

An often-neglected impact of communications failures is the impact upon commerce. During the 2014 and 2015 fires, when above-ground communication lines burned they took with them



Credit Union just outside the reservation at Brewster, WA, with electricity but without communications. Sign displays "ATM OUT OF SERVICE". [July 2014, Carlton Complex fires]

the ability to use credit cards and to withdraw cash from automated teller machines. Gas stations and grocery stores have to be connected via internet or telephone lines in order to verify that credit cards/debit cards are valid. Many affected people could not buy either fuel or food with their credit/debit cards, and could not obtain cash from ATMs.



Much of the Columbia River Road and SR 155 corridors (Coulee Dam and Nespelem to Omak), the Peter Dan/Manila Creek Road and the Cache Creek Road (Sanpoil Valley to points west), the entire Sanpoil Valley including much of Keller, and much or even most of the Silver Creek and Bridge Creek roads (Sanpoil Valley to Inchelium and points east), are without cellular phone coverage. As previously noted, there is no longer a pay phone infrastructure which can be used to report fires, accidents, or other emergencies.

Moses Mt. repeater site, August 2015, during Tunk Block Fire

Cellular telephone systems, while they may have battery or generator backup, cannot run indefinitely without line electrical power. The 2015 fires, particularly where the Moses Mountain communications site was involved, showed that.

When power lines to that site were destroyed by fire, the emergency generators powering the AT&T cell tower and powering the Tribal microwave backbone needed to be refueled regularly. Refueling small-capacity fuel tanks in an active fire area, where at least once the refueling team

had to evacuate for their safety and leave a disabled vehicle behind, is uncertain at best. Had these refueling missions failed, the only working cell tower for a large area of the reservation as well as the Tribal government's internet connection would have been lost.

In many jurisdictions, emergency responders can use their agency radios to communicate in the absence of telephones. That isn't always true on the reservation. Much of the northern Sanpoil Valley, for example, is a radio dead zone. During a 2014 petroleum tanker accident in the northern Sanpoil Valley, fire and police responders had to leave the scene to be able to reach a radio repeater to send and receive radio messages. This delayed the response, and may have increased the extent of the pollution from spilled fuel. As of this writing (four years after the accident), the cleanup to remove gasoline from ground water is still ongoing.

The problem with radio communications has multiple facets. The switch from wideband to narrowband required new radios and repeater equipment; at the same time, the radio communications industry has been moving from analog to digital radio. The "reach" of broadcasts from digital equipment (the area in which voice transmissions can be understood) is less than with old-style analog equipment. Finally, the reservation's location near the border with Canada puts part of it north of the Federal Communication Commission's (FCC) "A Line" within which broadcast power is more tightly restricted to avoid interference with Canadian users.

Although each of these problems can be solved with the application of enough funding, the switch to narrowband radio was an unfunded mandate imposed upon the Tribal government. Even now, more than five years after the FCC's mandatory deadline, portions of the public safety infrastructure are still wideband. Significant infrastructure investment is needed to bring the reservation into the modern communications era.

Finally, Tribal broadband internet access is threatened by the fact that it must connect to offsite transmission systems of varying quality. For example, one crucial stream crossing offreservation consists of a single bundle of fiber optic cable that, as of summer 2018, was still exposed to the elements and to casual vandalism. Elsewhere, as with telephone lines, fiber is strung on wooden power poles that can be damaged by ice storms, wind storms, or wildland fire. Although the Tribe can—and is—putting its own fiber underground, it still has to connect to off-reservation systems.

To summarize, the Tribe has little influence upon vital public utilities. It is dependent upon electrical power generated by sources beyond the Tribe's control; it is dependent upon off-

reservation links for its communications infrastructure with the outside world (internet, telephone, and cellular phone); and it is dependent upon outside sources of supply for fuel.

Possible Mitigation Strategies: Loss of Public Utility Services

The Tribe neither generates nor distributes electricity on its own. With service fragmented between two public utility districts, one rural electric cooperative, and one for-profit power company, the Tribe is not currently able to address electrical infrastructure issues. The Tribe has considered the option of creating a Tribal electrical utility, but that effort is still at the discussion stage.

What the Tribe can do now is seek funding for emergency generators for critical Tribal facilities. A successful example of this comes from the Nez Perce Tribe in Idaho, which obtained DHS grant funding to install emergency generators at community centers. That grant provided the Tribe with structures that, after generators were installed, could be used as evacuation shelters regardless of whether the shelters were for warming during ice storms or cooling shelters during a life-threatening heat wave.

As of the writing of this document, the Confederated Colville Tribes do not have a single community center or longhouse in any district with an emergency generator. That may change relatively soon; the Nez Perce longhouse in Nespelem, which burned down in 2012, is scheduled to be rebuilt. Plans for the structure include installing an emergency generator capable of carrying the building's entire electrical load. In this instance, identifying the lack of emergency generation capacity for evacuation shelters during past threat and hazard assessments has resulted in this mitigation action.

Where generators are not needed at all times, facilities could be pre-wired with cut-over and isolation switches to allow a generator to be connected in time of need. A portable generator could then be brought in to carry all or part of the load of that facility. A large trailer-mounted generator could, for example, be moved from well field to well field around the reservation during a major power failure. This would only work if each of the well fields, and water purification facilities, is pre-wired to accept a portable generator. Once water tanks at a location are at least partially refilled, the generator could be moved to additional well fields until power is restored.

The two community sewage systems (one Tribal, one private water and sewer district) could also benefit from emergency generators. The Nespelem/Colville Agency system should not
have to risk the discharge of sewage directly to the environment during a prolonged power failure.

The Tribe will pursue grants to install emergency generators. The cost to acquire and install three additional Tribal districts with emergency generation (since Nespelem District will have a longhouse with a generator), of pre-wiring facilities to accept a portable generator, and of acquiring a trailer-mounted large generator is sufficiently high that grant funding may be the only way to accomplish this within a reasonable time. The privately held water and sewer system has received at least one Indian Health Service grant in the past, to improve service to Tribal customers served by the utility.

A different mitigation problem is posed by fuel supply to the reservation. As noted before, no fuel station on or near the reservation has an emergency generator. The Tribal government does not maintain a fueling station capable of refueling emergency equipment, such as ambulances, law enforcement patrol vehicles, or fire apparatus. Unless the Tribe builds its own fuel supply for Tribal government vehicles, it remains dependent upon commercial stations.

Three states, concerned by the lack of emergency power at fuel stations, have now passed laws to resolve the problem. Depending upon the state, they require certain newly constructed or even existing stations to either have an emergency generator at all times, or to be able to connect one within twenty four hours of a power failure or a declared emergency. The most recent state to do so, New York, instituted that requirement as a direct result of Superstorm Sandy in 2013.

A possible solution would be to use the Tribe's regulatory and permitting authority to influence change over the long term. Additional commercial fuel stations may be built in the future; current fuel stations will eventually need to be remodeled or renovated. A council resolution imposing an emergency power requirement as a condition of receiving a building permit could eventually resolve this problem. There could include an exemption for stations of three or fewer pumps, to avoid shutting down the smallest fuel stations (such as the ones at Twin Lakes).

If this is too much of a burden, a lesser standard could be imposed requiring that newly constructed or remodeled stations must install a generator connection and isolation switch, so that a generator can be plugged in to operate the fuel pumps.

Another way to approach this would be to require emergency generator capability for certain classes of structures: health care facilities, commercial fueling stations, and certain other public

occupancies such as community centers. This would eventually result in emergency generator capacity for the IHS clinics, both of which must currently shut down most operations when there is a power failure.

Many homes on the reservation are heated with pellet stoves, which require electric power to operate. The cost of a small generator may be prohibitive for some Tribal members, even though essential to keep their homes warm and lighted during winter power outages.

A possible solution would be for the Tribe to make bulk small generator purchases with extension cords, at a discounted price, for Tribal members. The Tribe already provides this service to members for other expensive items. Although individual members should pay for the items, the Tribe's purchasing power would obtain discounts to enable more people to buy generators. This will help them be more resilient during disasters.

AT&T is currently seeking customers for its FirstNet program. FirstNet is a nationwide cellphone based network that gives first responders priority access to the available cellular bandwidth, so first responder calls will be given a higher priority than all other callers. AT&T may install additional towers on the reservation in the Inchelium area and along SR 155. It is not currently considering that action for the area on the reservation with the least cellular coverage, the Sanpoil Valley.

Issue	Possible Mitigation Strategies
1. No shelters with emergency power in	A. Pursue funding (grants etc.) to install
any district	generators
	B. Pre-wire shelters to accept portable
	generators to run the facilities
2. All community water supplies	A. Pursue funding (grants, etc.) to pre-
dependent upon electrical power	wire well fields/purifiers to accept
	generators
3. Power failure at Nespelem will cause	A. Pursue funding (grants etc.) to
sewage discharge to Nespelem River	purchase and install a generator for
basin	each of five sewage lift stations
4. No gas station on reservation or	A. Persuade Tribal enterprise to install
nearby can pump fuel during power	emergency generators at all four gas
outage	stations on/near reservation

Here is the summary of possible mitigation strategies for this hazard:

	B. Use Quam-Quam or other funds to
	install emergency generator at
	community gas station in Inchelium
	C. Use permitting power to require gas
	stations to provide emergency power
	for pumps
5. Tribal members with pellet stoves will	A. Use bulk purchasing power of Tribe to
not have heat during winter power	buy small generators and extension
outages	cords for discounted resale to
	members
6. Inadequate cellular phone service on	A. Consider switching Tribal government
reservation	phones to a provider that will build
	additional cell tower(s)
	B. Explore possibility of installing
	emergency phones to connect to 911
	operator or to Tribal police along
7 Inc. de suete sublic esfeture dis	existing land-line telephone routes
7. Inadequate public safety radio	A. Seek funding to heighten existing
coverage on reservation	B Seek grants to allow additional radio
	repeater sites to be constructed
	C. Seek additional FCC frequency
	allocations to improve radio coverage,
	and seek grants to install the additional
	repeaters needed

2. Cyber Threats

Many governments adapted over a period of years to a workplace in which desktop computers went from a curiosity to a necessity, and in which the need for connectivity grew continuously. This was an environment in which the need for standardized equipment and policy crept up on many jurisdictions, and networks grew in an unplanned manner. Wiring and connection points were added to existing structures designed and built in a pre-cyber age; servers, electrical power upgrades, and other needs were shoe-horned in wherever they would fit.

This was also true of the Tribal infrastructure. When the first Hazard Identification and Vulnerability Assessment (HIVA) for the Tribe was completed in March 2012, Information Technology (IT) staff was consulted about network vulnerability. It was recognized that there

was a risk of catastrophic data loss, due to the lack of off-site data backup. However, the staff apparently did not realize that a single structural fire could take down the entire network.

The Tribal headquarters building was destroyed by fire in July 2013. Every other connection in the Tribal network led to that structure. When the headquarters burned down, with a significant loss of records, it took the Tribal network with it.

The Tribal government has since redesigned and rebuilt its headquarters, redesigned and upgraded its network infrastructure, and is replacing older technology still in use. As with any other large organization, the Tribe faces a variety of cyber threats from both internal and external sources. Some of the "threats" are simply older technology. The Tribal network is vulnerable simply because it connects, off-reservation, to fiber optic cables that are above ground and susceptible to wildland fire, ice storm damage, or casual vandalism. Microwave backhauls are still in use, where wind disturbances to or ice accumulation on antenna dishes can push them out of alignment, rendering them useless or nearly so. Antenna sites are also vulnerable to wildland fires.

Adaptation to cyber threats has progressed, similar to the fashion in which the physical network grew and changed. Although the first documented denial of service technique was demonstrated in 1974 and the first worm was invented in 1988, the dangers of malware and network intrusions were for years more a concern of large government agencies, the military and large corporations. Local governments were much slower to respond to a changing threat environment. In an era before threats that could destroy or encrypt your data became common, local governments were often not considered to be common targets of malicious cyber activity. Now, when compromised user logins and passwords, personal identifying data such as social security numbers and dates of birth, and other information can be gathered and sold on the dark web, Tribal data is a target of cyber criminals.

Insider threats, primarily from a lack of security awareness, contribute to occasional cyber incidents due to phishing. Phishing emails sent to Tribal accounts are a daily occurrence, and occasionally they make it past screening software and into individual e-mail accounts. Users, including new employees, have not been systematically trained in the basics of cyber security. There has been little attention to training employees to secure their passwords or to defend against social engineering. According to the desktop support branch of the Tribal IT department, there were approximately ten infected Tribal computers during 2017. However, there are occasional surges; in February 2018, for example, four Tribal computers suffered malware infections. It is suspected that the primary source of that infection was a "spam

attack," as during that same month IT staff noted a significant increase in spam that included phishing attempts.

Occasionally there are incidents where Tribal data could have been compromised. For example, in 2015 a Tribal desktop computer at a community center was found to be communicating constantly with an IP address that resolved to Shenzhen, China. That infected computer was believed to have been part of a botnet.

There have been no recent incidents such as occurred in Licking County, Ohio, in February 2017. In that jurisdiction, the county network was infected with ransomware, the cybercriminals demanded more than \$30,000 to unlock the files, and government data became inaccessible. A similar attack disrupted health care at sixteen hospitals in the United Kingdom in May 2017.

The Tribe has not always been this successful at handling cyber threats. In 2008, a number of Tribal computers were victims to worms of the "Conficker" family; the actual number of infected machines is no longer available, but current IT employees recall that there were multiple computers infected.

Attempts to intrude into the Tribal network occur regularly but are blocked by the Tribe's adaptive security appliance. As of March 2018, the IP addresses from which many of the pings come commonly resolve to China or Russia.

The Tribe does not have computer-based industrial control systems; what Supervisory Control and Data Acquisition (SCADA) systems it has are automated rather than networked. They are manually configured and monitored, with non-networked alarms. Appropriate but ordinary physical security measures are all that are needed to secure such systems; they are not a weak point within the Tribe's cybersecurity measures.

The two small dams managed by the Tribe are controlled with manual valves. The Tribal water purification and distribution systems, although automatic to a degree, are not controlled or managed by networked industrial control systems; they are managed with manual checks, adjustments, and alarms. Standard physical security measures rather than elaborate cyber security defenses are all that is needed.

The Tribal IT program supports a number of other organizations which, although not part of Tribal government, access the internet through the Tribal system. These include the Colville Indian Housing Authority, Tribal Credit (a separate banking and loan institution), the Tribal

corporation (Colville Tribal Federal Corporation), Washington State University Extension, and the Lake Roosevelt Health Clinics.

Possible Mitigation Strategies: Cyber Threats

A significant cyber threat is simple failure of network infrastructure to work due to age, environmental factors (such as poor ventilation causing excessive heat buildup, excessive dust, etc.) that affect the service life of servers and other equipment, lack of redundancy to minimize single points of failure, and so on. To gain a better perspective of how far the Tribe has come, a brief review of the situation less than seven years ago is warranted.

In January 2012, during the preparation of the Tribal HIVA and CEMP, the Tribes' Chief Information Officer was Jim Ronyak. In an interview, he discussed Tribal plans to improve network reliability and data security. They included:

- Install fiber-optic cable to replace a T1 line (copper wire) connection to the internet at Coulee Dam, as the T1 line was already reaching its maximum capacity.
- Install a redundant fiber-optic cable to Omak to prevent cable or other damage cutting the Tribal network off from the outside world.
- Improve the Tribes' ability to back up data within the government, to preserve digital records.
- Archive data off site to avoid catastrophic data loss.
- Replace Tribal telephone equipment, "most" of which was fourteen to eighteen years old.

As of the preparation of this plan in October 2018, some of those goals have been achieved. There is now fiber between the Tribal offices at the Agency Campus (Nespelem) to the internet connection point at Coulee Dam. A contract has been let to lay a redundant fiber line to Omak, to improve network reliability in the event of accident or disaster. Fiber has been laid to the Mt. Tolman Fire Center. Much of the Tribal telephone network has been upgraded, with newer equipment. At the Agency campus where the bulk of the Tribal government is located, network architecture has improved dramatically with the construction of the new government center. Network storage is now available so that some data on individual desktop computers can be backed up to another location.

In terms of cyber security, major improvements have also occurred. Within the past two years, network security staff began receiving weekly bulletins from the Washington State Fusion Center. These weekly bulletins identify cyber threats such as compromised web sites and other sources of malware, phishing attempts, redirects, IP addresses from which network attacks are made, etc. This information is used to update the Tribes' adaptive security appliances to protect against such attacks. And within the past year, Tribal network security staff began receiving the U.S. Computer Emergency Readiness Team bulletins. These bulletins identify new security threats to cyber systems.

A security upgrade, about to be rolled out, is a switch to personal identity verification (PIV) cards and two-factor authentication for network access. This is scheduled for FY2019 for the entire Public Safety Division as a test case. This requires card reader slots for external keyboard-equipped desktop computer users, and either built-in or USB-connected card readers for laptop computers. This will improve network security by automatically locking the computer when the PIV card is removed (preventing unattended but open computers), raising awareness of security (which should help limit "shoulder surfing"), and similar potential compromises.

Improvement is still desirable in a number of areas, all of which are known to the IT unit. They include:

- Minimize the potential for user error. Currently, new employees receive brief information at their employee orientation about Tribal policies, including IT issues. As the entire orientation is complete in barely two hours, this does not include sufficient instruction about good security and data practices.
- Engineer an enterprise-wide solution for automatic data backup from all computer users.
- Work to improve data security practices involving large files, to minimize the need for portable storage devices such as "thumb drives".
- Issue encrypted thumb drives to keep data secure, in the event a portable drive is lost and recovered by someone else.

• Establish a program where external security contractors attempt to breach the Tribal network, in order to identify unsecured access points or ports, find vulnerable Tribal web sites that could be defaced, etc.

To minimize user error, at least one comprehensive training session could be required of each new or returning employee. This could cover simple security violations (such as writing a password down and leaving it next to the computer) as well as a classroom session on how to recognize phishing attempts or falsified "from" addresses on received emails. Real examples could be used to make the session more relevant.

Following the initial training, an annual refresher could be required. A possibly inexpensive source for this is DOI Learn, the Department of the Interior's online training portal. Since the Tribe operates many 638 contracts, it is required to meet the same security standards as a federal agency in carrying out those contracted duties for that Department. A yearly refresher is required to meet Interior standards, and non-Interior agencies can be allowed access to DOI Learn where that yearly update class is provided. This would improve the Tribes' cyber security posture.

The Tribe does not have an enterprise-level backup of data otherwise stored on individual desktop work stations, whether they are desktop computers or laptops in docking stations. Network storage is available, but it is incumbent upon each individual computer user to request access to a network share drive and remember to back his/her data up. This is not a recipe for robust data backup of everyday work products. (Enterprise-wide data programs, such as the Tribal accounting records, are automatically backed up.)

Installing a central backup storage, requiring computers to be left turned on and locked at the close of the work day, and automatic daily backups of all new or changed data would improve this situation. It may require time to obtain the necessary funding to increase storage and install software, but that is a goal that should be worked towards. Until this occurs, and until all Tribal data is not only backed up but is also protected by an additional off site backup, the Tribe remains vulnerable to another data loss disaster such as occurred in 2013.

Tribal data remains vulnerable to compromise due to the loss of portable storage. An easy fix would be to purchase encrypted thumb drives that allow data to be moved, secure against data compromise even if the drive is lost and recovered by someone else. Another partial solution is to set up an internal share point or FTP server where large files, too large to be sent via email, can be posted for download by another office or employee. If a large training video, for

example, needs to be shared with another Tribal office or employee the only current way to do so is to copy the file to portable storage. It can then be physically transported to another location. If the Tribal network made it easier to share large files, there would be less need for portable storage.

A summary of possible mitigation strategies includes:

Issue	Possible Mitigation Strategies
1. User security practices still allow	A. Increase level of cyber security training
phishing and other attacks	B. Explore access opportunities to "DOI
	Learn" and if successful, require every
	Tribal employee to take yearly cyber
	security refresher on line
2. Data stored on individual desktop	A. Establish an enterprise-wide system
computers is not backed up	that automatically backs up data from
	individual computers to server(s)
3. Data on portable "thumb drives" is not	A. Consider purchasing "iron key" or
secure if drive is lost	similar encrypted drives to protect
	data
4. It is difficult to transport large files	A. Set up network share site(s) as an
across the Tribal network	internal equivalent of an FTP site, to
	share data across programs
5. It is possible to share passwords and	A. Switch to two-factor authentication
user IDs on current network	enterprise-wide to increase security;
	require a password and PIV card
	B. Ensure PIV cards are removed when
	users step away from computers by
	setting PIV cards as the door access
	token

3. Dam Failure

There are four dams of primary concern within the reservation:

Chief Joseph Dam (CJD), operated by the Army Corps of Engineers (ACOE) Grand Coulee Dam (GCD), operated by the Bureau of Reclamation (BOR) Owhi Dam, operated by the Tribe Twin Lakes Dam, operated by the Tribe Chief Joseph Dam, operated by the ACOE, impounds Rufus Woods Lake. The reservoir extends to the base of Grand Coulee Dam approximately 52 miles upstream. The northern portion of the dam structure is within the exterior boundary of the Colville Indian Reservation.

CJD is a "run of the river" dam, which means that it has little or no capacity to store excess water flow. If Grand Coulee Dam releases additional water, the operators of CJD must also increase their water releases to match the incoming flow. A catastrophic breach of Grand Coulee Dam would likely, at a minimum, overtop CJD. A possible outcome would be the failure of CJD as well and the combined release of the stored capacity of both dams.

Grand Coulee Dam is operated by the Bureau of Reclamation (BOR); more than half of the dam structure is located within the external boundaries of the reservation. It impounds Lake Roosevelt, which continues north of the reservation.

There are fourteen water storage dams and fourteen run-of-the-river dams in the Columbia River watershed upstream from GCD. The primary concern of an upstream dam breach affecting GCD would be the failure of Mica Dam in British Columbia. It is the second largest earth fill dam in the world, and its water storage capacity dwarfs that of GCD. A breach of Mica Dam at full pool, with cascading subsequent breaches of two additional Canadian dams downstream, would cause an inundation event involving almost four times the active water storage capacity behind GCD. The inundation wave would not reach Northport, Washington, until approximately 22 hours after Mica Dam failure, allowing significant time to evacuate those at risk.

Both Owhi and Twin Lakes dams were constructed early in the 20th century, raising the levels of existing lakes. The failure of either dam should not result in the complete release of all water in the respective lakes. Dam inundation maps have been prepared in case of failure of either dam. Copies of those maps, and of the entire emergency plans for the two smaller dams, are at Tribal Police dispatch and readily available in case of emergency.

Owhi and Twin Lakes Dams are not staffed at all times, but they are monitored by Early Warning System (EWS) monitors. Although there are EWS monitors on both dams that relay data to the National Monitoring Center, it is conceivable that signs of impending dam failure or rupture would not be noticed until a breach and water release occurs. Notification of an event at these two dams is made to both Environmental Trust, which is responsible for monitoring these dams, and to the Colville Tribal Police Department dispatch.

During the 2017 spring runoff, water flowed over the spillway at Owhi Lake for weeks. If water levels had risen as little as six more inches, water could have eroded away ground near one end of the dam. That dam is currently scheduled for significant maintenance work during 2019 to lessen future risk.

It is rare for dams to fail catastrophically (rupture with immediate water release), and even more rare for them to fail catastrophically without any outward warning signs such as cracks or visible leaks. Major dams, such as Grand Coulee and Chief Joseph, are staffed around the clock and signs of impending failure should be detected. That allows warning to emergency managers and to populations downstream. This also provides the dam operator with time to make emergency water releases to lower the pressure on the dam and slow the rate of dam failure.

It is possible that low-lying lands immediately downstream could be flooded by an emergency water release. A concern below GCD is the area from Coulee Dam to downstream of Elmer City, where there are homes close to the water. The GCD emergency plan does not include any inundation maps for the entire stretch of reservoir/river leading to CJD. It does contain timetables for the arrival of an inundation wave at various points downstream.

In late 2017 GCD released copies of its emergency plan, with limited inundation maps, to local jurisdictions. The inundation maps do not include any areas immediately downstream from the dam. The BOR considers that it has met its emergency notification requirements when it notifies local jurisdictions of a breach or imminent breach of the dam. The ACOE also considers that it has met its emergency notification requirements of the dam. The ACOE also considers that it has met its emergency notification requirements when it notifies local jurisdictions of the dam emergency. Neither BOR nor the ACOE operates a siren or other warning system to notify those immediately at risk downstream in the event of a breach.

CJD has shared copies of its emergency plan since 2014. GCD allowed its plan to be reviewed at the BOR offices in 2012, but did not provide a copy to the Tribe. The Tribe did not receive a copy until the GCD plan was updated in 2017.

Possible Mitigation Strategies: Dam Failure

Concrete gravity dams such as CJD or GCD rarely fail in a catastrophic collapse. There is nothing the Tribe can do to prevent failure and flooding from either dam, whether it takes the form of an emergency water release or a catastrophic collapse. What the Tribe can do is mitigate the consequences of dam failure by warning those at risk. The BOR's own plan states that following a catastrophic dam failure, lives would be immediately at risk from inundation. An inundation wave would reach Elmer City only six minutes after a dam breach.

The Tribe has already partially mitigated this issue. The ACOE plan for CJD, prior to 2013, did not even include notification to the Tribe of a dam emergency. The Tribe is now third on the external notification list, after a 911 call and after the National Weather Service (NWS) is notified. (The NWS operates the Emergency Alert System, or EAS, for storms and evacuations.)

The most recent BOR plan for GCD listed the Tribe as eighth on the notification list, behind two Sheriff's Departments covering areas upstream from the dam where no one would be at immediate risk. BOR has since committed to changing the priorities on their call list.

Early notification by the warning system sensors at Owhi Dam and Twin Lakes Dam may detect potential dam failures in time to evacuate persons downstream and to close roads that could be flooded. The Tribe's only mitigation option may be to warn people downstream of the danger and to close roads.

A summary of possible mitigation strategies includes:

Issue	Possible Mitigation Strategies
1. Lack of ability to quickly notify those	A. Acquire and operate a Tribal
immediately at risk from an emergency	emergency notification or "reverse
water release from Grand Coulee or	911" system
Chief Joseph Dam	B. Consider an alternate notification
	method for emergency evacuation
	warnings, such as radio tone-triggered
	sirens covering several miles
	downstream from each dam
2. Prepare Tribal and other responders	A. Conduct Tribal tabletop exercises
for a dam emergency	addressing dam failure, notification,
	and evacuation scenarios for both
	major dams
	B. Continue to participate in the biennial
	tabletop exercises for Twin Lakes and
	Owhi Lake dams organized by BIA dam
	safety staff

4. <u>Hazardous Materials</u>

During the initial public outreach to determine the major concerns of members and residents, hazardous materials incidents were identified as a significant Tribal concern.

Hazardous materials (hazmat) incidents on the reservation are primarily associated with transportation accidents. Commercial trucks operate across the reservation, and some of them are placarded to show that they carry hazardous substances. The most significant hazmat incident involving transportation occurred in May 2015, when a gasoline tanker overturned in the northern Sanpoil Valley on SR 21 and spilled at least 3,000 gallons of gasoline next to the Sanpoil River. A smaller amount of diesel was spilled. Other known hazmat incidents involved spilled fuel from motor vehicle accidents.

The Tribe does not manage hazmat incidents on state highways; under state law, the Washington State Patrol does. What the Tribe does is provide first response, place barriers if safely possible to contain any spills, and call for hazmat cleanup specialists. Once the first response is over, the Tribe's role is to monitor the cleanup to make sure it is properly completed. The Tribal Environmental Trust department is responsible for monitoring.

Internet and Federal Railroad Administration records searches (the searchable data base covers 1975 to 2018) found no recorded train derailments on the reservation. The Cascade and Columbia River Railroad does carry diesel fuel, propane, and bulk agricultural supplies through the reservation.

There is a local emergency planning committee, or LEPC, in both Okanogan and Ferry counties. LEPCs were established under the Emergency Planning and Community Right-to-Know Act (EPCRA). Some Tier 2 (hazardous material storage) reporting is made directly to the Tribe; other reports are sent to local fire districts and to the LEPC. The Tribe participates in meetings with both LEPCs.

The Tribe's concerns with transportation accidents are not limited to those occurring on the reservation. The Tribe has fishing, hunting, and gathering rights off reservation that can be affected by transportation accidents. A railroad tank car, truck tanker, or pipeline accident causing a spill into the Columbia River or any of its tributaries could severely damage the natural resources upon which the Tribe depends. An example comes from the 2016 Mosier train derailment, where sixteen oil-filled tank cars derailed in the Columbia River gorge. Oil contaminated Mosier's sewage treatment plant and drained into the Columbia River. The Yakama Tribe played a role in the response and post-incident monitoring.

The Tribe is routinely notified by the Washington Department of Ecology of spills affecting traditional areas, such as oil releases into the Columbia River and its tributaries downstream from the reservation. Tribal staff may be called to respond to such incidents off-reservation to protect cultural sites threatened by petroleum products, or to monitor cleanup efforts.

Although salmon habitat is an obvious Tribal concern from hazmat incidents, salmon are not the only culturally significant species that can suffer habitat destruction in such an accident. The Tribe has actively litigated to stop pollution and obtain damages from those responsible for damaging waterways important to Tribal life. The Teck Cominco litigation over pollution of the Columbia River and its fisheries, now in its fourteenth year, demonstrates the Tribe's commitment to protect waterways and fisheries.

Possible Mitigation Strategies: Hazardous Materials

The Tribe has small quantities of sorbents, barrier materials, and disposal drums for small-scale petroleum spills. It is not equipped for any cleanup activities beyond that. The Tribal EMS/Fire/Rescue Department is trained and equipped to respond to, but not to clean up, hazardous materials incidents.

Issue	Possible Mitigation Strategies
1. Tribal responders have limited training	A. Conduct table-top exercises to practice
on hazardous materials incidents	hazardous materials incident response
	 B. Conduct training sessions in how to
	safely use and dispose of the sorbents
	that are in stock
2. Hazardous materials are stored in	A. Identify hazards by reviewing LEPC
commercial facilities in the Okanogan	reports
River floodplain	B. When flooding is possible, contact Tier
	2 reporters to ensure materials have
	been moved to safe locations
	C. Use permitting process to limit future
	facilities in floodplains or other
	locations at risk, such as on
	liquefaction-prone soils

A summary of possible mitigation strategies includes:

5. Governmental and Regulatory Issues

Tribal governments in general and the Confederated Colville Tribes in particular have survived a long history of interference with, or outright attempts to destroy, the Tribal way of life. A short list includes:

- The taking of the North Half of the reservation by Congress, without compensation, in 1892;
- The opening of the reservation to "settlement" in 1916, without compensation to the Tribes;
- The taking of Tribal land for Grand Coulee Dam in 1934, initially without provision to pay for the seized Tribal lands;
- The "Termination Era", when the official policy of the United States was to terminate tribal governments, reservations, and the Tribal way of life;
- The decisions to build dams on the Columbia River without fish ladders, destroying a critical food source for Tribal members without compensation;
- And many more.

Another example with long-term consequences involves mining. Until 1934 mining claims could be filed within the reservation. There was little oversight during mineral exploration and production, and there was little or no reclamation after mining operations ended. Elsewhere in the western United States, the Department of the Interior makes funding available for the reclamation of abandoned mine lands. However, the abandoned mine land reclamation program excludes Indian reservations, even though that Department was responsible for this problem. To this day the reservation is dotted with abandoned mines, some of which pose a fall or collapse hazard.

Unfortunately, these examples—many of which occurred within living memory—have consequences for the Tribes today. Further, actions similar in spirit or effect to those listed above still occur. Some samples of these types of issue are addressed in this section, following.

Federal Funding

Many Tribal programs are dependent upon Federal funding. This is not limited to programs funded under the Indian Self Determination and Education Assistance Act, Public Law 94-638, known as "638" programs. Other Tribal functions are at least partly funded by grant funds received either directly from the Federal government, or by Federal grant funds passed through from Washington State entities (such as public health grant funding).

Such funds are subject to the budget priorities set by the President and Congress, and can be taken away at any time. For a cautionary example, one needs to look only at the financial crisis that developed in Puerto Rico when federal tax laws (designed to encourage manufacturing there) changed. Manufacturers that had relocated to Puerto Rico began leaving when the tax advantages expired. Jobs vanished, and the local economy in 2006 started a long decline as a direct result of decisions made in Washington D.C.

The Tribe is similarly vulnerable to decisions that affect the timber, livestock, and gaming industries, or to decisions to underfund 638 programs vital to the day-to-day health and safety of Tribal members.

Federal Extinguishment of Tribal Rights

Since 1991, thousands of acres of land owned by BLM within the North Half of the Colville Reservation have been transferred into private ownership. ("North Half" refers to that area of the 1872 reservation forcibly taken from the Tribes by Congressional act in 1892 and moved into the public domain for "settlement".) According to BLM data, between 1991 and 2008 more than 3,800 acres of public lands in Ferry County alone---all of which were within the North Half and clearly subject to Tribal usage rights---were transferred into non-Federal ownership.

These transfers were based upon a BLM resource management plan that dated to the 1980's. BLM is currently engaged in a resource management planning effort that will set land disposal, exchange, and management priorities for the foreseeable future. Despite seeking to join that land management planning effort as a "cooperator", the Tribe's effort ended when the BLM regional office in Portland declined to approve a Memorandum of Understanding between the Tribe and BLM.

Obsolete Federal Lands Actions

A review of the Bureau of Land Management (BLM) Master Title Plats for lands within the Colville Indian Reservation show a number of power site reservations. These include lands within sections 10, 14, 15, and 24 of Township 29 North, Range 25 East. The plats identify the source of this withdrawal as "SO Pwr S Res 764" (a "Secretarial Order" for a power site reservation, numbered 764) dated January 15, 1945. It appears that some of these withdrawn lands may have been used in the construction of Chief Joseph Dam, but other still-withdrawn lands do not appear to have been used for any power-related purposes.

A similar concern involves a listed Executive Order dated January 3, 1917, shown on the plats, purportedly establishes a power site reservation (numbered 564) encumbering trust lands within sections 3, 4, 8, 9, 17, 18, and 19 of Township 29 North, Range 26 East.

The realty staff at the BLM office responsible for maintaining records for the area does not have a copy of this Secretarial Order, so it is impossible to determine why this land use reservation exists. A review of the list of executive orders issued January 3, 1917, reveals that six executive orders were issued that day. None of them appears to have established this power site reservation.

It is difficult to understand why encumbrances on Tribal lands are still shown on the official master title plats, when there is apparently no authority to support those encumbrances. In the alternative, if an authority for either withdrawal can be identified, it is still difficult to understand the need for the continuing validity of unused withdrawals more than a century old.

These are only two of the obsolete, or impossible to verify, withdrawals or similar lands actions shown on master title plats both within and outside of the Colville Indian Reservation. There are a number of such reservations shown on the master title plats within the North Half, and elsewhere, for potential power projects which may no longer be economically viable, will never be needed, or both. Off reservation and outside of the north half, such withdrawals are still a Tribal concern because they may impact federal- and state-managed lands within the traditional areas of the Tribe. Those withdrawals or land use reservations could, if the original projects are ever pursued, interfere with or end traditional uses of those lands by Tribal members.

Possible Mitigation Strategies: Governmental and Regulatory Issues

The Tribe retains lobbyists to protect Tribal interests in both the state capital and the nation's capital. These representatives have arranged for the Tribe's voice to be heard in Congressional hearings, at the state capital, and before government agencies. Examples of their successes include the state law, passed in 2017, that authorized the use of dental therapists. These providers can provide dental services to Tribal members on reservations that, in the past, could only be provided by dentists. Reservations are significantly undeserved when it comes to dental care, according to the federal Health Resources and Service Administration, and this change in state law was made to increase the availability of dental care on reservations.

Lobbying is more than contacting legislators and executive branch officials, and it is more than just a public relations strategy. Lobbyists monitor the changing regulatory as well as legislative

environment, and provide early notification to the Tribe about proposed changes in policy and regulation.

In addition to specific Confederated Colville Tribes' lobbying efforts, the Tribe is also supported on both the state and national levels through such organizations as the Affiliated Tribes of Northwest Indians (ATNI), National Congress of American Indians (NCAI), Northwest Tribal Emergency Management Council (NWTEMC), and others. These groups are valuable because they also monitor changes in both federal and state law and regulation.

Changes in law, regulation, and policy—and more importantly, proposed changes—that may affect tribes are then identified early. It is easier for a Tribe to be heard, and to be effective in influencing those changes, when Tribal contact with the proponents is made and comments provided at the earliest possible moment.

The Tribal Law and Order Act of 2010 (Pub. L. 11-211) is an example of successfully lobbying at the highest national levels; that effort was triggered after a 2007 NCAI resolution brought attention to the issue. That law worked toward fixing significant shortcomings involving Tribal jurisdiction over serious crimes on reservations.

The need for active lobbying isn't limited to changes in law. An example of a Tribal success in the policy realm comes from FEMA's first attempt at drafting standards for Tribal disaster declarations in the wake of the Sandy Recovery Improvement Act of 2013. That Act authorized, for the first time, a Tribe to request its own presidential disaster declaration without going through the governor of a state.

FEMA drafted its first attempt at rules for Tribal declarations, and a review by the Colville Business Council considered them unnecessarily restrictive. The Tribe submitted comments directly to FEMA, and the Council met with FEMA representatives in person, to share the Tribal perspective on the FEMA draft. The Tribe also circulated its draft comments to other Tribes, to encourage them to raise the same issues as well. FEMA listened to the comments from multiple Tribal sources, revised its draft, and ended up with a policy that was far more workable for Tribes than the first attempt.

To continue to propose and/or mitigate changes in policy, regulation, and law that may affect Tribes and their membership, the Tribe will continue its policy of engagement with regulatory agencies as well as with legislators. The Tribe will continue to submit formal written comments on proposed policy and regulatory changes, to protect Tribal sovereignty as well as the interests of all members. A summary of possible mitigation strategies includes:

Issue	Possible Mitigation Strategy
1. Changes in law and policy at both State	A. Continue monitoring proposed
and Federal level may adversely affect	regulations and proposed changes in
Tribes	law for adverse effects.
	B. Submit detailed comments on
	proposed regulatory changes, to
	minimize adverse effects and promote
	positive changes.
2. Tribal issues may not be considered at	A. Continue to employ lobbyists to
State and Federal levels	advocate for Tribal issues
3. A single Tribe may not have the ability	A. Explore opportunities for inter-Tribal
to influence policy- and law-makers	collaboration to increase influence at
	the State and Federal level, including
	but not limited to ATNI and NCAI
4. Federal and State land management	B. Continue rapid response to
agencies, with control over lands in	consultation notices; attend resource
traditional territories, may affect Tribal	management plan meetings by those
hunting, fishing, and gathering rights or	agencies to monitor for changes that
fail to protect cultural sites	could affect Tribal rights
5. Obsolete Federal lands actions may	C. Pursue cancellation of obsolete land
affect Tribal control over lands within	withdrawals that affect Tribal lands,
the reservation and traditional	whether trust land or in traditional
territories	territories

D. Natural Hazards

6. <u>Disease</u>

Historically, disease all but destroyed the peoples that now constitute the Confederated Colville Tribes. Smallpox crossed the North American continent and infected tribes in Eastern Washington even before the first Europeans arrived; the first smallpox epidemic occurred between 1770 and 1780 (Cebula, 2003). When the Lewis and Clark expedition reached the Columbia River in 1805, they noted old men with smallpox scars. Additional smallpox epidemics occurred in 1800, 1825, and 1830. By 1802, smallpox alone had caused a loss of an estimated 45% of the original population. The post-1802 smallpox epidemics, a scarlet fever epidemic in 1844, a measles epidemic in 1847, and the spread of malaria to what is now Washington State killed 75% of that remaining population by the mid-nineteenth century (Hunn, 1990; Ackerman, 1990).

The human population on the reservation is today as susceptible to—and as protected from disease as any other human population. Not often considered, however, is that the reservation's economy can be severely impacted by plant and animal disease. In addition to the economic impact, some animal diseases have the potential to jump to the human population.

Finally, some animal diseases—such as Chronic Wasting Disease (CWD)—have the potential to permanently alter or outright destroy traditional cultural practices of Tribal members and their descendants.

<u>Human Disease</u>:

The Colville Service Unit of the Indian Health Service (IHS) operates two clinics within the reservation: the main IHS facility at Nespelem, and a satellite clinic in Omak. It is currently planning to replace the Omak facility.

The Tribe operates two clinics: the main Lake Roosevelt Community Health Center in Inchelium, and a smaller clinic in Keller. These clinics are partially funded by the Indian Health Service under a public law 93-638 contract to support Tribal members. The two Lake Roosevelt clinics also serve non-members through their individual health insurance or as private pay patients.

All of these clinics comply with mandatory reporting guidelines for communicable diseases. In addition, IHS holds annual vaccination clinics to make seasonal influenza immunization available to all Tribal members.

As with other rural and economically depressed Tribal nations across the country, the Tribe faces issues with high rates of suicide, alcohol abuse, drug abuse, and a shortage of both addiction treatment facilities and mental health support. To address this shortage, the Tribe is currently planning the construction of a residential addiction treatment facility to be built in the Keller area.

Because the threat from human disease is considered to be very low, no further mitigation efforts are needed. Human disease will not be addressed further in this plan.

<u>Plant Disease</u>:

The primary commercial crops on the reservation are orchard fruit, wheat, corn (produced primarily for livestock use), and hay.

Commercial orchard fruits are produced by large agri-business operations, with multiple orchards on and off reservation. Fruit is produced on both fee lands and on lands leased from the Tribe. No problems with plant disease affecting orchard production within the reservation have come to the Tribe's attention. Only one disease, powdery mildew affecting cherry production, has caused significant infestations in the past thirty years in Eastern Washington.

In 1996, a single small field of durum wheat outside of Moses Lake was found to be infected with karnal bunt, a wheat disease that destroys the economic value of harvested wheat. An exotic wheat disease first identified near Karnal, India in the 1930's, at the time of its discovery near Moses Lake an outbreak was taking place in Arizona, California, and Texas. Other nations refuse to purchase wheat from areas where karnal bunt is known to exist, affecting the overall marketability of wheat in regions where the disease exists. Moses Lake is less than eighty miles by road south of the reservation, and the infestation posed a threat to Eastern Washington's agricultural economy. Eastern Washington is a major wheat producing region.

The Moses Lake infestation was successfully eradicated. There was a subsequent multi-state outbreak in 2001, but it did not extend to this state. As of the spring of 2018, Karnal bunt disease in the United States was confined to Arizona.

There are no other known significant threats to crop production on the reservation other than drought and climate change.

Because the threat of plant disease is considered to be very low, no further mitigation efforts are needed. Plant disease will not be addressed further in this plan.

Animal Disease:

Chronic Wasting Disease (CWD), mentioned above in the introduction, has the potential to severely damage or destroy traditional Tribal hunting practices. It is a spongiform encephalopathy that infects cervids (deer, elk, and moose) and is in some ways similar to the

so-called "mad cow" disease (bovine spongiform encephalopathy, or BSE). BSE can be transmitted to humans, who undergo mental deterioration and eventually death. CWD has not been shown to infect humans, but hunters are routinely advised not to eat any animals that could have been suffering from CWD. The Washington State Department of Fish and Wildlife has been testing for CWD since 1995, and has never had a positive test result.



Source: <u>https://www.nwhc.usqs.gov/images/cwd/cwd_map.jpg</u>, retrieved 2 April 2018

CWD has been detected in a captive cervid population in Western Montana, and in wild animals in both Northern Montana and Utah. It has never been detected in Washington or an adjacent state. If it does spread to Washington, the effect on Tribal hunters and traditional practices could be devastating. Subsistence hunting, as well as ceremonial hunts, could be greatly impacted if harvested cervids could not be safely consumed.

The Tribe has previously addressed CWD in its game management plans, including the 2012 Interim Management Plan prepared by the Tribe's Fish and Wildlife division. Since CWD is already in the wild in the Rocky Mountain States, the arrival of CWD on the reservation may be inevitable. BSE was not known to occur in the United States until 2003 when the first case was discovered in Mabton, near Yakima, within Washington State. The infected cow came from Canada, where the first known North American case occurred in 1993. An unrelated case occurred in Texas in 2005, involving a cow that had spent its entire life in that state. Occasional cases have occurred since then in both the U.S. and Canada.

Another danger from BSE is financial. Cattle production is an important economic activity on the reservation, and that sector of the economy could be devastated by the detection of a single case of BSE and a perception that reservation cattle were unsafe. During the BSE outbreak in the United Kingdom ending in the 1990's, 180,000 animals were euthanized to control the epidemic.

BSE is not the only disease that could destroy the livestock sector of the Tribe's economy. Foot and Mouth Disease (FMD) occurred in the U.S. in the past; there were nine documented outbreaks between 1870 and 1929. An outbreak occurred in Saskatchewan, Canada, beginning in late 1951; it was traced to an immigrant who had brought it, apparently on his clothing, from a farm in West Germany. When FMD broke out in the United Kingdom in 2001, more than 3.5 million animals were euthanized to stop the disease's spread. The only effective tool to stop either disease is mass slaughter of infected animals, and of all potentially susceptible or exposed animals nearby.

Domestic sheep and goats pose a threat to the reservation's wild population of bighorn sheep, particularly due to mycoplasma pneumonia. This organism can be present in domestic sheep and goats while causing no more than mild illness. However, it causes devastating illnesses and death in the bighorn sheep population.

The final disease to be discussed in this section is Avian Influenza (AI). In December 2014, AI was detected in northwestern Washington after first surfacing in British Columbia the previous month. On January 27, 2015, Highly Pathogenic Avian Influenza (HPAI) was confirmed in a privately owned 5,000-bird flock of poultry (primarily ducks) just north of Riverside, Washington. HPAI in a small flock near Oroville was confirmed on February 3, 2015.

The Washington State Department of Agriculture responded to this event, and followed the standard response plan of euthanizing infected and exposed animals while establishing a quarantine zone. The only significant issue with the State's response was that it announced a quarantine that extended onto the reservation, without contacting or consulting with the Tribal government before doing so.

The Tribe cooperated with the State in monitoring for infected birds, and worked together to keep the disease from spreading. The Tribe already has a program to examine found raptor carcasses to determine if they died from lead poisoning. During the AI outbreak, Tribal Fish and Wildlife tested found carcasses for AI as well.

Possible Mitigation Strategies: Disease

The primary disease-related concern for Tribal members, as evidenced by the survey and the heat map exercise, was that of animal disease. The threat of human diseases is considered very low, and an emergency plan is in place in the event of a human pandemic. The threat of plant disease is also considered to be very low. Mitigation planning is needed only for animal disease.

As discussed in the "Hazards and Threats" section of this document, the primary threats to the Tribe come from Avian Influenza (AI), from the potential spread of Chronic Wasting Disease (CWD) to the reservation, and from contagious animal disease affecting either domestic livestock or wild animals.

Animal Disease	Possible Mitigation Strategies
1. CWD may spread to reservation	A. Conduct outreach efforts to educate
	hunters in how to recognize CWD,
	report possible occurrences, and not to
	eat potentially infective tissue
	B. Tribal NRE officers and/or fish and
	wildlife staff respond immediately to
	any suspected occurrences to verify
2. Mycoplasma infection may spread to	A. Do not issue any grazing permits for
wild bighorn sheep from domestic	sheep or goats on the reservation
sheep and goats	B. Where sheep or goats are grazed on
	private lands, keep them from
	interacting with bighorns through
	fencing etc.
3. Other diseases of cattle may spread to	A. Continue existing herd surveillance for
reservation	BSE or other infestations
4. Al or HPAI may spread to reservation	A. Monitor news media and State

Here is the summary of possible mitigation strategies for this hazard:

agriculture department releases for
outbreaks near reservation
B. Increase monitoring, work with State
on quarantine restrictions, if outbreak
occurs on or near to reservation
C. When outbreaks are in area, test any
dead raptor carcasses found to
determine if AI/HPAI contributed.
Consider testing other species if
carcasses found

7. <u>Drought</u>

Climate researchers sometimes differentiate between agricultural drought, meteorological drought, hydrological drought, snow drought, and ecological drought; others may add socioeconomic drought as a category as well. These all address the impacts of a drought (Abatzoglou 2018).

"Drought", in the context of this plan, refers to a period of abnormally low rainfall. It may or may not include a lack of water for other purposes. A drought can occur when reservoirs remain near normal levels, when surface water is still available for irrigation, and where springs have not run dry. Depending upon the time of year a drought begins, it may not significantly affect some rainfall-dependent crops (such as winter wheat).

This simple definition is chosen because it is adequate to describe the Tribe's concerns relating to drought. (Climate change is addressed in a section of its own.) For the purposes of this plan, drought is of concern because of its impact upon wildland fires, fisheries, other culturally important plant and animal species, and agriculture.

The connections between drought and the above concerns are very clear. Forests that are drier than normal may catch fire more easily and burn more completely; instead of low-intensity creeping fires that clear out undergrowth, they may instead be raging infernos that destroy large quantities of marketable timber, destroy habitat for the plants and animals upon which Tribal culture relies, and cause other long-term damage (such as winter silt and mud runoff from burned lands into streams, destroying future fish runs). If there isn't enough rainfall at the right time, crops won't grow. And if the rivers and streams are low, anadromous fish cannot reproduce. The fallout from that comes in the form of future salmon, steelhead, and lamprey runs that are too small to sustain the fishery.

During the 2015 drought year, when large wildland fires later devastated the reservation, there was also a massive fish loss due to low water levels with high water temperatures. The sockeye salmon run on the Okanogan River was the lowest in years. According to NOAA's 2016 Sockeye Salmon Fish Passage Report, only 2% of the Okanogan sockeye salmon that passed Bonneville Dam survived to Lake Osoyoos to spawn. During the previous five years, survival rates ranged from 25% to 50% over the same distance.

Drought doesn't occur only when streams are low, reservoirs emptying, with wildland fires either burning or imminent. The official web site <u>www.drought.gov</u> shows the following drought conditions for the reservation as of September 25, 2018:



Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current 9/25/2018	0.0096	100.00%	48.33%	9.80%	0.00%	0.00%
Last Week 9/18/2018	0.0096	100.00%	60.16%	17.31%	0.00%	0.00%
Three Months Ago 6/26/2018	42.81%	57.19%	11,98%	0.00%	0.00%	0.00%
Start of Calendar Year 1/02/2018	100.00%	0.00%	0.00%	0.00%	0.00%	0.0096
One Year Ago 9/26/2017	4.97%	95.03%	63.66%	0.00%	0.00%	0.00%

Source: https://www.drought.gov/drought/states/washington downloaded October 3, 2018

Most of the reservation is shown as being in the lowest category of drought, "abnormally dry." The remainder, the northwest portion of the reservation, is shown in the next higher category of "moderate drought."

During any year, an area may suffer from abnormally low rainfall. The data above shows that as of the start of calendar year 2018, no portion of Washington State was in drought. As the year progressed and became abnormally dry, the reservation slipped into drought along with the rest of the state.

To date, the primary known effect of the 2018 drought has simply been that the area has seen less moisture. There have been no catastrophic wildland fires on the reservation, no reservoirs running dry, and groundwater levels have not sunk to the point where wells no longer provide

water. Long term drought, or a severe short-term drought, can contribute to all of those problems.

In 2015, the catastrophic wildland fires took place during a drought summer. Washington's mountain snowpack that year was so low that in May of 2015 the governor declared a statewide "drought emergency." Total precipitation in the form of snow and rain over the winter of 2014-2015 was near normal. What was different was that much of the precipitation fell in the form of rain earlier in the year than normal, due to warmer than normal temperatures. That rain helped melt the snowpack early. The loss of snow meant that midand higher-elevation lands dried out sooner than normal. This caused drier and warmer fuels early in the season, increasing fire risk and increasing the energy release component of fires. These were direct precursors to a catastrophic fire season.

A significant effect of drought may be the loss of habitat, especially during long-term drought. Drought can impact deer, elk, and moose numbers due to environmental stress from lack of food. In addition, drought is a stressor that can increase animal diseases.

During the 2015 drought, "bluetongue" (a viral disease of deer) killed large numbers of deer throughout Eastern Washington. News reports stated that 68 whitetail deer carcasses, killed by bluetongue disease, were collected within the town of Colville in Stevens County that summer. During another drought year, 1996, 81 deer carcasses were picked up within the same town. Those deer all died of a similar disease, Epizootic Hemorrhagic Disease (EHD).

Other drought years correlated with EHD outbreaks were 1988 and 2004. Drought is not the only stressor that can cause an increase in deaths from these two diseases, but it is a significant one. Because of the importance of hunting to Tribal culture and life, a deer die-off during a drought would be a significant impact to the Tribe.

Possible Mitigation Strategies: Drought

While the Tribal government has no way to influence how much precipitation falls, and may not control instream water flows from off-reservation, it has options for dealing with drought.

The reservation has no communities dependent upon surface water for domestic use; all community water supplies come from wells. Unless there is a years-long severe drought that causes water tables to drop below the reach of existing wells, Tribal members and residents will not go without water. Individual well-dependent homes may have wells run dry in a lesser drought and may have to seek Tribal, IHS, or other assistance. Unlike some other governments

that draw their drinking water from rivers, the Tribe is somewhat insulated from the loss of domestic water supplies during drought. The Tribe will still need to preserve those water resources, for emergency livestock/wildlife needs and for wildfire protection.

The primary hazards from a drought revolve around damage to fisheries from low instream flows combined with high water temperatures, loss of wildlife due to loss of water, damage to the livestock industry and other agriculture, and the increased risk of devastating fires due to dry vegetation. In addition, drought may interfere with the availability of traditional foods, including huckleberries, roots, and other food and medicinal plants.

Drought	Possible Mitigation Strategies
1. Monitor permitted grazing when	A. Reduce grazing season to preserve
drought sets in, to stay within the	ground cover and prevent erosion that
grazing prescription (percent utilization	would increase future runoff
of shrubs, forbs and grasses)	B. Reduce permitted grazing numbers
	(AUMs) to reduce additional impact of
	grazing upon drought-related poor
	plant growth, to preserve ground cover
2. Minimize wildlife losses	A. Improve water sources for wildlife with
	temporary stock ponds, guzzlers, or
	water delivery
3. Ensure instream flows necessary for	A. Initiate government-to-government
migrating anadromous fish	consultation to protect fish stocks and
	reproduction with sufficient in-stream
	flows and fisheries monitoring
	B. Consider restrictions upon fishing to
	preserve limited stocks for future
	C. Consider active intervention to move
	anadromous fish upriver if low water
	blocks spawning or traps fish
4. Preserve domestic water supplies	A. Initiate a water conservation program
	when needed, including household
	use, lawn watering/car wash
	restrictions, leak reductions
	B. Inspect/repair any leaking water mains

Here is a summary of possible mitigation strategies for this hazard:

	or fire hydrants
5. Increase fire protection activity to	A. Strictly enforce burning restrictions
prevent wildland fires	B. Prohibit fireworks
	C. Raise industrial fire protection level
	(IFPL) on all lands
	D. If extreme fire danger, close Tribal
	lands to all motorized vehicles or to all
	entry and use
6. Search for additional water supplies	A. Explore short-term purchase or lease
	of unused/underused water rights
	from fee land owners
	B. If Tribe has leased any water rights,
	explore whether the Tribe can
	temporarily revert them during
	drought emergencies
7. Obtain State or Federal assistance	A. Consider declaring a drought
	emergency, including in concert with
	other jurisdictions

8. Earthquake

In November 2011, the U.S. Department of Homeland Security (DHS) issued a report entitled "Analytical Baseline Study for the Cascadia Earthquake and Tsunami." It was prepared by DHS' Homeland Infrastructure Threat and Risk Analysis Center (HITRAC), and is commonly referred to as the "HITRAC" study. This study attempted to identify the effects of a catastrophic earthquake along the offshore Cascadia fault, a magnitude 9.0 on the 10 point Richter scale, on Washington State west of the Cascade mountain range.

The last known earthquake of that strength or higher occurred in late January 1700, and the tsunami it generated struck Japan. The date of the earthquake became known by working backwards from the known date on which the tsunami reached Japan.

Although 1700 predated written history in what is now Washington, it did not predate oral history. It isn't clear how far to the east the earthquake was felt, nor the strength of the earthquake in what is now Eastern Washington. There is a story indicating that it was felt strongly as far east as the Yakima Valley. In 1889 G.B. Kuykendall collected that story from a

Yakama native that described the earth shaking. It shares other common elements with stories from coastal tribes, stories that have been tied to the 1700 Cascadia earthquake (Ludwin, 2002). This is the only identified story from east of the Cascade Mountains that could reasonably be associated with the 1700 Cascadia earthquake.

A well-known landslide was the Bonneville-Cascade landslide that temporarily dammed the Columbia River, creating a lake more than 100 miles long; it is the subject of at least one Colville Tribal legend (Budwha, 2002, citing Clark's 1953 collection of legends). This landslide was initially dated by research in 1978 as occurring around the year 1100. However, more recent studies indicate that the massive slide occurred much later. Samples from submerged trees at separate sites in the temporary lake behind that landslide have now been dated. They were killed by submergence circa 1699. Lichen growth studies also date the landslide as occurring between 1670 and 1760. That raises the possibility that this landslide is an eastern Washington example of damage caused by the 1700 Cascadia earthquake (Hill, 2002).

One major earthquake affecting the Colville Indian Reservation is thoroughly documented in the historical record. That is the series of earthquakes and aftershocks that began on December 14, 1872, and lasted into 1874. Known variously as either the North Cascades or Lake Chelan earthquake, recent research has attempted to better determine the magnitude and the epicenter.

The earthquake was felt from Salem, Oregon, in the south to as far north as central British Columbia. In the west, people ran out of buildings in Seattle and Victoria when they felt the earthquake. Items fell off shelves as far away as the town of Colville, in Stevens County (Nisbet, 2015).

Closer to the epicenter, the earthquake damaged a trading post built near the mouth of the Wenatchee River and threw settlers to the ground. The third aftershock caused a landslide approximately four miles north of the mouth of the Entiat River, which completely dammed the Columbia River. Miners who crossed the Columbia River on the dam were stranded on the wrong side when the river broke through the landslide (Hackenmiller, 1995). As much as five feet of subsidence occurred at the mouth of the Wenatchee River (Nisbet, 2015).



The Columbia River rose at least fifty feet overnight after the landslide, flooding fields and a trading post. Significant subsidence, and major landslides, occurred as far east as Whitestone Rock on the Columbia River as well as at the mouth of the Spokane River. The only documented fatality occurred when a Spokane woman, upset by the earthquakes, ran away from her community near the mouth of the Spokane River and was later found dead (Nisbet, 2015).

Liquefaction occurred in many areas, from the Wenatchee to the Spokane River shorelines and surrounding areas. A Spokane tribal member, many years later, said that the ground "boiled like a big pan of boiling gravy" during one of the earthquakes (Nisbet, 2015).

There were no seismographs in Washington at the time of the earthquake, so it was impossible to determine the epicenter. Various studies have moved it to near Canada and all the way south to Lake Chelan. One of the reasons for placing the epicenter at or near Lake Chelan is because that is where aftershocks continued to be felt for more than two years, after they were no longer felt in a wider area.

Other changes occurred there, including the eruption of a fifty-foot geyser near the outlet to Lake Chelan. The geyser gradually declined over the winter, and eventually became a spring

that continues to flow today. Several other smaller geysers two to three feet in height were seen (Nisbet, 2015). Since there are Colville Tribal land holdings in this area, including a Tribal casino, another earthquake in this area could significantly affect the Tribe today.

According to Nisbet, various studies have assigned not only different locations for the epicenter of this earthquake, but have also assigned different strengths on the Richter scale. A 1976 study placed it in Canada, at a 7.0 to 7.3 magnitude; another set it at 7.4 but at Ross Lake; still another placed it at Lake Chelan, but at a magnitude 6.8 (Nisbet, 2016).

There is another way to evaluate an earthquake's strength, and that is by applying observations against the twelve-level Modified Mercalli Intensity Scale. The Mercalli scale is more focused on the damage an earthquake did, or can do, rather than just the strength of the movement. The type of rock or soil through which the earthquake is conducted, and the frequency of the various earthquake waves, can make a major difference in the amount of damage that occurs.

A Jesuit missionary, Father Urban Grassi, was on the Colville Indian Reservation shortly after the earthquake and was a regular visitor. In 1874 he wrote this about the Sanpoil Tribe:

This Tribe more than any other on the Columbia for the past two years has been visited by God with earthquakes that in some places has sunk the ground, in others has piled it up greatly, and in others has broken the sides of the mountains. (Nisbet, 2015)

When contemporary accounts are compared to the Mercalli scale, the 1872 Chelan earthquake is considered to be intensity VIII to IX. Here is a chart to place that in context:

VII	Severe	Difficult to stand or walk. Damage to poorly built masonry buildings. Some cracks in better masonry buildings.
VIII	Destructive	Extensive damage to unreinforced masonry buildings. Fall of some masonry walls. Wood-frame houses moved on foundations if not bolted
IX	Violent	General panic. Damage to masonry buildings ranges from collapse to serious. Wood- frame structures rack, and, if not bolted, shifted off foundations. Underground pipes broken.
x	Very Violent	Poorly built structures destroyed with their foundations. Even some well-built wooden structures and bridges heavily damaged and needing replacement.

Source: Oregon Office of Emergency Management slide presentation, partial screen image of slide 15, captured October 1 2018 from <u>http://wleog.org/wp-content/uploads/2014/06/2015-hour-and-a-half-Cascadia-Infrastructure.pdf</u>

In 1873, following the earthquake, there was famine on the reservation because people were not able to gather foods as they normally did (Ackerman, 1996).

Earthquakes can cause soil liquefaction as well as landslides. Although detailed liquefaction zone and landslide maps are not available for the reservation, the State has generally mapped liquefaction zones and identified historical landslides statewide. Until this planning project began those maps were not being used for planning and permitting by the Tribe.

Earthquake is a concern for emergency planning because the danger of it, on the reservation, has been seen as very remote. Statewide public planning efforts are focused on preparation for the eventual Cascadia Subduction Zone earthquake that may cause tsunamis, destroy much of the infrastructure of the Puget Sound area, and kill thousands. But as shown above, not only would such an earthquake affect Eastern Washington, the reservation has its own history with severe earthquake.

Further, an unknown but presumably large percentage of the structures on the reservation were built before the Tribe instituted a robust permitting and building code enforcement process. The Tribe has formally adopted both the International Building Code and the International Residential Code. Older structures, however, have not been evaluated against either standard. The 1872 earthquake and its effects are not well-known on the reservation. It is not clear that older structures were built to withstand that significant an earthquake.

An earthquake issue associated with major hydroelectric dams is that of "induced seismicity." This is thought to be caused by the weight of water in a reservoir forcing water into the underlying rock, lubricating existing faults that friction had kept stable. Especially during the first years of a reservoir's existence, this lubrication may cause earthquakes. Such earthquakes often lessen in both strength and frequency with time. There are no reported instances of this type of earthquake associated with either Grand Coulee or Chief Joseph dams.

Potential Mitigation Strategies: Earthquake

Issue	Possible Mitigation Strategies
1. There is little awareness of EQ	A. Begin annual participation in the Great
potential/danger on reservation	Washington Shakeout
	B. Plan to participate in 2022 statewide

Here is a summary of possible mitigation strategies for this hazard:

	EQ exercise
	C. Obtain EQ outreach materials for
	booths at events, visits to schools, and
	begin "Two Weeks Ready" education
	program
2. Improve Tribal resilience	A. Professionally assess which major
	structures may survive a significant EQ,
	build response/recovery plans around
	them
	B. Send appropriate staff to ATC-20
	course to learn to assess EQ damaged
	structures
	C. When permits are issued to remodel
	structures, conduct an assessment to
	identify recommendations to identify
	seismic safety issues such as unbraced
	cripple wall foundations
3. Improve EQ emergency response	A. Locate funding to re-establish CERT
capability	program, and equip CERT rescuers
	B. Conduct collapsed structure rescue
	training
	C. Identify local source of cribbing and
	wedges for collapsed structure rescue
4. Identify potential liquefaction zones	A. Locate funding to conduct a
	liquefaction survey of the reservation
5. Limit potential for future EQ damage	A. Consider mapped fault lines, EQ-
	caused landslides and liquefaction
	potential when issuing new building
	permits
	B. Deny permits or require site mitigation
	in high-risk areas prior to permitting

9. <u>Flood</u>

Flooding is often spoken about in terms of "100 year floods", "500 year floods", and so on. A 100-year flood is one that has a 1% chance of occurring during any single year. A 500-year

flood would have one-fifth of a 1% chance of occurring during any single year. A 50-year flood, on the other hand, would have a 2% chance of occurring during any year. It is possible to have a major flood, even at the 100-year occurrence level, for two or more years in a row.

FEMA maintains flood risk maps for the entire nation; if FEMA has mapped an area for flood risk, the map is available on-line. The State of Washington also assembles flood risk maps, from the FEMA data; those maps are also available on-line. As of October 2018, neither source shows any flood risk maps for any portion of the reservation outside of the Okanogan River corridor.

In 2015, FEMA issued a "Discovery Report" concerning their re-evaluation of flood risk mapping for the Okanogan River basin. FEMA has been requested by the Tribe to map other watersheds at risk on the reservation, and Tribal data has been shared with the FEMA contractors. When that work is completed, the results will be incorporated within the next revision of this plan.

In February 2017, a warm and intense rainfall on snow triggered flash flooding on the reservation. The most significant damage occurred at the Mt. Tolman Fire Center (MTFC), where both the Tribal building housing the BIA wildland fire program and an adjacent building, housing the Natural Resource Enforcement program, were flooded. This was at least the third time that the MTFC has flooded.

Flooding is not limited to the main channels of rivers and streams. A severe rainstorm, especially upon fire-scarred lands not yet covered with new vegetation, can cause damaging



"sheet flow" runoff where soils and debris are moved by flowing sheets of water. This has occurred repeatedly around the reservation; the Sanpoil Valley during the winter of 2014-2015, and the Haley Creek Road area during 2015-2016 are two recent examples. In both instances, there was significant road damage.

Sheet flow in the Sanpoil Valley below Devil's Elbow Fire burn scar, February 2015

The reservation has been impacted by flooding on four different rivers:

• the Columbia River, along the eastern and southern boundaries of the reservation;

- the Nespelem River basin, including the Nespelem and Little Nespelem Rivers;
- the Sanpoil River, running down the center of the reservation and joining the Columbia River/Lake Roosevelt south of Keller; and
- the Okanogan River, which forms the western boundary of the reservation.

In addition to these rivers, there are several creeks that have flooded in the past and damaged structures as well as roads. Storms in the winter of 2015-2016, after the major fires of 2015 denuded the landscape of vegetation and increased storm runoff, contributed to flooding along



Morningstar Ministries, Wannacut Creek, February 2016

the normally intermittent Wannacut Creek.

That flooding surrounded one modular structure used by a church group; hasty defense work was needed to protect a nearby residence from flooding. Other creeks of concern for flooding include Stranger Creek, Hall Creek, and Omak Creek.

In the past, stream gage data was collected on three creeks: Hall Creek from 1913 to 1929, and again 1972-1974; Stranger Creek from 1914 to 1929; and Omak Creek from 1972 to 1974 and again from 1976-1979. Twin Lakes Dam releases into Stranger Creek are monitored for dam safety (for ruptures and leaks), but the actual stream flow is not. The only creek being monitored today is Omak Creek. In 2013 the Tribe installed a continuous monitor that provides real-time water flow and height data to the USGS.

Columbia River

The Columbia River drainage upstream from the reservation is now regulated by at least twenty-eight dams, and is monitored for both in-stream flow and stream height. Snowfall and rainfall in the basins that feed the upper river are measured in many places; this data allows, during an average snowfall year, reasonably accurate forecasting of river levels for the spring runoff.

The entire shoreline of the reservation along what was once the free-flowing Columbia River is now a reservoir shoreline. Major flooding along the Columbia River occurred in 1894, 1948, and 1996. The 1894 flood inundated parts of Portland, Oregon, and is the first flood that is clearly recorded in contemporary written records. Subsequent floods, such as the 1948 and
1996 events, have been partially controlled by Grand Coulee and other dams. The 1948 and 1996 Columbia River floods had little impact on Tribal lands.

Nespelem River

Of the three remaining rivers on the reservation, there is a lack of historical data and stream flow monitoring for the Nespelem River. River gage data for the Nespelem River was collected from 1911 to 1929, but those gages no longer exist; the last data gage on the Nespelem River, which operated at a mill pond for only two years, was discontinued in 1974. There is no network of snow or rainfall monitors to provide data for runoff or flow forecasts. Although the Nespelem River Basin is small, draining approximately 122 square miles, it has apparently flooded in the past. Topographic maps indicate that much of the Nespelem and Colville Agency area is relatively flat; as they both exist along rivers, and the Agency area is near the junction of the Nespelem and Little Nespelem Rivers, a reasonable presumption is that it has flooded in the past.

There is one privately-owned small dam creating a stock pond, used for ranch purposes, on the lower Nespelem River. It is small, and if breached would drain almost immediately into the Columbia River. It is not a hazard mitigation concern.

Tribal members have recounted past flooding of some structures at the Colville Agency area and in the Town of Nespelem, caused by heavy rain and flash flooding. There are no FEMA flood risk maps for the Nespelem River Basin.

Sanpoil River

The Sanpoil River drains a basin of approximately 902 square miles. River gaging data is not comprehensive; it exists for 1911 to 1918, 1952-1955, and 1972-1974. There is also some gaging data for upstream portions of the river, such as from the discontinued gage at Thirteen Mile. There are not enough snow and rainfall monitors in the basin to allow the NWS to issue river forecasts. A flood level has not been set for this gage; experience by Tribal Emergency Management staff during the 2015 through 2018 spring runoffs is that the risk of flood damage to infrastructure becomes significant when the river level is higher than six feet as measured at the Keller gage.

Because there was so little data available about Sanpoil River flooding, in 1994 the Tribe, Ferry County, the local conservation district, and the State agreed to cooperate with a Natural

Resources Conservation Service (NRCS) study of the river. The goal of that project was to map flood risk zones, and establish potential flood flows up to the 500-year recurrence level.

The partial graph shown below displays what water flows would amount to for each flood recurrence level along the river. The top "cross section level" corresponds to the Keller Tribal community; the next cross section refers to the Sanpoil Valley north of Keller to the Devil's Elbow area, north of the SR21 junction with the Bridge Creek Road.

Table 2: S Sanpoil	anpoi Flood	l Disch plain l	iarge b Manag	oy Cro gemen	ss Sec t Stud	tion y	
	Flood Recurrence Interval - years						
Cross Section Number	2	5	10	25	50	100	500
	1	Peak D	ischarge	- cubic	feet per	second	[
9.2 - 11.4B	1,456	2,509	3,080	3,984	4,950	6,068	11,637
13.9 - 30.0B	1,281	2,534	3,118	3,970	4,855	5,905	11,429
31.1 - 43.4	1,072	2,431	2,914	3,562	4,258	5,326	10,945
43.5 - 51.2	420	1,144	1,255	1,575	2,121	2,662	5,847
51.3 - 57.5	316	919	982	1,260	1,708	2,178	5,164
57.55 - 59.6	172	514	547	741	1,065	1,425	3.669
59.8C - 62.5B	77	235	242	373	662	910	2,121
Mouth O'Brien Ck.	84	280	309	522	900	1,218	2,717
Mouth Granite Ck.	143	419	432	533	899	1,263	3,165
Mouth Scatter Ck.	42	127	127	127	127	135	280
Mouth West Fork	552	1,257	1,435	1,661	1,826	2,239	5,124

During the 2017 flooding, which began with warm rain falling on snow in February, the river flow peaked on the morning of April 9th at Keller at 5,620 cubic feet per second (cfs). This places the peak of the 2017 flood at between the 50 and 100 year recurrence interval.

Source: Table 2, Appendix B, NRCS Sanpoil River Study

The 2017 flood caused significant damage to roads, threatened other homes to the point where protective sandbagging was necessary, and destroyed one home. A log jam formed behind the 21 Mile Bridge, a BIA bridge across the Sanpoil River, in the early morning hours of April 9th. At some point water moving around the log jam eroded away the bridge abutments, stranding two residents, and water was suddenly released to flow downstream. The river gage at Keller, after an abrupt three foot drop in water level, rapidly increased. The rapid increase apparently reflected the surge of released water reaching Keller. At about the same time, water began rapidly eroding away the river bank upon which the Saltz Road home rested. The home slid into the river that evening.



Sanpoil River near Keller, April 9, 2017



Twenty-One Mile Bridge, SR 21, April 10, 2017

The highway bridge on SR 21, where Gold Creek reaches the Sanpoil River, was destroyed. The highway was closed for two weeks until a temporary one-lane bridge was installed. This impacted school children who could no longer reach their schools by road, as well as normal traffic to jobs, shopping, and medical care.

<u>Okanogan River</u>

The earliest stream flow records for the Okanogan River date back to 1911-1925 at Okanogan. The oldest continuous records for the river date began in 1929, where the river is measured at a gage in Tonasket. That gage is approximately sixteen river miles north of the reservation boundary.

The Okanogan River experienced major floods in 1948, 1972, 1974, and 2018. The 1948 flood caused flooding throughout the Okanogan Valley, knocking out power and other services. A Tribal member recently related that her 1948 Okanogan High School graduation was held on the athletic field, lit by the headlights of parked cars because power was out. The local newspaper reported that a lake one half mile wide extended from the east side of the Omak River Bridge into the reservation; workers crossed the lake by boat to get to work. While numbers are not readily available now, that newspaper reported more than one hundred houses were evacuated, two homes were "washed away", and "Many others were washed off foundations." The reported damage was \$6.9 million in 1948 dollars, the equivalent of more than \$70 million today.

The 1972 flood, the highest on record, caused a reported \$6.8 million in damage. This is equivalent to more than \$40 million in today's dollars. Damage was somewhat limited by levees that were constructed in 1949, but that did not save the Tribal community in East Omak. Tribal members who are elders today recount the frantic sandbagging efforts they took part in as high school students. The newspaper record states that:

"The river invaded East Omak through the Stampede Arena, where a desperate attempt to throw a dike across the grounds failed Wednesday night. By then, homes in East Omak and Okanogan were being flooded and evacuated." *Omak Chronicle, June 8, 1948*

Following the 1972 and 1974 floods, the Army Corps of Engineers constructed new levees to protect communities along the river.

Unlike the Sanpoil and Nespelem Rivers, the NWS has established flood stages for the



Tribal employees and volunteers filling sandbags May 7 2018

Okanogan River. The NWS has enough years of data to be able to estimate runoff. Beginning in March 2018, river forecasts indicated the likelihood of at least moderate flooding during the spring runoff. The NWS forecasts were handicapped by the lack of good data from within the Similkameen River drainage, in Canada. The Similkameen is one of the major contributors to the flow of the upper Okanogan River.

The Tribe responded early to the 2018 flood and committed significant staffing, equipment, and funds to limit damage and

protect the population. The county assisted by providing and delivering sand. The Tribe, through a combination of volunteer and employee efforts, filled approximately 51,000 sandbags.

Approximately 40,000 sandbags were either placed by the Tribal emergency response, or were supplied to individuals to protect their own property.

The Okanogan River stayed above flood stage from May 5th through May 28th, 2018. It stayed above "moderate" flood stage for fifteen days, and above the "major" flood stage for twelve. One Tribal home was destroyed in East Omak; at least five other Tribal homes were damaged. The Colville Indian Housing Authority provided housing for four displaced Tribal families.

Flood damage in East Omak was made worse by damage to the city-maintained storm drain in East Omak, necessitating a Tribal pumping operation. Ground water rising above the ground surface due to high river levels (a river surface higher than the surrounding terrain), and seepage through the levee, caused water accumulation in East Omak that could no outlet. The Tribe operated pumps that at their peak were pumping more than two million gallons per day out of East Omak and into the river.

The 2018 flood left substantial quantities of debris on trust lands along the river.



Trust lands south of Omak, May 2018 Flooded Tribal office at Brooks Tract, May 11 2018

The developed areas along the Okanogan River have been mapped for the purposes of the National Flood Insurance Program. The map for the Brooks Tract area, where one Tribal structure flooded and one across the street did not, establishes that the flood level was lower than the 100-year recurrence level. For comparison purposes, the record flood in 1972 was considered to be an 80-year flood; that is, a level of flood that would recur an average of once every eighty years (Northwest Management, 2013).

Possible Mitigation Strategies: Flood

The Tribe's experience during recent floods reinforced the need for a multi-faceted mitigation strategy for flooding. Lessons learned during the 2018 floods included the need for advance training, stockpiling of supplies, and pre-flood mitigation.

A summary of possible mitigation strategies includes:

Issue	Possible Mitigation Strategies
1. Reservation is not fully mapped under	A. Request FEMA to expedite risk
the National Flood Insurance Program	mapping of areas identified as at risk
	for flooding but not mapped, including
	Nespelem River, Hall Creek, etc.
2. Use permitting process to mitigate	A. Deny permits that place well pumps
future flood damage	and pump sheds within flood zones;
	require relocation of such structures
	B. Deny, or require mitigation for, permits
	to build structures in flood plains
	C. Require propane tanks that supply
	structures to be secured against flood

3.	Tribe did not have dewatering pumps, nor a secure place to cache them where needed	 A. Tribe has now acquired pumps and hose; needs to identify secure storage
4.	Tribe is not prepared to rapidly evaluate flooded structures	 A. Send appropriate staff to ATC-45 course to lean to evaluate storm and flood damaged properties for safety B. Locate funding to prepare field kits for structure damage assessments
5.	Roads repeatedly wash out during high runoff events	 A. Identify and map repetitive road damage sites B. Conduct engineering assessment of repetitive loss sites C. Seek grant or other funds to mitigate design issues that contribute to road failure, including costs of road relocation
6.	Flood fighting supplies not readily available	 A. Seek grant or other funding for the costs of stockpiling flood fighting supplies: Hesco barriers, sheet plastic, sandbag filling tools, etc.
7.	Emergency response staff not ready for flood fighting operations	A. Conduct training; bring FEMA course to reservation

10. Landslide

Geographically the Colville Indian Reservation is part of the Okanogan Highlands. The reservation is mountainous; crossing the central reservation from Inchelium to Omak requires

traveling through three mountain passes. Roads passing through mountainous terrain are often subject to rockfall and small landslides.

Although rockfall during winter and during rainstorms is common, larger landslides have significantly impacted transportation across the reservation. The photo at right depicts a major slope failure above one of only two east-west routes across the reservation. The road was closed for



Upper slope failure, Mile Marker 1, Peter Dan Road, March 2017



Inchelium Highway subsidence Iandslide, April 18 2017

months when a creeping landslide slid across the road, causing a lengthy detour.

The road network on the reservation has been impacted by multiple landslides, ranging from the sudden collapse of a section of the Columbia River Road in March 2016, to the subsidence landslide that closed the Inchelium Highway in April 2017. The Inchelium highway landslide, in particular, isolated the community because the primary alternate route was also closed due to a bridge washout.

The State of Washington has generally mapped historical landslides throughout the state, and is working on a mapping project statewide to identify high-risk areas where landslides may pose a danger to homes and infrastructure. Only lowresolution landslide maps, not suited for permit and construction decision-making for individual parcels, are

available for the reservation. Major landslides have occurred in the traditional territories of the Tribe, although those areas are not currently within the reservation. The 1872 Lake Chelan earthquake completely dammed the Columbia River north of the Entiat River, and was one such landslide.



Green coloring indicates identified landslide areas. Retrieved/excerpted February 14, 2017, from: https://fortress.wa.gov/dnr/protectiongis/geology/?Theme=natural_hazards

Homes can be at direct risk from landslide. A February 1953 landslide in Hopkins Canyon, near the Columbia River Road, destroyed one house (Jones, 1961).

One of the unexpected results of the filling of Lake Roosevelt behind Grand Coulee Dam was the number, size, and extent in years of lakeshore landslides. The Jones study published in 1961 documented more than 300 landslides along Lake Roosevelt between 1942 and 1955. These included a landslide in April 1952 that caused a 65-foot high wave against the opposite shore, three miles south of the Kettle Falls Bridge; and a series of landslides in 1953 that resulted in at least one wave that was also 65 feet high (Burnett, 2009). Although many landslides were generated from the Reed Terrace, approximately twenty river miles north of Inchelium, there have also been many within the reservation. A series of landslides on the west bank of the Sanpoil Arm of the lake, south of Keller, during the early 1950's required multiple repairs to the state highway (Jones, 1961).

A wave caused by a landslide into water is sometimes called an "inland tsunami" but is also known as a "seiche". One of the more damaging seiches on Lake Roosevelt occurred in February 1951, when such a wave pushed logs through walls ten feet above the lake level at the Harter Lumber Company Mill in Kettle Falls (HIVA, 2012).

A National Park Service report explains this phenomenon:

The landslides are controlled in-part by the size and rate of annual reduction in the reservoir elevation. Risk of landslides is a moderate concern for 30-50 ft drawdowns, and a major concern for drawdowns of more than 50 ft. Rates of drawdown in excess of 1.5-2 ft/day are also believed to accentuate occurrence of landslides. Bureau of Reclamation management of reservoir levels has attempted to avoid these conditions for the past 20 years. (Riedel, 1997, page 5)

Erosion problems persist primarily because of the annual drawdown of Lake Roosevelt. Erosion of shorelines occurs primarily as large landslides located at hundreds of sites along the reservoir. Several studies have shown that the larger the annual drawdown of Lake Roosevelt, the greater the number of landslides. (Riedel, 1997, page 67)

There has been no comprehensive study of landslide-prone terrain within the reservation, other than along the Columbia River/lake shorelines.

Landslides along the Lake Roosevelt shorelines still occur. The most recent damaging landslides occurred on the Spokane Arm of the lake in January 2009, producing a 30-foot wave that caused significant damage to private docks and moored boats; and again in August 2009, causing damage at an NPS campground.

Possible Mitigation Strategies: Landslide

During the preparation of this plan, the possibility of doing a reservation-wide landslide risk assessment was considered. The State of Washington, after the Oso Landslide in 2014, set standards for a statewide landslide risk inventory. The amount of funding available to the Tribe, to perform an assessment to the same standard as the State, was insufficient.

A lesson learned from the 2015-2016 post-fire flooding is that the BIA's Burned Area Emergency Rehabilitation (BAER) response is focused on trust lands, and does not adequately assess issues on fee lands within the reservation. Runoff and soil stability issues from fee lands may affect adjacent or downstream trust lands, and some fee lands are occupied by Tribal members.

Issue	Possible Mitigation Strategies
1. A landslide risk assessment has not	A. Seek \$300,000 in grant funding for
been completed	comprehensive landslide risk mapping
	of the entire reservation
2. BAER evaluations do not assess all	A. After large fires, request assistance
lands at risk, even if may affect Tribal	from Conservation District or other
lands	sources to assess fee lands; ensure that
	issues from fee lands will not affect
	trust lands
	B. If fee lands pose a landslide risk to
	adjacent trust lands post-fire, seek
	emergency stabilization funding to
	minimize damage to trust lands
3. Major landslides are an uncommon	A. Begin an in-service training program on
event; staff may be unfamiliar with	disaster preparedness and response
landslide rescue issues	for first responders and potential
	incident commanders. Include
	landslide response and considerations
	in the training.
4. Building permits not currently assessed	A. Until risk mapping is available, evaluate
for landslide risk	every permit and plan from the

A summary of possible mitigation strategies includes:

	standpoint of landslide risk.
 Repetitive landslides block roads and endanger travelers 	 A. Map locations where landslides and rockfall reach roads, including state highways and county roads B. Identify high-risk sites that need mitigation. Work with road/highway owner to locate funding to improve road safety

11. Severe Weather

During the first public input portion of this planning effort, members and residents participating typically ranked "severe weather" or "severe storm" as either their highest concern, or the second highest concern after wildland fires. The "heat map" exercise included a separate category of "winter storm"; no one participating rated a winter storm as among their three highest concerns. This may be because winter storms are a yearly occurrence, while severe rain and wind storms are less common.

Tribal experiences with severe storms during the last decade include:

July 2012: Damage from straight line winds was severe in the Sanpoil Valley to Inchelium area, but associated rainfall caused damage from flash flooding in the Okanogan County portion of the reservation. The Tribal IT building on the Agency campus was flooded; road damage occurred north of SR 155 and a Malott. Trees crushed homes in Keller, cabins at Twin Lakes, and cut power throughout much of the eastern reservation.





Keller, July 21 2012

Blowdown along SR 21, near Keller, July 21 2012

July 2014: Severe winds caused trees to crush homes and cabins at Twin Lakes, and cut power to the Inchelium and Twin Lakes areas for parts of three days.

February 2015: Heavy rains falling on burn scars, and quickly running off, damage roads in the Sanpoil Valley.

August 2015: Severe winds caused the Tunk Block fire to blow up, moving south more than twelve miles in one day and burning approximately thirty homes.

Winter 2015-2016: Heavy rains running off burn scars cause flooding in the Haley Creek area, causing major road damage.

February 2017: Heavy rain falling on snow caused flash flooding in the Sanpoil Valley. Flooding heavily damaged the Mt. Tolman Fire Center headquarters building, a Triballyowned structure from which the BIA fire protection program is run. Other Tribal structures were also damaged.

October 2018: A sudden windstorm caused an electrical fire in Elmer City, burning seven mobile homes at the Grandview Trailer Park. Four of the homes were occupied.

During this period there were many lesser wind and rain storms that temporarily blocked roads with trees, caused debris to flow onto roads, and interfered with travel. But in the last decade, there has only been one severe winter storm period that required an emergency response: the heavy snowfall and ice storms of 2008-2009. That storm resulted in a disaster declaration for the Ferry County portion of the reservation.

Possible Mitigation Strategies: Severe Storms

Issue	Possible Mitigation Strategies
 There is no quick way to get warnings to members and residents 	 A. Obtain an emergency notification system ("reverse 911") for the Tribe to allow rapid notifications of weather hazards B. Tie into national IPAWS system for wireless emergency alert access
 New structures may be susceptible to damage from high winds; older structures may need retrofitting 	 A. During permitting, provide information on hazard mitigation such as chimney bracing, securing shingles or metal roofs to avoid wind lifting, etc.

	 B. Distribute information about non- structure mitigation measures for homeowners, such as tree hazards C. Conduct outreach at district, membership, or other meetings to educate residents about mitigation ideas and current construction standards
3 Above-ground power lines may fall	A Require new power lines to be
during winds, causing fires	underground
during winds, causing mes	B. Evplore with electric utilities the
	B. Explore with electric diffices the
	possibility of shutting down power
	during extreme winds, to avoid power
	line-caused fires
4. Flash flooding impacts same locations	A. Identify repetitive loss properties
causing repetitive losses	B. Review sites for engineering solutions
	to runoff problems: diking, diversion,
	or engineered run-off paths
	C. Explore other mitigation options such
	as structure relocation
5. Tribe not prepared to shelter evacuees	A. Obtain emergency generators for
if power is out	community centers, for sheltering; for
	sewage lift stations; and for well fields
	B. Obtain portable beds and other shelter
	supplies for evacuees
6. Tribe not prepared to rapidly assess	A. Send appropriate staff to ATC-45
damaged structures	course to lean to evaluate storm
	damaged properties for safety
	B. Locate funding to prepare field kits for
	structure damage assessments
7. Tribe may not have rescue-trained	A. Obtain funding to restart Community
workforce immediately available	Emergency Response Team (CERT)
	nrogram
	B Develop plan to use CERT volunteers
	and keen them involved in the
	emergency response program
8 Essential emergency supplies not	Δ Assemble emergency management
readily available	cache for Inchelium from existing
	stocks
	B Obtain grant funding for additional
	roscup aquipment peeded such as
	chain saws cribbing safety belmets
	chain saws, chubing, safety heimets

and vests

12. Volcanic Eruption

Any of the Washington Cascade Range volcanoes, and conceivably Oregon volcanoes as well, could pose a threat to the Colville Indian Reservation. It is not clear which volcano is most likely to erupt. Because they are the closest volcanoes, a Tribal planning assumption is that Glacier Peak and Mt. Baker are the greatest potential threats. However, two eruptions of Mount St. Helens within recorded history have affected the Tribe.

Distance and topography protect the reservation from lahars or other debris flows, lava flows, or blast damage from an eruption. The primary danger will likely come from volcanic ash fall. The 1980 eruption of Mt. St. Helens resulted in limited ashfall on the reservation; however, measurable ashfall from that event occurred as far away as Oklahoma. In the distant past a Glacier Peak eruption dropped 12 inches of ash at what is now the city of Chelan, and 1¼ inches of ash in southwestern Montana.

A lesser-known disaster was the Mt. St. Helens eruption of 1800, which resulted in significant ashfall on what is now the Colville Indian Reservation. Stories collected later referred to that year as the one in which "dry snow" fell, which greatly interfered with Tribal life. Several inches of ash fell, driving away game animals in the Sanpoil Tribe's area, and the ashfall was so thick that there was little difference between night and day (Cebula, 2003). Another researcher described Tribal members as "too distraught to collect foods" that year (Ackerman, 1996, page 40). The result was famine the following winter.

Prior to any eruption there will likely be a change in geologic activity at the volcano, signaling the possibility of an eruption. Small-scale steam or ash venting, earthquakes, and similar occurrences usually precede significant eruptions. Before the catastrophic Mt. St. Helens event, there were almost two months of such warnings. Such notice gives emergency managers time to order contingency supplies, update plans, and provide preparatory advice to managers and to the public.

When warning signs of a possible eruption are noted, public information is a key part of the Tribal response. Tribal members and residents must be informed of the potential risks, be advised how they can protect themselves and their property, and be strongly encouraged to keep supplies of food, water, and home heating fuel on hand as well as keep personal medications available.

Ashfall may quickly follow an eruption; the initial ash plume from Mt. St. Helens travelled at approximately 60 miles per hour. If Glacier Peak erupts, and the wind direction is unfavorable, ash could begin falling on the reservation slightly more than one hour later. Although there will likely be many indicators that a volcano is becoming more active, there may be little or no warning of an actual eruption and the start of ash fall.

Eruption clouds and ash fall commonly degrade or interrupt telephone and radio communications. This includes physical damage to equipment, frequent lightning (electrical discharges), and either scattering or absorption of radio signals by the heated and electrically charged ash particles. All Tribal operations and residents should expect communications problems with land-line telephones, cellular phones, and direct radio transmissions as well as radio repeaters.

Volcanic ash is small enough to be inhaled by people and livestock, is extremely abrasive, can damage vehicles and other machinery, is not only corrosive but conducts electricity when wet, and can damage or overload and collapse roofs. It has a very different impact than ash and smoke from wildland fires. Volcanic ash can also significantly change the acidity of surface waters.

Ashfall impacts range from short term emergency situations which may last for several days (highway closures, air quality requiring people to stay indoors, power failures due to ash contamination and electrical arcing, etc.), to very long term problems (decreased agricultural productivity, significant livestock mortality from both ash and fluorosis). A significant and expensive issue is the removal and disposal of ash from roads, housing areas including residential roofs, Tribal buildings and facilities, and parking areas near those facilities as well as streets.

Ash composition can vary widely with distance from the eruption. After Mt. St. Helens erupted, the Yakima area was able to use street sweepers to remove ash from roads. The ash that fell on Spokane, approximately 120 miles further from the eruption than Yakima was significantly lighter and finer with almost a talcum powder consistency. Spokane ash removal managers had to invent a method involving large quantities of damp sawdust as a collector, before they were able to remove volcanic ash with machinery.

There is significant risk of damage to Tribal infrastructure, including building HVAC systems (heating, ventilating, and air conditioning) and Tribal vehicles. Sewage systems, water supply systems, and buildings (or at least their HVAC systems) may need to be shut down to prevent damage. Opening system bypasses and draining untreated sewage into waterways may be

necessary to save sewage disposal infrastructure. Tribal members with respiratory and/or cardiac issues may require significant medical support or even evacuation from the area.

Possible Mitigation Strategies: Volcanic Eruption

A volcanic eruption is often seen as non-mitigatable; once the population at risk has been evacuated, there is nothing more that can be done. For jurisdictions very close to volcanos and at risk of lahar flows or other direct affects, that may be true. Since the reservation is not within range of lahars, nor of direct eruption effects, the threat to the reservation is primarily from volcanic ash fall.

Issue	Possible Mitigation Strategies
1. Advance planning is needed	A. Update the Tribe's volcanic eruption
	EOP to include recent research findings
	and best practices
2. Scarce supplies may be needed on	A. As funding permits, stockpile other
short notice	necessary supplies with multiple-use
	disaster functions; e.g., sheet plastic
	for flooding can be used for ashfall
	protection for buildings; N95
	respirators for wildfire smoke will work
	for volcanic ash
3. Volcanic eruption is an unlikely event,	A. Begin an in-service training program on
and staff may be unfamiliar with	disaster preparedness and response
volcano eruption issues and hazards	for first responders and potential
	incident commanders. Include volcanic
	eruption discussion in this series.

A summary of possible mitigation strategies includes:

13. Wildland Fire

Wildland fires play a major role in shaping western lands. Wildfires have benefits for cleaning out dead fuels, helping to restore a more natural environment and encouraging renewal of food sources for both wildlife and domestic grazing animals. The other side of this coin is that wildfires threaten the lives of fire fighters, community members, their communities, and the entire infrastructure that the Tribe has developed.

The Colville Indian Reservation is not an isolated fire world. Private, U.S. Forest Service (USFS), BOR, and State-owned lands adjoin the reservation. Fires cross boundaries without respect to land ownership or land management. Background information will provide some perspective on wildland fire issues.

The Bureau of Indian Affairs is responsible for wildland fire suppression on trust lands within the reservation. It operates the Mt. Tolman Fire Center (MTFC) to carry out that responsibility. It generally operates as a fire suppression agency from March to November each year. In addition:

- The Town of Coulee Dam operates a municipal fire department.
- Okanogan County Fire District 2 is based in Elmer City.
- Okanogan County Fire District 3 covers Malott, Okanogan, and Omak and lands on the reservation side of the river; it operates as three municipal fire departments, one for each community, under the umbrella of the fire district.
- Okanogan County Fire District 5 covers the Monse area and reservation side of the Okanogan River until District 8 begins.
- Okanogan County Fire District 8 covers the southwest portion of the reservation, with its high proportion of privately owned (fee) lands.
- Okanogan County-Ferry County Fire District 13 covers the northern portion of the Sanpoil Valley along SR 21, and some isolated parcels of fee lands
- The Colville Tribal EMS/Fire/Rescue Department (CTFD) operates two 24-hour/7-day per week staffed fire stations, one each in Inchelium and Nespelem.

The Town of Nespelem formerly operated a volunteer fire department. That department disbanded when the town reached an agreement for the CTFD to operate from the town's fire station, and turned over the town's fire equipment for Tribal operation. CTFD is primarily and ambulance and structural fire protection service. It does respond to wildland fires threatening homes, and suppresses wildland fires when MTFC is not in operation. The CTFD is not heavily staffed; each fire station operates with only two full-time fire fighters on duty.

The CTFD faces limitations that impair its ability to operate. Among them is that the Tribe cannot operate a volunteer fire department program to augment full-time staff. Elsewhere in the State, one of the ways to induce volunteer fire fighters to sign up is the fact that they not only can earn a small pension, but that they are covered for the purpose of on-the-job injury. Volunteers properly enrolled under state law are eligible to earn a pension and to receive workman's compensation if they are injured while working as a volunteer, under the Volunteer

Firefighters and Reserve Officers Relief and Pension Act. The CTFD is barred from participating in that state-wide system because it is neither a municipality nor a fire district, under the language of the Act.

A mainstay of fire protection against rapidly moving wildfires, throughout Washington, is the Fire Mobilization ("Fire Mobe") program. A local jurisdiction, when it is overwhelmed and mutual aid resources are limited, can call on the State to declare a Fire Mobe. Once that is done, regional fire district and fire department resources are dispatched to assist. They typically arrive within a few hours, help protect structures, and suppress the fire.

According to the chief of the Washington State Patrol (the approving official for fire mobilizations) and the state fire marshal (the recommending official for fire mobilizations), the CTFD cannot request one because it is neither a fire district nor a municipal fire department. Neither State official is willing to accept that the Tribe's agreement with Nespelem, to provide fire protection to the town, is equivalent.

There have been two disastrous fire seasons affecting the state during the last decade: the

2014 Carlton Complex fires, and the 2015 fire season. The 2014 fire season set new records for the most acres burned, and was the worst fire year in state history. The 2015 fire season far exceeded 2014 in acreage burned.

There have been many large and significant fires on the reservation, but the most significant fires in living memory were the 2015 North Star and Tunk Block fires. During those fires in 2015, more than



Tunk Block Fire, August 21, 2018

240,000 acres on the reservation burned. That nearly equaled the 2014 statewide record set during the 2014 fire season. The acreage burned on the reservation in 2015 was only a fraction of the statewide fire acreage that year.

Several issues have affected the reservation's ability to handle and recover from major fires. They include:

- The need to protect structures from approaching fire, which MTFC firefighters are not allowed to. The CTFD, which does defend structures, at times has insufficient staff to both protect homes and answer ambulance calls.
- Members and residents may not be able to find, or to afford, fire insurance. Many homes are far from fire hydrants, and some insurers will not sell fire insurance to homeowners when there is no fire station or fire hydrant nearby.

MTFC has been responsible for fire prevention activities involving wildland fire. The emphasis of that program has varied depending upon the resources made available to it each fiscal year. After the 2015 fires burned more than 240,000 acres and 30 homes on the reservation, MTFC restarted the Firewise program in 2016. Firewise emphasizes risk reduction, including home changes (such as landscaping) and clearing out fuels in the area.

WSU extension, and the local conservation districts, participated in the Firewise restart and the first community fire protection project. Since that time, MTFC fire prevention has been less active. Firewise emphasizes risk reduction, including home changes (such as landscaping) and clearing out fuels in the area.

There are three components that drive wildland fires: weather, topography, and fuels. The first two components are not under local control; nothing can change their impact on wildland fires. Something can be done about fuels. A discussion of each of these three components follows, for better understanding of fire prevention options.

<u>Weather</u>

Weather is the most significant component as it makes fuels more available for wildland fires. It is the strength of winds, relative humidity, temperature, and moisture that determine the intensity of wildland fires. During the past several years the Western United States has experienced large, devastating wildland fires.

This is believed to be due to rising temperatures and an increased length of the fire season. Above normal temperatures dry out green fuels, which makes them burn more readily to generate larger and more destructive wildland fires.

<u>Topography</u>

Topography drives wildland fire by heat transfer and by preheating and curing fuels as fires burns upslope. Topography can also slow the spread of wildfires because wildfires burn slower traveling down slope. Other influences that affect wildland fire spread include "aspect," which refers to a slope facing in a certain direction. In general south and west aspects tend to receive more direct sun which in turn dries out fuels. This makes them more ready to receive fire, increasing fire spread. The fuel types on the south and west aspects tend to be lighter and flashier fuels, which contributes to rapid fire spread.

On north and east aspects the general conditions tend to be a little wetter, and the fuels a little heavier and less ready for combustion; these slopes will burn more slowly. In some cases the fuels on these aspects, being much larger in diameter, will hold higher fuel moistures and will only dry out enough to support wildland fire much later in the season if at all.

<u>Fuels</u>

Fuels come in all forms and fashions from herbaceous grasses, brush, trees, leaves, and needles to building materials. It is their properties and vertical arrangement that affects how and when these fuels will burn.

Fuel loading is the size and shape of the fuels. Moistures of live and dead fuels determine how much of the woody fuels are available for



Table 1: Wildfires 2001~2017

combustion. Generally the lighter and flashier fuel types will have a higher rate of spread. In the Western United States the main carriers for all wildland fires are the herbaceous grass fuel types.

In order to have single tree torching, group torching, or crowning wildfires there needs to be ladder fuels that will carry fire into the forest canopy. Without this vertical arrangement there would be only a ground fire. The time of day when the wildfire burns through an area also determines how much of the fuels are available due to relative humidity, temperature, and recovered fuel moistures.

Fire Occurrence

Wildland fire occurrence data from the Mount Tolman Fire Center (MTFC) was used for this Hazard Mitigation Plan. The wildfire data covers from 2001 through 2017.

On average the reservation has sixty human-caused and forty natural-caused wildfires each year. Table 1 demonstrates that both human and natural fires are trending down for the past



However, Table 2 displays acres burned by both human-caused and natural-caused fires. This table shows that there were more acres burned with fewer ignitions. More acres burned per incident could be from summers becoming warmer and dryer, as well as from longer fire seasons.

Fuels Assessment

The reservation has been classified by fuel type into four different Fire Management Zones (FMZs). FMZ 1 is the light grass and brush model. It is at lower elevations, running the length of the west side and along most of the south boundary of the reservation. FMZ 2 is the lower



Figure 1 - Colville Reservation Fire Management Zone Map

elevation timber, brush and grass mixture. FMZ 3 is mixed conifer and brush at the mid-

elevations of the reservation. FMZ 4 is high elevation timber, and has a mixture of all the coniferous tree species.

<u>FMZ 1</u>

This is low elevation with mostly grass, sagebrush, and bitter bush with an occasional tree or small clumps of trees. There are several communities within FMZ 1, posing a risk of community losses. Because of the light flashy fuels in zone 1, these communities are at risk from wildland fires.

Treatments in FMZ 1 could include mowing, mechanical brush removal, hand-piling and pile burning. Another possibility is putting in strategic fuel breaks around communities. These fuel breaks would need annual maintenance due to the fast-growing grass fuel types within this zone.

<u>FMZ 2</u>

This zone is also low elevation; the fuels include grass, brush, and timber. This is the transition zone between zone 1 grass and brush fuels types, and zone 3 which includes grass and brush but is primarily coniferous forest. There are several communities within FMZ 2 and it would be beneficial to establish strategic fuel breaks around the communities.

Potential treatment options include mowing, mechanical thinning or brush removal, pruning brush and trees, and hand piling with either broadcast or pile burning.

<u>FMZ 3</u>

This is the mid-level zone which is mostly timber; much of the Tribe's timber harvesting comes from this zone. The understory is a mix of grass, brush and second and third growth timber species. The overstory consists of ponderosa pine, douglas fir, western larch, and lodgepole pine.

Treatment options include but are not limited to mechanical thinning and piling, hand thinning and piling, and either pile or broadcast burning.

<u>FMZ 4</u>

This is the high elevation timber zone; the overstory has a mixture of ponderosa pine, douglas fir, lodgepole pine, western larch; it also includes white fir, subalpine fir, and spruce. The other fuels consist of downed and dead woody materials, brush, and grass. In FMZ 4 there are also two wilderness set-aside areas.

Treatment options for this zone include but are not limited to mechanical thinning, hand thinning, machine piling, hand piling, and pile or broadcast burning. Fuels treatments can have a longer duration of impact if there is scarification. This creates openings to mineral soil as site preparation for seeding and plantings for regeneration to the desired species distribution.

Wildland Urban Interface

Wildland Urban Interface (WUI) exists in FMZs 1 through 3. Because WUI is found in all three FMZs the WUI areas are not treated as additional, separate Fire Management Zones. Instead, the WUI component is addressed within each FMZ.

The U.S. Forest Service (USFS) defines WUI as at least one home per forty acres. Population shifts and growth are expanding homes and communities into the wildlands. WUI growth nationally is partially driven by population shifts towards the western United States. The effects of the shifts and population density also heighten the wildfire risk caused by humans; an NPS report states that "as many as 90 percent of all wildfires in the United States are caused by humans" (NPS web resource, 2017).

A significant way to reduce risks is to develop WUI fire codes. These codes could include building all new homes with more fire resistant materials for walls and roofs; require remodelers of older building to upgrade to the new building codes and use fire resistant materials; and make design changes to protect against embers lodging where they could ignite structures. Development of landscaping guides and a plant list of native, fire-resistant plants for landscaping designs would also help to protect WUI communities.

Fuels treatment in WUI areas could include mechanical thinning, hand thinning, pruning, mechanical piling or hand piling, and pile burning.

Communities at Risk

According to the current BIA Wildland Fire Prevention Plan (WFPP) there are 16 communities within the Colville Reservation. In the development of the WFPP each community was

evaluated for risks from wildland fires. In the table below you can see how each community was rated.

High	Moderate	Low
#13 Roger's Bar	#7 Colville Agency	#9 Elmer City
#10 Keller*	#15 Twin Lakes*	#8 Belvedere
#14 Kewa	#3 Okanogan*	
#12 Inchelium*	#11 West Fork	
#5 Disautel*	#16 Coulee Dam	
#6 Nespelem*	#2 Omak*	
	#1Malott*	
	#4 Ft. Okanogan	

"*" Denotes communities listed on the 2001 Federal Register of Communities at Risk. Table 1: Composite Community Assessment Ranking

The above table reflects fire risks that have already been evaluated; it prioritizes the communities where resources could best be assigned for fuel reduction projects. Ground assessment work, and working with the fuels reduction group at MTFC, could get WUI fire safety projects moving with only seasonal delays.

Possible Mitigation Strategies: Wildland Fire

There is a need to bring the "Home Ignition Zone" training to the reservation. When combined with the Firewise program, it could help save homes from future fires. Much of the work needed to reduce the risk of losing homes or outbuildings can be completed in a weekend using ordinary hand tools. This needs to become an annual event before each fire season begins.



Morning air quality in Nespelem, late August 2015, during North Star Fire

Another issue is that of wildland fire smoke. The Tribe's air quality specialist is working on a "Smoke Ready Reservation" program, working with Tribal partners to reduce air pollution in the area. Working with partners allows a coordinated airshed-level approach to reducing particulates and improving air quality year round, not just during the annual fire season.

Issue	Possible Mitigation Strategies
1. Inconsistent emphasis on fire	A. Seek grant or other funding to place a
prevention programs	full time fire prevention specialist
	within the CTFD.
	B. Seek consistent support for fire
	education and prevention from the BIA
	fire management organization
	C. Seek partners such as WSU extension
	and the Conservation District to bring
	Firewise and the Home Ignition Zone
	training to members and residents
	D. Conduct outreach at public events to
	raise awareness of wildland fire
	hazards and ways to protect property
2. Increase staffing level for CTFD	A. Complete conversion of former
	volunteers into paid-on-call employees
	B. Seek funding to increase firefighter
	shift size from two to three firefighters,
	to better protect lives and properties
3. Improve building permitting process to	A. Consider requiring fire prevention staff

A summary of possible mitigation strategies includes:

limit homes at risk in WUI	to review and sign off on all permits for construction or major remodeling in WUI
	B. Require distribution of Firewise and/or
	Home Ignition Zone safety training
	materials during permit issuance
4. Improve interagency coordination and	A. Complete mutual aid agreements with
response to fires	surrounding jurisdictions
	B. Participate in the Okanogan County
	and Ferry County Community Wildfire
	Protection Plans the next time they are
	revised
	C. Conduct annual review of defensible
	space around every community
5. Make homes and structures more fire	A. Consider changes to Tribal code
resistant	requiring that new construction meet
	specified standards for fire resistance
	such as the improved attic vents,
	prohibiting new "shake" roofs, etc.
	B. Consider requiring setbacks from wood
	piles, sheds, and other sources that
	could ignite homes
6. Improve fire protection infrastructure	A. Replace or move flood-prone Keller fire station
	B. Identify garage storage at the Mission
	campus to store one fire apparatus
	filled with water, year around
	C. Explore funding sources and abilities to
	develop water sources in under-served
	areas, to allow fire engines to refill

14. Climate Change

Climate change, and its potential to disrupt ecosystems and Tribal lives, is a looming threat that is currently impossible to quantify. The graphs below explain the type of change occurring now:

These graphs were copied from the NOAA-NWS "Fire Season Outlook" presentation delivered June 13th, 2018, at the annual Tribal fire season briefing. All that the graphs show is that over a sixty year period, temperatures in Eastern Washington increased slightly and precipitation decreased slightly.



The graph below, from the same source as those above, shows the results of those two changes in terms of increased fire activity. Even without the anomalous 2015 year, the trend is clear that there is a long-term increase in the number of acres burned each year while temperatures were increasing and temperatures were decreasing.



The presentation concluded that there is no reason to believe that this long-term trend will stop.

These are not the only documented changes. Between the mid-20th century and 2006, the snowpack in the Cascades range decreased by 15% to 35%. Over the time period from 1948 to 2002, 66% of snowmelt-dominated stream runoff shifted at least three days earlier into the season (Case, 2017). This results in warmer and shallower waters that may interfere with anadromous fish runs, such as the summer-run sockeye salmon.

During the 2015 drought year, there was in fact a much-increased mortality for the summer sockeye salmon run in July. An estimated 98% of all Okanogan River sockeye salmon died before they could spawn that summer (Case, 2017). In addition, there was a large die-off of sturgeon broodstock, presumably from high heat and low dissolved oxygen levels.

Although projections can—and have been—made about future temperatures and rainfall changes, they are not yet fact. They are cause for concern, because:

• Changing climate could cause changes in plant succession, in both disturbed areas and in natural environments.

- Culturally significant species of plants, both food and medicinal, could decrease their range and be less common.
- Insect pests may proliferate with higher mortality for trees, changing the mix of forest species. These could include pine and other tree-killing beetles, spruce budworm, douglas fir needle midge, etc.
- Plant diseases could spread due to warmer winter temperatures. These could include blister rusts, root rot, and the spread of parasitic plants such as dwarf mistletoe.
- If there is more winter precipitation and runoff, it may increase sedimentation. This could affect fish spawning, culvert adequacy, cause road damage, and more.
- Drought and dry soils may increase erosion, which will end up in streams and culverts. Soils may also be lost through dust storms.
- Lower water levels in streams and rivers, and higher water temperatures, may increase fish mortality during spawning runs. They may also increase the mortality of non-migrating fish.
- If the graphed trends above continue, there will be more wildland fires. There may be additional expense to keep cheatgrass and other noxious weeds from taking over newly damaged and opened lands before trees can be replanted.

One of the most significant issues relating to climate change is documenting that something has changed. Anecdotal information, and stories, may be useful to help identify what needs to be examined, but they are not the same as hard data documenting that a change is underway or has occurred.

Unanswered questions, that need answers in order to be able to craft a coherent climate change adaptation strategy, include:

- What will invasive species and noxious weeds do to the fire regime? Will they contribute to more fires that will limit or destroy the availability of traditional cultural, medicinal, or food plants?
- Will medicinal or cultural plants remain available, or will hotter and dryer summers reduce their numbers and range?
- Has there been a change in the distribution or availability of traditional food plants, such as roots and berries?
- Will vegetation be lost due to dryer and hotter summers? Will that expose cultural or archeological sites to disturbance or vandalism?
- Will habitat for rare, threatened, and endangered species be disrupted and no longer suitable for those species?

Possible Mitigation Strategies: Climate Change

Here is a summary of possible mitigation strategies for this hazard:

Issue	Possible Mitigation Strategies
 Conduct research to identify changes in plant distribution/availability of culturally significant plants 	A. Seek funding to research methods for mass cultivation of culturally significant plants in nurseries, for additional seed or to plant as accellings.
	or to plant as seedlings
	species most need assistance to retain
	a viable population distribution on the reservation
2. Spawning fish are and will be exposed	A. Explore possibilities of extra water
to higher temperatures and shallower	releases from tributary dams (such as
water, causing higher mortality.	Conconully Dam) to keep water
	temperatures below 20 degrees C
	B. Explore possibilities of creating cold
	water refugia for migrating salmon
	snawning success rates
	C. Search for other methods to improve
	spawning success of anadromous fish
3. Climate change may disrupt traditional	A. Set up a monitoring program for
gathering practices, by:	cervids and other harvested species to
changing seasonal food gathering	monitor whether they migrate
times, leaving members out of step	B. Conduct plant transit studies to
with the traditional yearly calendar	confirm whether, or where, plant
relocation or breakup of traditional	C Conduct research on whether
redistribute to more suitable	significant plant species can be
microclimates	replanted in former areas, or in new
migration of animal species to higher	microclimates
altitudes due to heat, or to wetter	
locations, or off reservation, disrupting	
hunting practices	

Chapter 5: Supporting Documentation

- A. Plan Adoption
 - 1. Colville Business Council Resolution to adopt HMP
 - 2. FEMA Acceptance Letter
- B. Planning Documentation
 - 1. Public Meetings: Announcements, Invitations and Attendance Sheets
 - 2. Planning committee and stakeholder documentation
 - 3. "Heat Map" Results
 - 4. Survey Results
- C. Hazard Summary Worksheet with Rating Criteria
- D. Landslide Risk Maps
- E. Glossary
- F. Literature Cited and Selected Sources

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