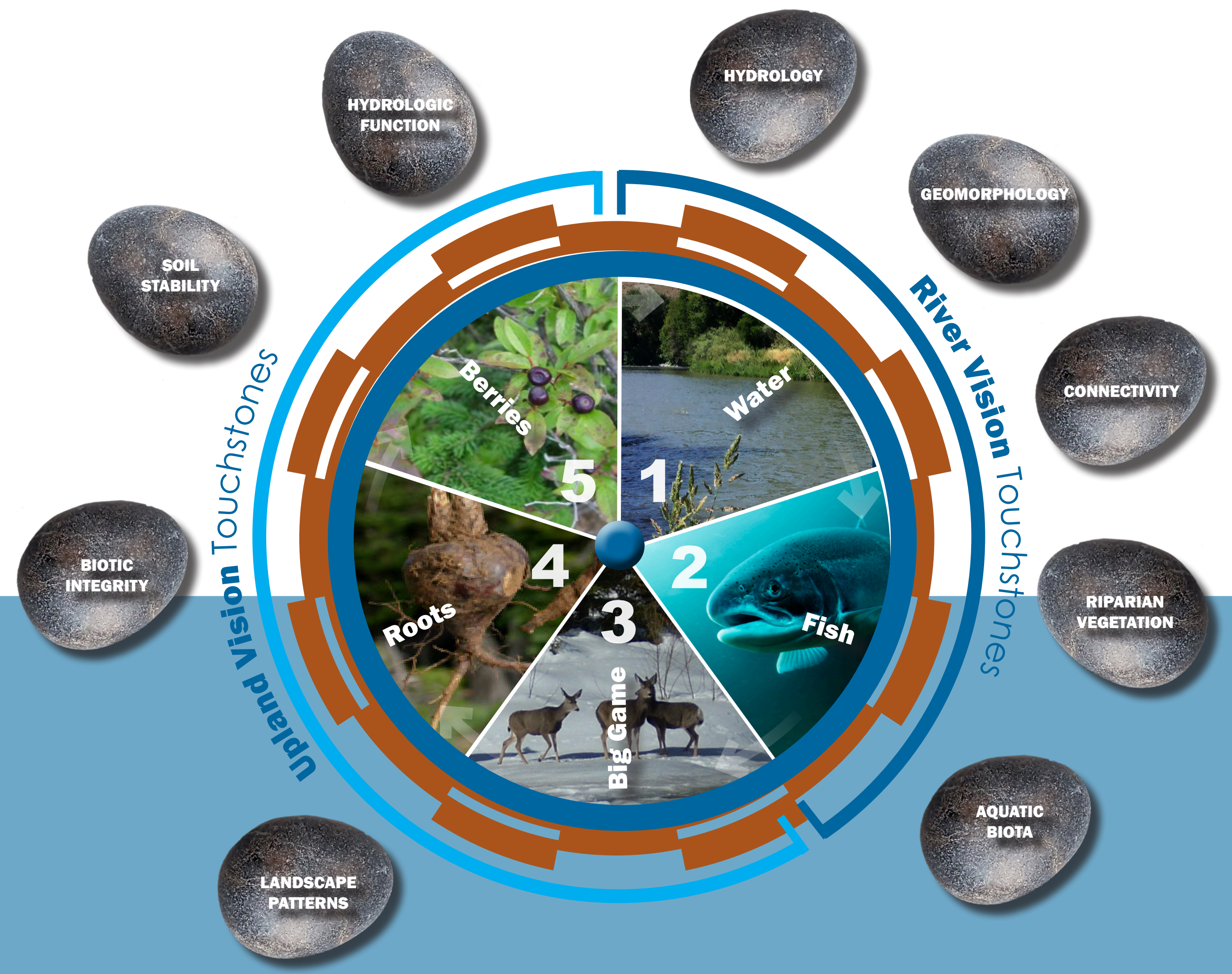


CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
46411 Timíne Way | Pendleton, Oregon 97801
Phone: (541) 276-3165 | FAX: (541) 276-3095

Umatilla River Assessment

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

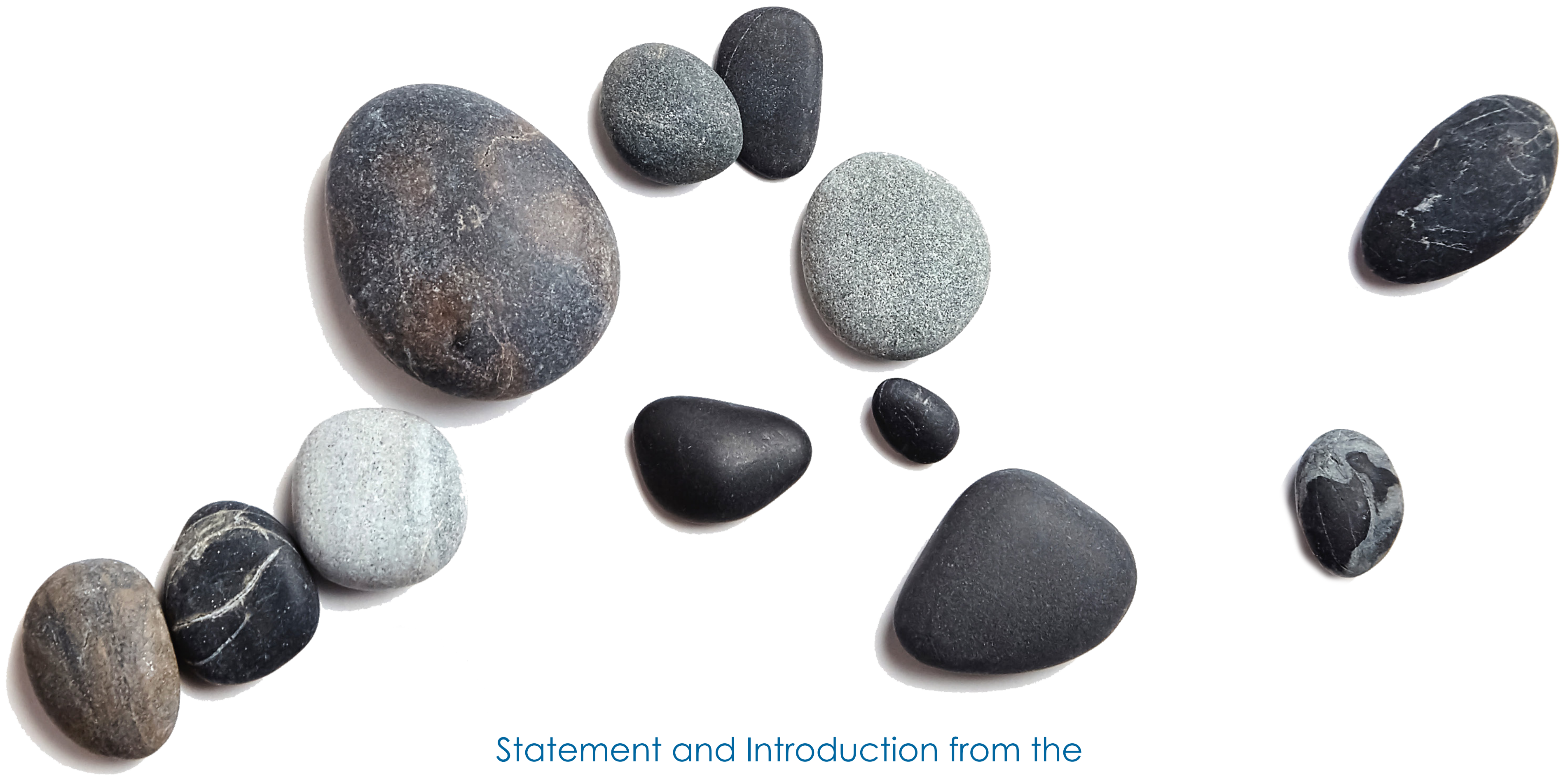


Photo: Adobestock.com

Statement and Introduction from the Confederated Tribes **Umatilla River Assessment**

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Natural Resources Fisheries Program has collated existing data, reports and input from state co-managers, Federal and local agencies, and other stakeholders into this watershed-scale assessment of historic, current, and desired conditions. This assessment will support a scientifically defensible and strategic approach to protect, enhance, and restore sustainable and functional river-floodplain systems that support and sustain healthy aquatic habitat conditions and populations of focal aquatic species including Middle Columbia River summer steelhead (ESA-listed Threatened), Columba River bull trout (ESA-listed Threatened), spring Chinook salmon, Pacific lamprey, freshwater mussels, and other native fish, and ultimately lead to self-sustaining populations of all native First Foods species that will be available for Tribal and non-tribal use.

Guiding the Fisheries Habitat Program is the “First Foods” DNR Mission and Tribal community-driven management approach (Quaempts et al. 2018), which identifies physical and ecological processes (“key touchstones”) of a highly functional watershed and dynamic river system important for providing water quality and fish habitat that supports aquatic First Foods integral for Tribal ceremonies and traditions. This document identifies the historic and current function of natural geomorphic and hydrologic processes that are linked to focal fish species habitat, as organized by the CTUIR River Vision (Jones et al. 2008) and Upland Vision Touchstones (Endress et al. 2019), and assesses the effect of current land use on the function of those natural processes and their influence on the production of focal species. The assessment will support the quantitative prioritization of geographic areas according to the potential for restoration and conservation of watershed/floodplain processes that support focal fish species habitat and restoration plans that may be applied to each geographic area to aid in restoring watershed processes and achieve enhancement and sustainability of habitats for native fish.

This assessment will supply the scientific rationale for a 30-year strategic Tribal and State co-manager, and stakeholder approach to floodplain restoration based upon natural processes and watershed-specific data. This assessment is primarily focused on the alluvial channel and floodplain of the Umatilla River from the confluence with the Columbia River near Umatilla, Oregon, to the headwaters of the North and South Forks of the Umatilla River in northeast Oregon. The primary study area includes approximately 107 miles of stream and the associated floodplain and tributary confluences of those stream segments. The secondary study area includes a reconnaissance-level assessment of the upland conditions and tributary processes across the Umatilla Subbasin that influence the primary study area.

Cover photograph: Umatilla River off the Birch Creek Road Bridge/Chinook Salmon overlay

Table of Contents

Umatilla River Assessment

CHAPTER ONE: Introduction

Since time immemorial, the members of what is now known as the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have lived in the Umatilla Subbasin and their traditional homelands. For many thousands of years, the Tribes managed the landscape guided by the traditional philosophy of **tamánwit** –unwritten traditional law that includes, but is not limited to, the reciprocal responsibility of the People to take care of the Foods that, in Tribal creation belief, made a promise to provide for the people.

However, impacts beginning with the Euro-American settlement starting in the 1800's, such as logging, agriculture, and the building of infrastructure like roads and railroads, have resulted in the ecological deterioration of the Umatilla Subbasin. This deterioration has disrupted the traditional reciprocal relationship between the people and the foods.

The CTUIR has been working collaboratively to restore and enhance the subbasin using holistic, process-based strategic planning and methodology for restoring watershed processes to support First Foods and treaty-reserved resources for perpetual cultural, economic and sovereign use. In order to sustain harvestable fish populations, and for CTUIR to exercise related Treaty rights, the watershed, rivers, and floodplain must be ecologically healthy to support clean, abundant water and fish. As part of this effort, the CTUIR and its partners and stakeholders identified the need to develop a scientifically-robust assessment of the subbasin's historic and current condition (this document), a geographical prioritization of where restoration actions might occur, and an action plan based on desired future conditions.

In 2007, the CTUIR Department of Natural Resources (DNR) adopted the following mission:

DNR MISSION STATEMENT:

To protect, restore, and enhance the First Foods - water, salmon, deer, cous, and huckleberry - for the perpetual cultural, economic, and sovereign benefit of the CTUIR. We will accomplish this utilizing traditional ecological and cultural knowledge and science to inform: 1) population and habitat management goals and actions; and 2) natural resource policies and regulatory mechanisms.

The First Foods (the traditional foods served ritualistically in a Tribal meal) are utilized by the CTUIR DNR as a management approach to ensure that the minimum ecological products necessary to sustain CTUIR culture are protected and sustained to meet Treaty-reserved resources (Quaempts et al. 2018).

The CTUIR DNR comprises seven programs:

- **Cultural Resources Protection**
- **Water Resources**
- **Fisheries**
- **Wildlife**
- **Range, Agriculture, and Forestry**
- **Energy and Environmental Science**
- **First Foods Policy**

This project will develop a scientifically-defensible, robust, and quantitative assessment and action plan focused on the alluvial channel and floodplain of the Umatilla River from the confluence with the Columbia River near Umatilla, Oregon, to the headwaters of the North and South Forks of the Umatilla River in northeast Oregon. This document represents the assessment, and presents the historic and current conditions for the Umatilla Subbasin. The results of this assessment will be used to develop a restoration prioritization tool, which will lead to an action plan.

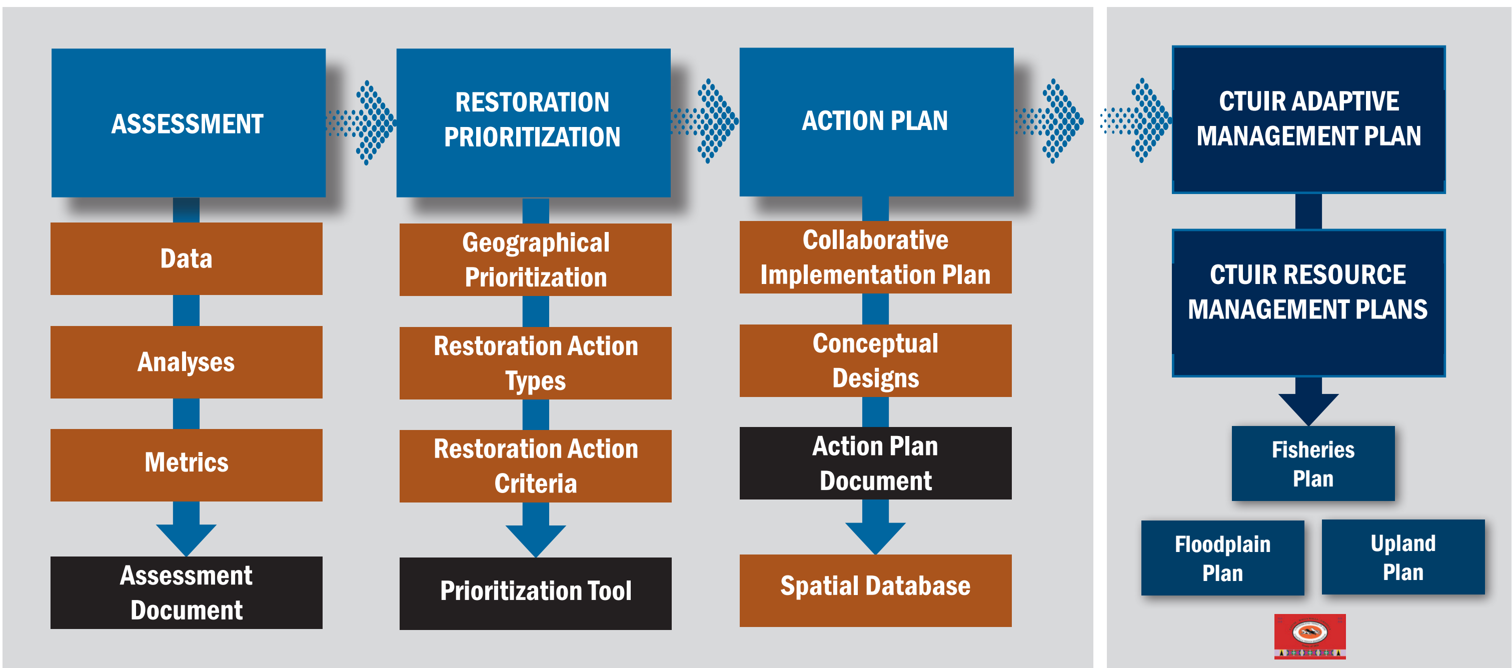
The primary study area includes approximately 107 miles of stream and the associated floodplain and tributary confluences of those stream segments. The secondary area of emphasis includes a reconnaissance-level assessment of the uplands conditions and tributary processes that influence the primary study area.

Project Vision:

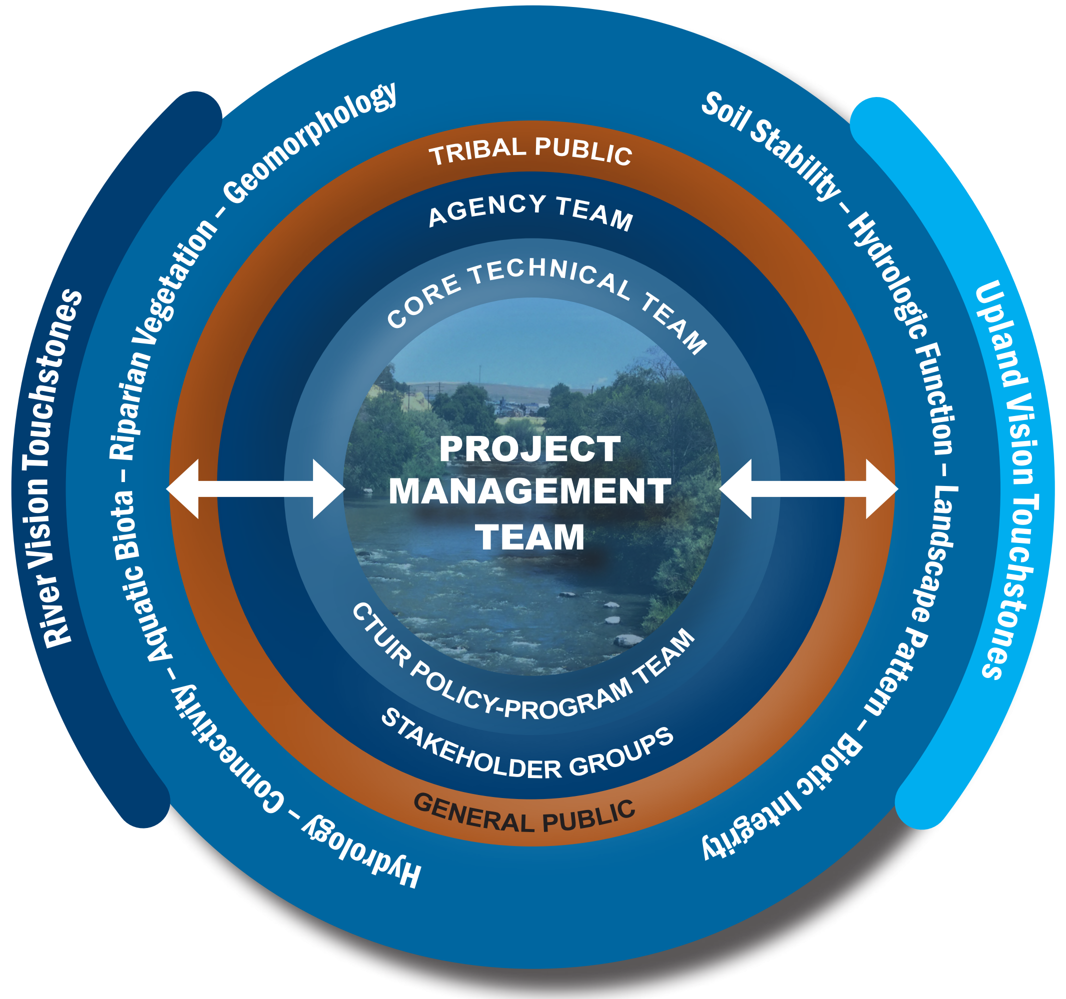
To ensure an ecologically functional Umatilla River in which natural riverine processes are sustained per River Vision and Upland Vision represented touchstones. We accomplish our vision by providing the scientific foundation to promote land management activities that ensure a sustainable balance with healthy ecosystems and cultural practices into the foreseeable future. This will ultimately lead to self-sustaining populations of all native First Foods species that will be available for Tribal and non-tribal use.

Umatilla River Assessment and Action Plan

CTUIR Management Tools



Project Collaboration:
This project represents a collaborative process involving the CTUIR, state and federal agencies, local non-governmental organizations, private landowners, and the Tribal and general publics.



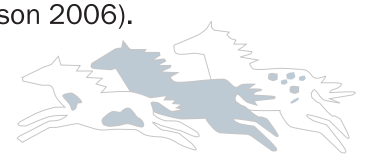
Project Stakeholders

- CTUIR Tribal Members
- General Public
- Landowners
- CTUIR Government
- City Governments
- Umatilla Basin Watershed Council
- Umatilla County
- Umatilla County Soil and Water Conservation District
- Tiichum Conservation District
- Oregon Department of Fish and Wildlife
- Oregon Department of Environmental Quality
- Oregon Watershed Enhancement Board
- Oregon Water Resources Department
- Bureau of Reclamation
- National Marine Fisheries Service
- Natural Resources Conservation Service
- U. S. Army Corps of Engineers
- U.S. Fish and Wildlife Service

Tamánwit: a reciprocal responsibility between the First Foods and the people (from CTUIR Cultural Resources Protection Program [CRPP])

Before there were human beings on the Columbia Plateau, the Creator discussed their impending arrival with the animals. People would be like infants who would need to be taught how to live here. An animal council was held to determine how to proceed. Salmon volunteered to be the first to offer his body and knowledge to the people and the other plants and animals followed suit (Conner and Lang 2006). The animal council's decisions reflect "tamánwit, the traditional philosophy and law of the people—the foundation of a physical and spiritual way of life that would sustain Plateau peoples for thousands of years" (Conner and Lang 2006). Tamánwit "is an ideology by which all things of the earth were placed by the Creator for a purpose. The works of the Creator were given behaviors that were unchangeable, and until time's end, these laws are to be kept" (Morning Owl 2006). The people's purpose is "to take care of all that was given them" (Conner and Lang 2006).

The Creator decreed to the people that they have a reciprocal responsibility to respectfully care for, harvest, share, and consume these traditional foods, or the foods may be lost. Neither can survive without the other. Since the beginning of time tamánwit has taken care of the traditional foods and guided the CTUIR in preserving them (Sampson 2006).



First Foods-Áwtni Tkwátat

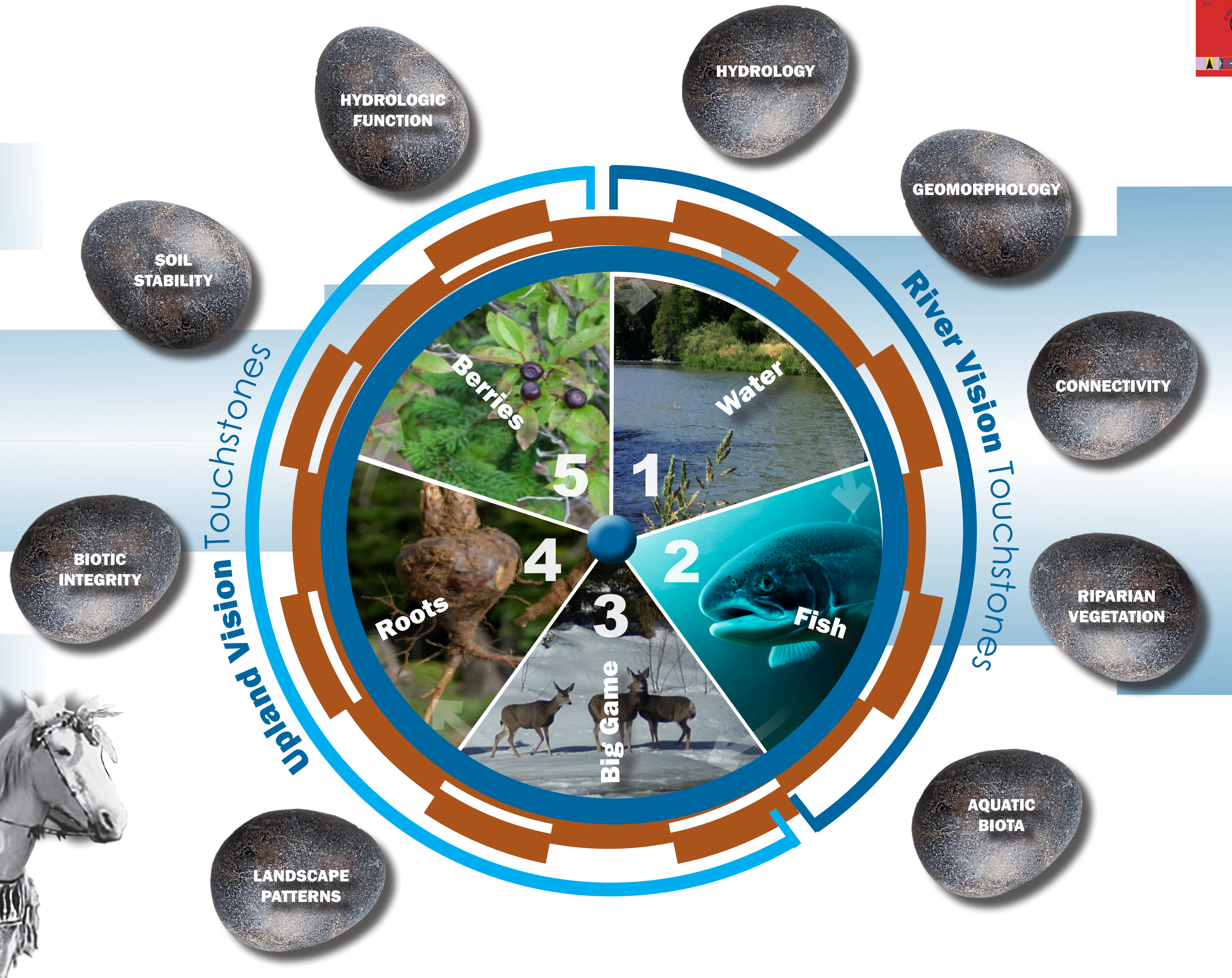
Čúuš	Umatilla River Subbasin surface water and groundwater
Núsux	Chinook salmon Coho salmon Lampreys Mussels Sockeye Steelhead Suckers Trout Whitefish
Yáamaš	Mule deer Rocky Mountain Elk White-tailed deer Buffalo Bighorn Sheep Mountain Goat Moose
áwš	Celery Cous Bitterroot Camas Indian Carrot
Wiwnu	Huckleberry Chokecherry

AQUATIC Áwtni Tkwátat:

The CTUIR River Vision, developed in 2008, describes the management vision for rivers, water, and associated First Foods. The Vision summarizes the interactions between ***five "touchstones": hydrology, geomorphology, connectivity, riparian vegetation, and aquatic biota.*** *These touchstones are what shape resilient and functional rivers and streams in the Umatilla Subbasin* (Jones et al. 2008).

UPLANDS Áwtni Tkwátat:

The CTUIR Upland Vision, developed in 2019, summarizes the interactions betweenuplands and associated First Foods via ***four touchstones: soil stability, hydrologic function, landscape pattern, and biotic integrity.*** *These touchstones support the maintenance of ecosystems, species, and associated ecological processes and interactions within their natural ranges of variability (Endress et al. 2019).*



CONFEDERATED TRIBES
OF THE UMATILLA
INDIAN RESERVATION

Tribal History

The Cayuse (Weyíiletpu), Umatilla (Imatalamláma), and Walla Walla (Walúulapam) Tribes have lived in what is now northeastern Oregon and southeastern Washington for tens of thousands of years, using parts of the Blue Mountains and the surrounding watersheds for hunting, fishing, trading and religious purposes. The landscape of the Umatilla Subbasin, with its forested upper drainages and the shrub-steppe and grasslands of the middle and lower drainages, provided abundant resources for the Tribes, now collectively known as the Confederated Tribes of the Umatilla Indian Reservation.

Traditional Use Area

VISIT THE MUSEUM AT TAMÁSTSLIKT CULTURAL INSTITUTE

LEARN MORE...
www.tamastslikt.org

Photo: Adobestock.com

SHARING the Columbia River

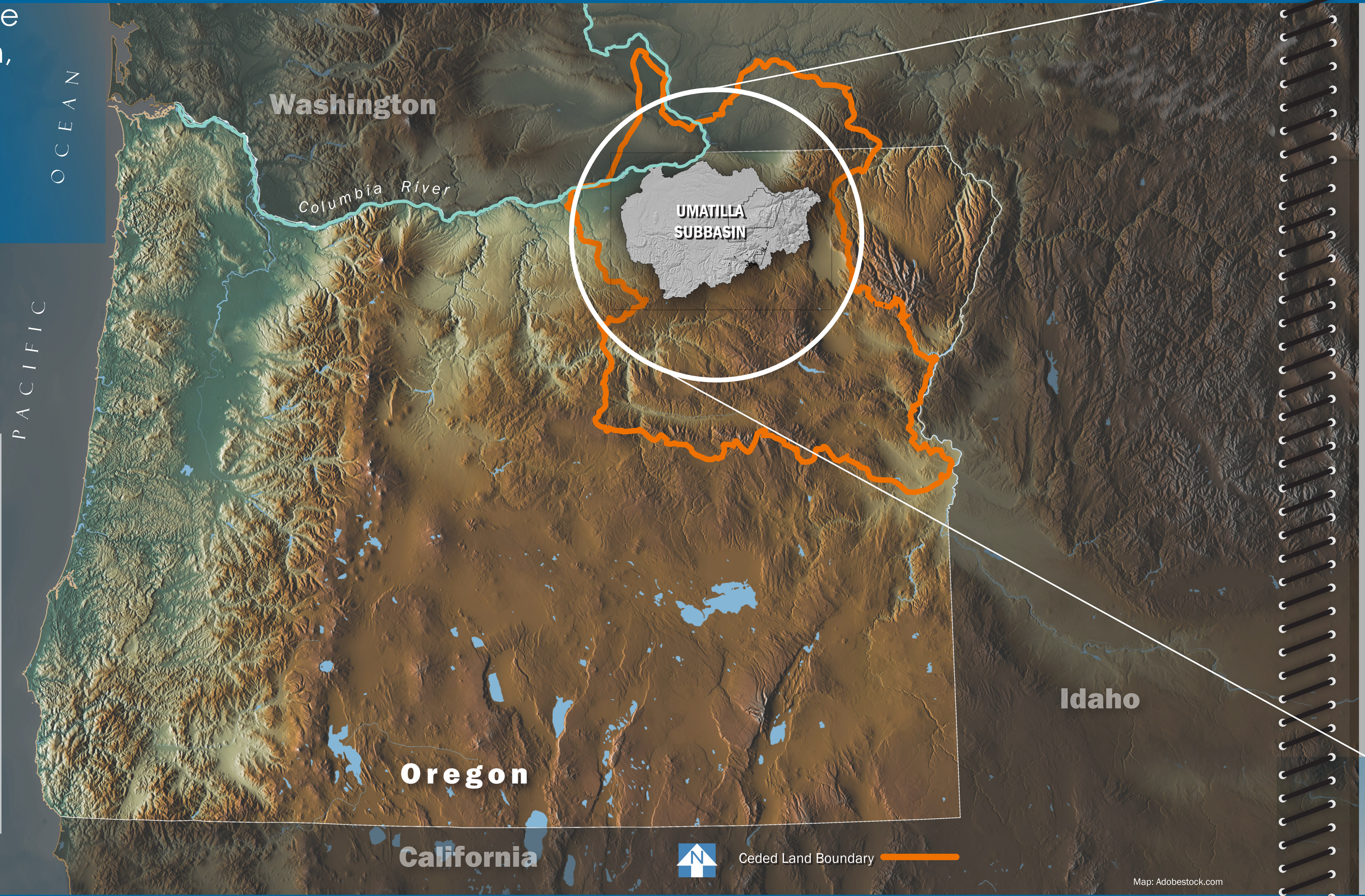
and its river valleys, our tribes moved seasonally in a circular pattern between hunting camps, fishing locations, celebration and trading locations, and for gathering resources such as roots, berries, and other ***First Foods.***

Used with permission, Lynn Kitagawa

- **1700's - Horses arrive**
- **1855 - Treaty of 1855**
- **1884 - Railroad is built**
- **1908 - 1914 - Feed Canal, Furnish, Maxwell, and Three Mile Dams**
- **1926 - Chinook and Coho salmon extirpated**
- **1927 - McKay Dam**
- **1938 - 1971 - Columbia River Dams**
- **1967 and 1974 - Lamprey extirpated with rotenone**
- **1981 - Spring Chinook salmon reintroduced**
- **1982 - Fall Chinook and Coho salmon reintroduced**
- **1984 - First returns of reintroduced Chinook and Coho salmon**
- **1986 - CTUIR fish hatchery satellite facilities**
- **1987 - Umatilla Habitat Project**
- **2005 - Freshwater mussels reintroduced**

Some Significant Recent Events in the CTUIR History:

Introduction to the Umatilla Subbasin, Reservation, and Ceded Lands



Subbasin Watersheds

Upstream

- Headwater Umatilla River
- Meacham Creek
- Wildhorse Creek
- McKay Creek
- Mission Creek-Umatilla River
- Birch Creek
- Alkali Canyon-Umatilla River
- Stage Gulch
- Upper Butter Creek
- Lower Butter Creek
- Sand Hollow
- Cold Springs Canyon*
- Hunt Ditch-Umatilla River

Downstream

* Cold Springs Canyon watershed is listed by the U.S. Geological Survey as a part of the Umatilla Subbasin. However, the watershed is only connected to the Umatilla River through an inter-basin transfer (Bailey et al. 2001). The watershed does not provide habitat and has historically had no influence on the lower Umatilla River. The watershed is only included in this document because of the hydrologic influence on the lower Umatilla River via the transfer. - *See section on Water Quantity for more information on Cold Springs Canyon and see the Technical Appendix for more information on the USGS designations of Subbasins, Watersheds, and Subwatersheds.*

Umatilla Subbasin Previous **Research and Work**

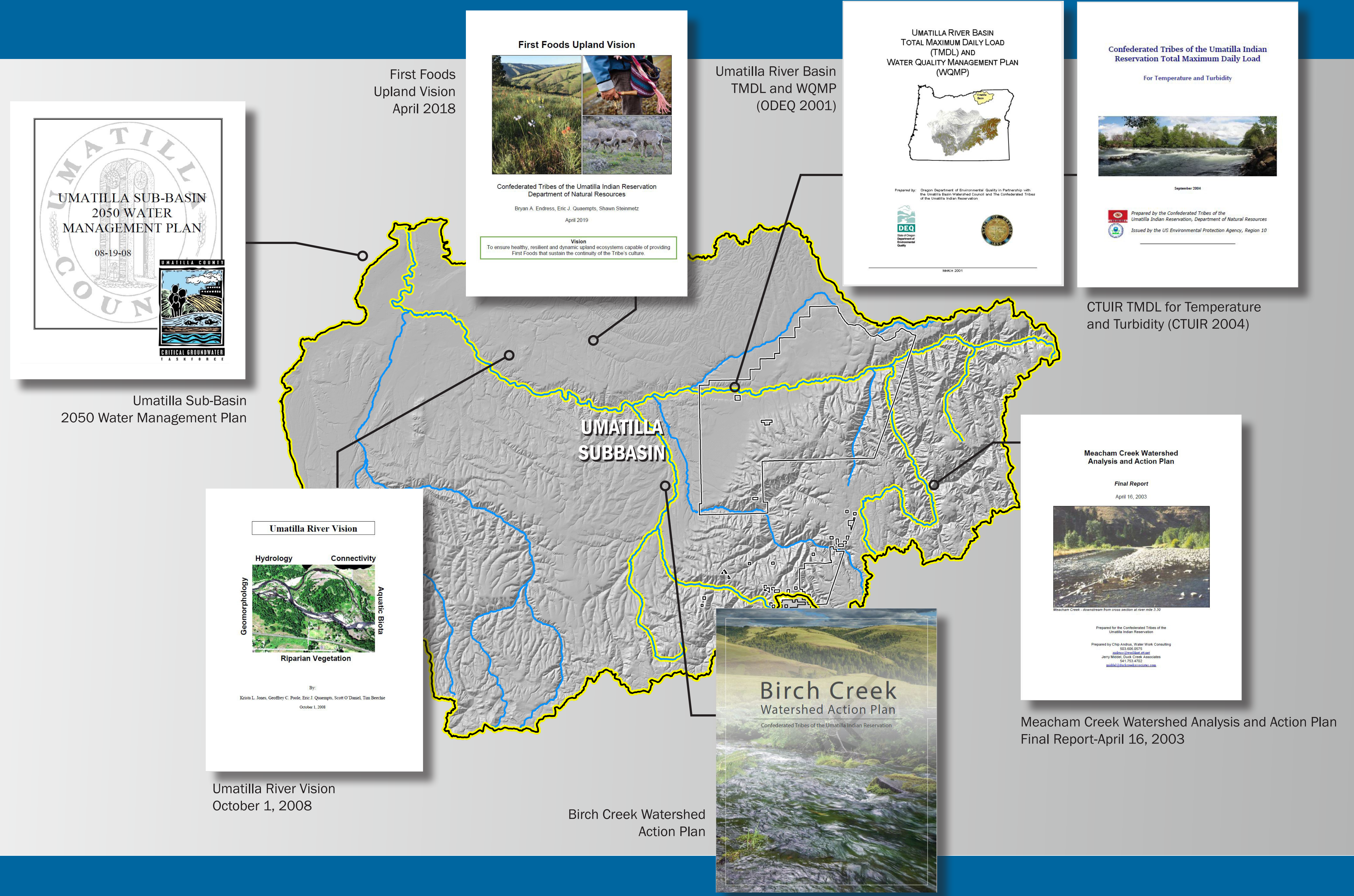
The CTUIR, along with various universities, non-profit groups, and state and federal agencies have conducted a tremendous amount of research within the Umatilla Subbasin, providing a wealth of information on landscape patterns, hydrologic function, geomorphology, connectivity, riparian vegetation, and aquatic biota. Numerous restoration projects have also been designed and implemented over the years, providing critical anecdotal evidence on the relative effectiveness of various restoration approaches within the Umatilla Subbasin.

Past efforts include, but are not limited to:

- **Umatilla River Basin TMDL and WQMP (ODEQ 2001)**
- **Meacham Creek Watershed Analysis and Action Plan (Andrus et al 2003)**
- **Draft Umatilla/Willow Subbasin Plan (NPCC 2004)**
- **CTUIR TMDL for Temperature and Turbidity (CTUIR 2004)**
- **The Umatilla River Vision (CTUIR 2008)**
- **Umatilla Subbasin 2050 Water Management Plan (Umatilla County 2008)**
- **Comprehensive Rangeland Resource Inventory (CTUIR 2009)**
- **Umatilla River Water Rights Assessment (CTUIR 2010)**
- **Agricultural Resource Management Plan (CTUIR 2010)**
- **Forest Management Plan (CTUIR 2010)**
- **Birch Creek Watershed Action Plan (CTUIR 2016)**
- **First Foods Upland Vision (CTUIR 2019)**

Collectively, this body of work laid the foundation for this Assessment, which draws heavily on the information generated and the lessons learned from these past efforts to build a robust and data-driven strategic action plan for the Umatilla Subbasin.

A more complete, but by no means exhaustive, list of important research and past work within the Umatilla Subbasin is provided as an annotated bibliography in the Technical Appendix. Here you can find a description of each effort along with links to the resulting reports and datasets.



CHAPTER TWO: Historic and Current Upland Vision Touchstone Conditions

The uplands areas of the Umatilla Subbasin historically featured diverse habitats and an abundance of flora and fauna. The rich cultures of the people of the region were sustained by the plentiful resources of Water, Big Game, Roots, and Berries for millennia, but those resources are now greatly reduced.

DISTURBANCES	Herds Of Cattle, Sheep, And Horses Introduced By Euro-American Settlers	Introduction of Non-native Plant species	Fire Suppression	Timber Harvest
Hydrologic Function	Reduced capacity to absorb and hold water	Increase in bare ground susceptible to erosion	Reduced infiltration of rainfall, increased overland flow, reduced water availability, increased erosion rates, reduced water quality	Reduced infiltration of rainfall, increased overland flow, reduced water availability, increased erosion rates, reduced water quality
Soil Stability	Soil loss, degraded soils, reduced water infiltration, soil compaction, decline in organic matter and nutrients	Altered fire frequency and intensity, reduction of fire-tolerant shrubs	Increase in large, infrequent, severe fires that reduces nutrients, organic matter, and soil microorganisms	Increased erosion and negative affects on hydrologic function (water quality)
Landscape Pattern	Small, isolated patches of native vegetation that are susceptible to invasion by non-native species	Over-simplified structural and species complexity	Increased homogeneity, increased connectivity of stands, and increased number of large stand-replacing fires reducing health and availability of First Foods	Reduced dry-forest resistance and resilience, decrease in old growth open canopy and increase in mid- or late-successional closed canopy forest
Biotic Integrity	Decline in abundance and diversity of First Foods, and contracted distributions	Decline in abundance and diversity of First Food species; altered habitat, availability of food resources, and migratory routes of wildlife	Increased abundance of less fire-tolerant species, increased fuel loading, increased fire severity	Increased stresses to drought, pathogens, infestations and other disturbances, reduction in biodiversity for wildlife

Hydrologic Function – Soil Stability – Landscape Pattern – Biotic Integrity

Historically, the uplands of the Umatilla Subbasin were hydrologically functional. The uplands and valleys were covered in lush vegetation, fed by ample seasonal rains and the slow melting of the winter snows in the mountains. Water moved slowly from the uplands to the streams, slowed by the mature vegetation, extensive wetlands, and numerous beaver dam complexes. This slow movement of water through the landscape meant that even during the summer, the streams were recharged by cold, clean water that had been cleaned and filtered as it moved through the system, and plant, fish, and animal First Foods were sustained.

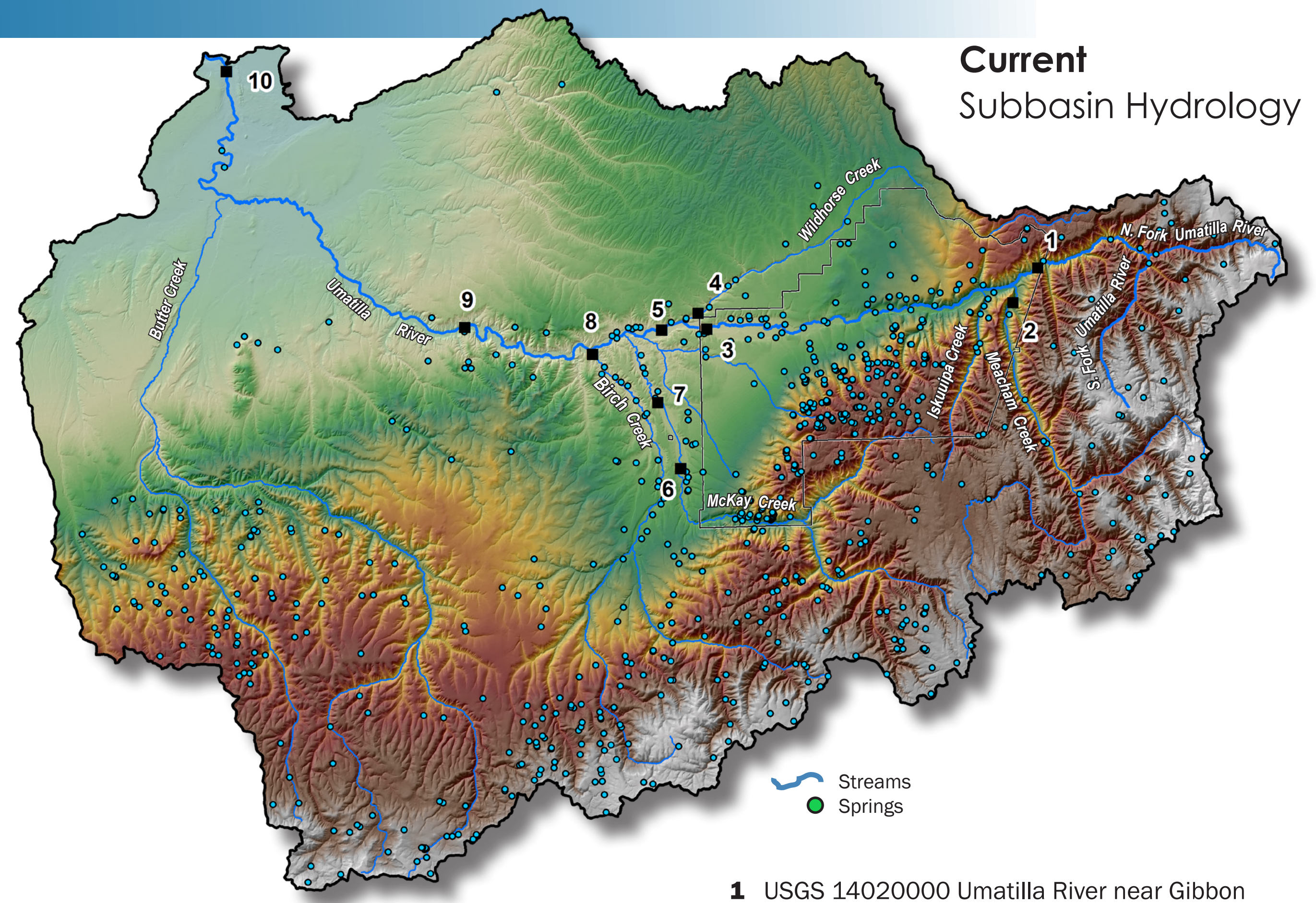
Since the 1800's, the landscape of the Umatilla Subbasin was changed by the introduction of agriculture, logging, fire suppression, and the development of roads, railroads, and irrigation diversions. As a result, the current landscape has altered hydrologic function. Precipitation runs off quickly rather than being stored and released, and the deteriorated ecological function of the subbasin means that it is less able to filter and process the water before it reaches the streams and rivers. (Endress et al. 2019).

The introduction of livestock in the early 1900's led to the development of springs and the use of smaller tributaries for the herds. This has resulted in degradation of native First Foods vegetation cover, replacement of these species with exotic species, and reduced infiltration (CTUIR 2004). Improvements to the subbasin's hydrologic function are needed in order to create greater reslience to expected impacts from climate change.

In the future, it is expected that temperatures will rise, less precipitation will fall as snow, and there will be less flow in the subbasin's streams and rivers in the summer. Improvements to the subbasin's hydrologic condition are needed in order to create greater resilience to expected impacts from climate change. Additionally, the Columbia River Cold Water Refuges Plan shows that, with additional work, the Umatilla River is a producer of cold water to the Columbia River (Palmer 2021, Snyder et al. 2022).

Visit the Climatetoolbox.org to learn more about the expected impacts from climate change in the Umatilla subbasin.

Current Subbasin Hydrology



The left bank of [the] river [is] very rapid, not navigable. Distance over river 303 links [200 feet].
(GLO Survey Notes from May 6, 1860 describing the Umatilla River)

1 USGS 14020000 Umatilla River near Gibbon
2 USGS:CTUIR 14020300 Meacham Creek
3 USGS:CTUIR 14020850 Umatilla River at West Reservation Boundary
4 CTUIR 14020990 Wildhorse Creek at Pendleton
5 OWRD 14021000 Umatilla River in Pendleton
6 OWRD 14022500 McKay Creek near Pilot Rock
7 OWRD 14023500 McKay Creek near Pendleton
8 OWRD 14025000 Birch Creek near Reith
9 OWRD 14026000 Umatilla River at Yoakum
10 USGS 14033500 Umatilla River near Umatilla

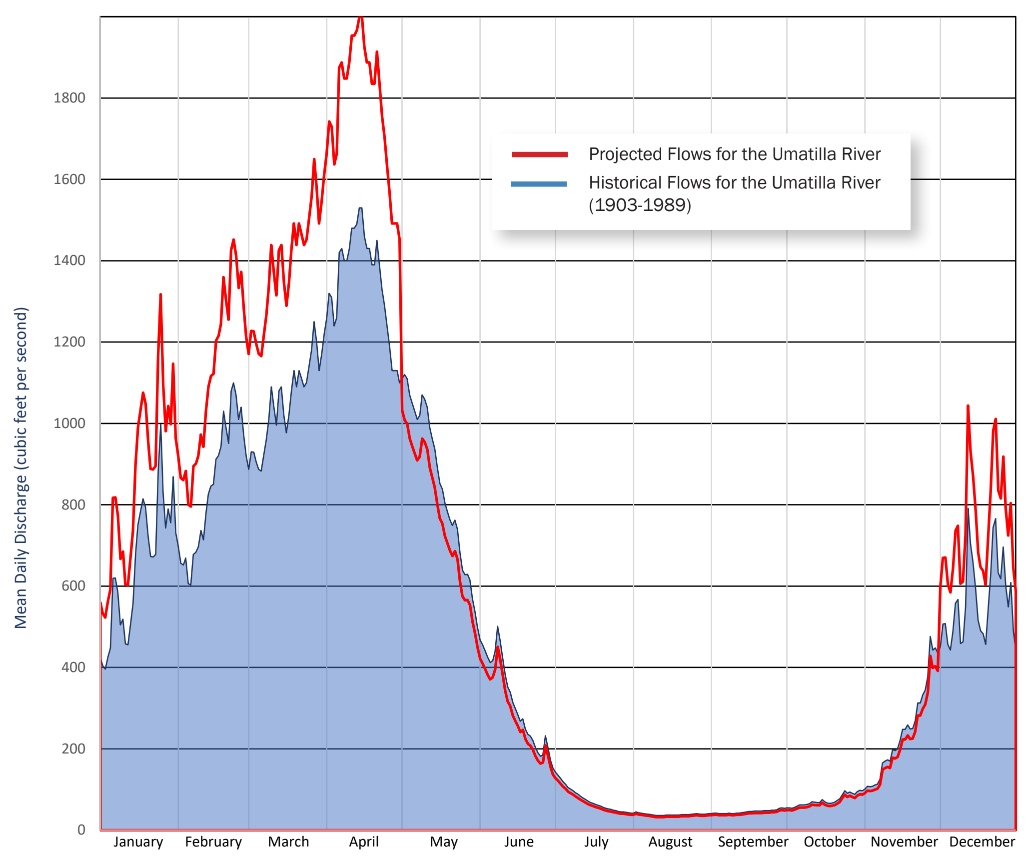
Changing Hydrology By 2080 (from NorWeST summer stream temperature and flow model [Isaak et al. 2017])

Mean summer streamflows in the Umatilla River are expected to **DECREASE:**

- **Between 1 and 10 cubic feet per second (cfs)** in the North and South Fork Umatilla River
- **Between 10 and 20 (cfs)** from the confluence of the Forks of the Umatilla River downstream to Meacham Creek
- **Between 20 and 60 (cfs)** from Meacham Creek downstream to Birch Creek
- **More than 60 (cfs)** from Birch Creek downstream to the mouth

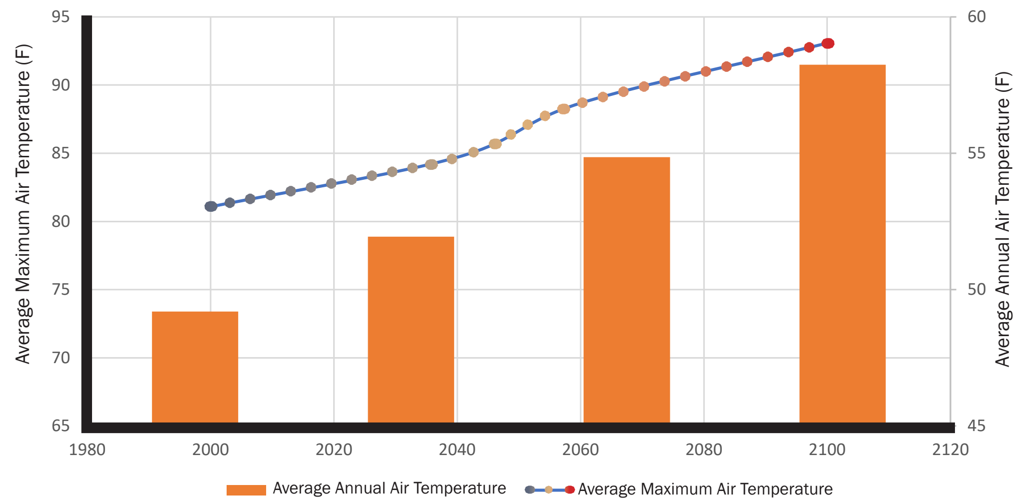
Photo: Adobestock.com

Predicted Subbasin Hydrology



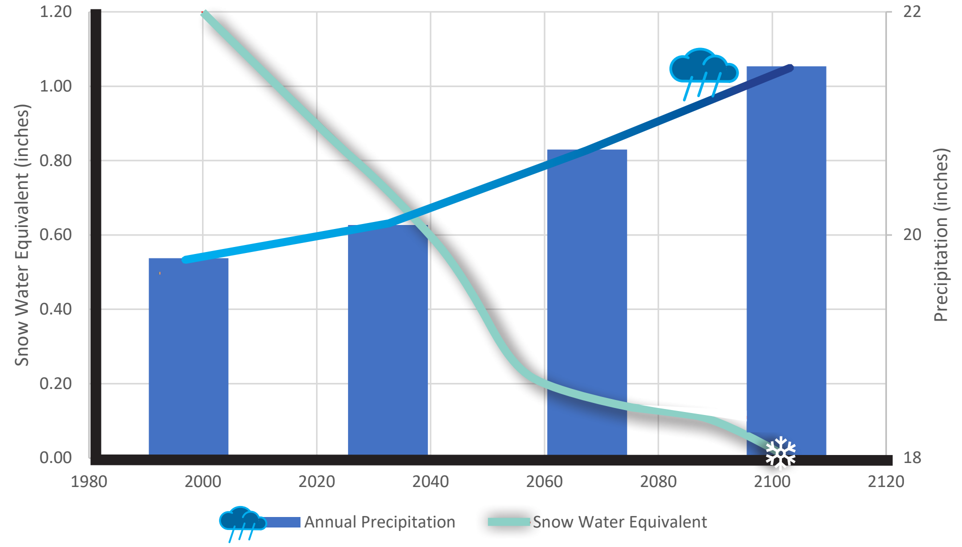
From the Climatetoolbox.org:

Characterizations of anticipated future streamflows in the Umatilla Subbasin project increased winter flows as a result of greater frequency and intensity of Atmospheric Rivers. Estimated summer flows will also generally decrease but also be subject to punctuated, convective thunderstorms in the late summer. Both winter and summer streamflows are also expected to increase in variability from 2040 to 2080 (Hamlet et al. 2013). Using different modeling techniques, researchers at University of Washington and the CTUIR found very similar patterns in the predicted hydrology for the Umatilla Subbasin (Pylak et al. 2018; O'Daniel 2023).



From the Climatetoolbox.org:

By 2099 annual average daily temperatures are expected to increase by **9 degrees** and annual precipitation is expected to increase by **1.7 inches** and average April 1st snow-water is expected to decrease to **0 inches**



"We need cold, clear, pure, *sacred* water, and salmon."
(Átway Louie Dick, CTUIR Tribal Member)

By 2039 Summer flows are expected to decrease by **3%** and winter flows are expected to increase by **14%**

By 2069 Summer flows are expected to decrease by **5%** and winter flows are expected to increase by **31%**

By 2099 Summer flows are expected to decrease by **7%** and winter flows are expected to increase by **32%**

Pre-EuroAmerican settlement, the landscape was managed using Traditional Ecological Knowledge (TEK) which utilized pruning, burning, sowing seeds, and coppicing. These land management techniques were used to promote the production of First Foods and other important resources. The landscape was covered by native vegetation, which filtered runoff before it reached the streams.

TEK
Traditional Ecological Knowledge (TEK)

Endress et al. 2019

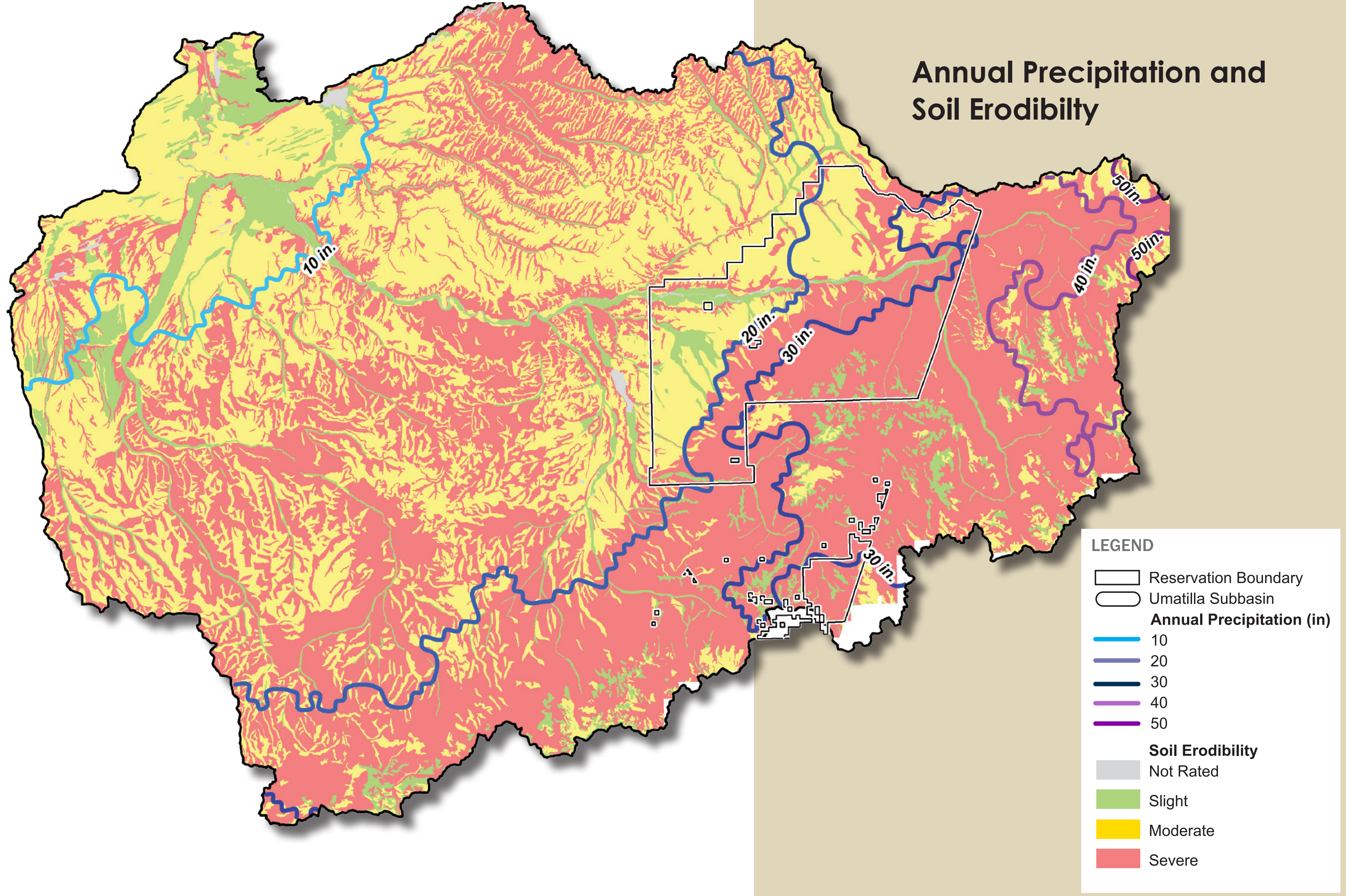
Post-EuroAmerican settlement, the conversion of land from areas of First Foods production to agriculture reduced availability of traditional foods, and reduced range for wildlife. Over-grazing by livestock has introduced non-native plants and timber extraction has depleted forest stands, further reducing soil stability and increasing sediment routing to streams. This decrease in soil stability under Post-EuroAmerican settlement is a particular concern given the erodible nature of the soils in the Umatilla Subbasin.

Gullying formed as a result of soil instability.

Dry, cracked soil due to loss of vegetative cover from over-grazing.

Example of timber harvest decreasing canopy cover.

Annual Precipitation and Soil Erodibilty



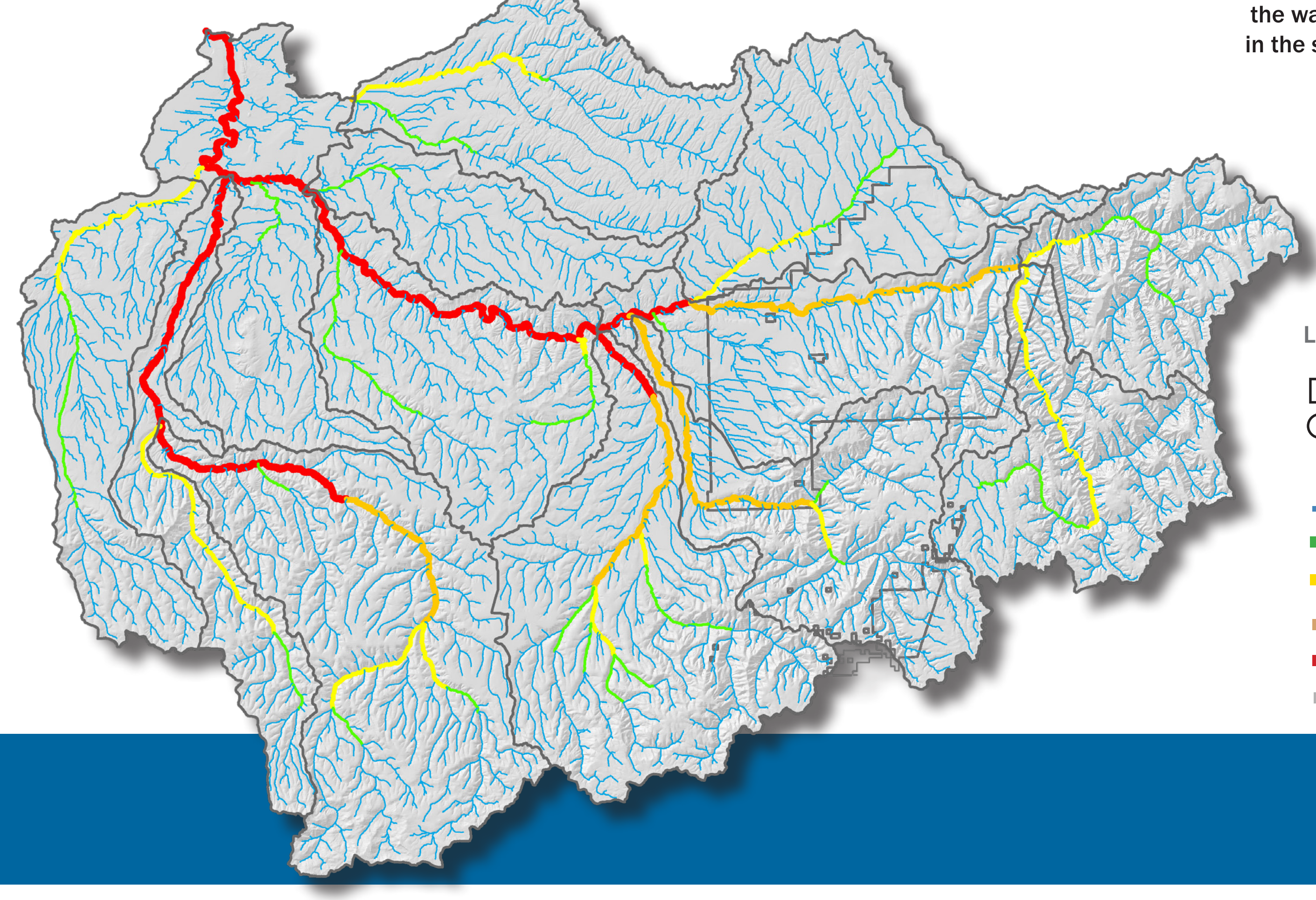
Historically, the landscape was covered by native vegetation, which filtered runoff before it reached the streams. However, since the 1800's thousands of miles of roads were constructed.

Although ensuring a functioning road network is critical for maintaining transportation routes, it is important to minimize impacts from roads on the hydrology and aquatic habitat in watersheds.

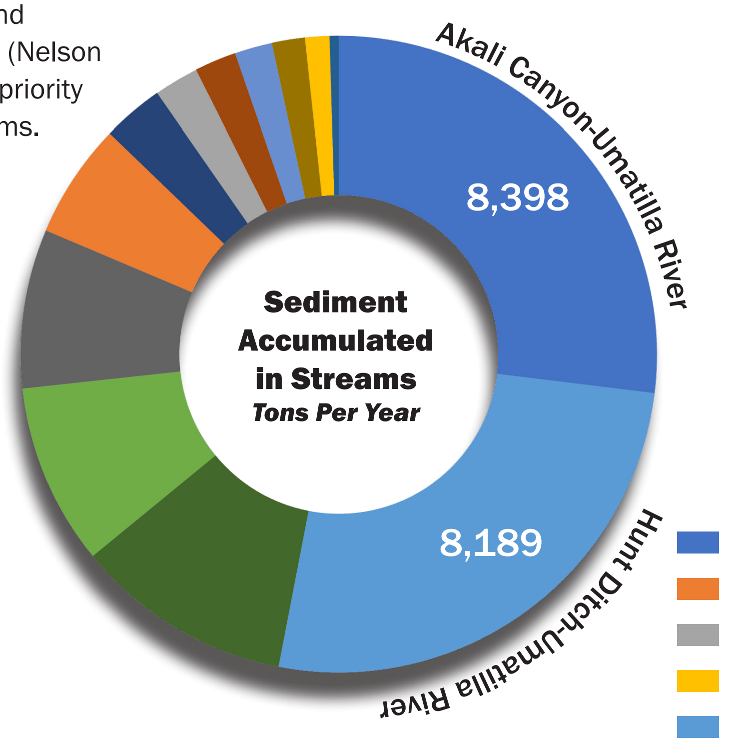
To evaluate environmental issues stemming from hydrologic interactions with the road network in the subbasin, road networks of concern were identified using the Geomorphic Roads Analysis and Inventory Package (GRAIP) Lite tool. GRAIP Lite is a system of tools for ArcGIS developed by the U.S.Forest Service that models road-related sediment impacts to stream habitats. The model utilizes topography and road maintenance levels to calculate sediment production from road segments. The program then describes the stream connection probability and sediment delivery based on distance to streams and accumulated sediment in the modeled stream network (Nelson et al. 2014). The tool facilitated identifying the highest priority road segments that deliver the most sediment to streams.

The GRAIP Lite tool modeled a total of **5,024 miles of road** and **3,721 miles of streams** in the subbasin. **319 miles of roads** were identified as high sediment delivery to streams (greater than 0.01 tons of sediment per year) and 135 miles of stream were identified as having greater than 30 tons of sediment accumulated per year.

Stream Sediment Accumulation



Total sediment delivered to streams in each of the watersheds in the subbasin.



- Alkali Canyon-Umatilla River
- Birch Creek
- Cold Springs Canyon
- Headwaters-Umatilla River
- Hunt Ditch-Umatilla River
- Lower Butter Creek
- McKay Creek
- Meacham Creek
- Mission Creek-Umatilla River
- Sand Hollow
- Stage Gulch
- Upper Butter Creek
- Wildhorse Creek

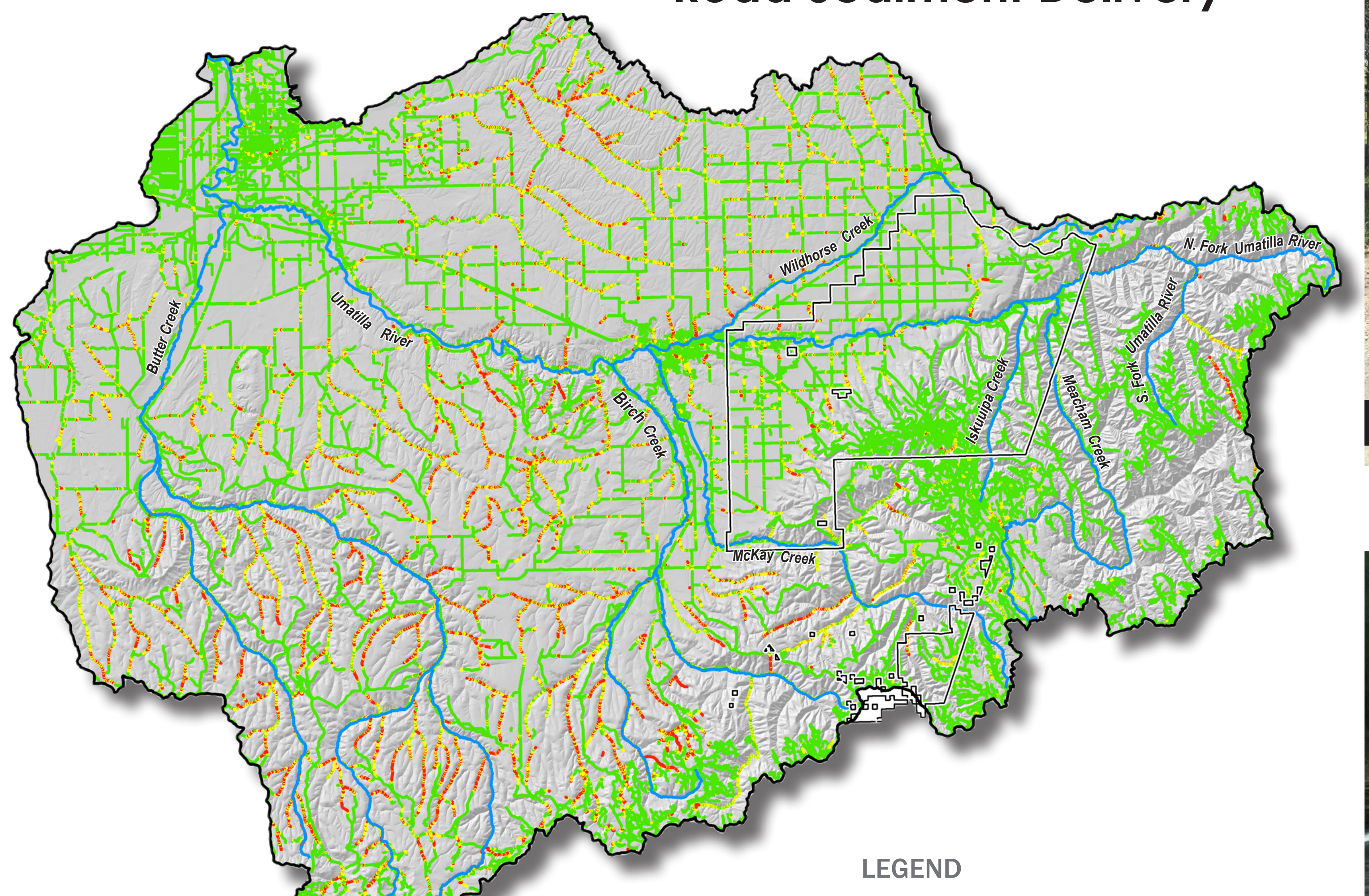
LEGEND

- Reservation Boundary
- Umatilla Subbasin

Stream Sediment Accumulation

- NEGLIGIBLE
- LOW
- MODERATE
- HIGH
- EXTREME
- NONE

Road Sediment Delivery



LEGEND

- Reservation Boundary
- Umatilla Subbasin

Road Sediment Delivery

- LOW: 0 - 0.001 tons/year
- MODERATE: 0.001 - 0.01 tons/year
- HIGH: >0.01 tons/year

Example of a well-built road surface.

Highly-eroded road on delivering sediment to Meacham Creek.

LAND COVER
In the Umatilla Subbasin

Since time immemorial, the CTUIR managed the landscape of the Umatilla Subbasin to encourage a spatial pattern of ecosystems that supported the First Foods. Fire and other land management tools were used to encourage spatial heterogeneity in the landscape, with an assortment of landscape types, patch sizes, and high connectivity.

However, since the 1800's, the conversion of much of the subbasin to agriculture and the use of other areas for seasonal grazing, logging, and development, means that the current landscape pattern is highly diverged from the historical condition. Smaller remnants of intact habitats are surrounded by highly impacted landscapes, limiting connectivity for species and providing less resilience to changes in the climate or other disturbances.

Current CTUIR forest and agricultural management plans require agricultural buffers for all ESA-listed habitat. However, buffers are voluntary for non-ESA listed streams.

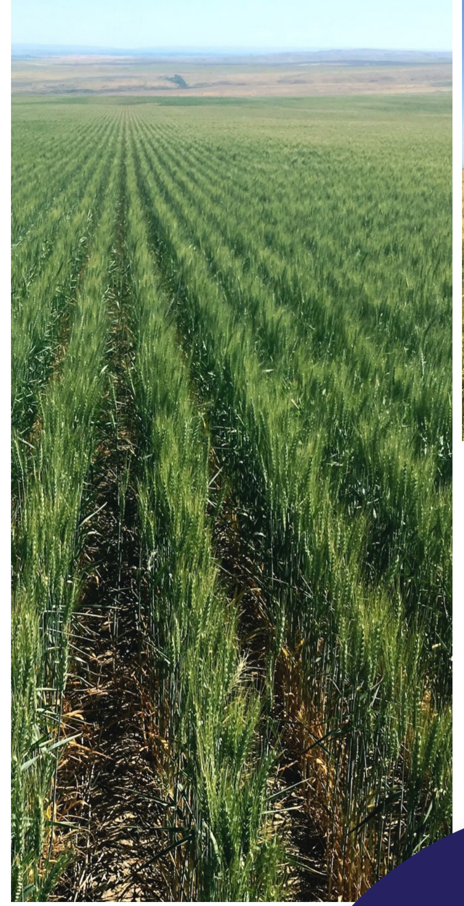
Dense growth of sage, interspersed with a little grass, greasewood and cactus. Land gently rolling. Umatilla bottom, very rich land... rich soil and good for farming purposes... plenty of timber for the purposes of the settler
(GLO Survey Notes from 1864 describing the Umatilla Subbasin)

Forests

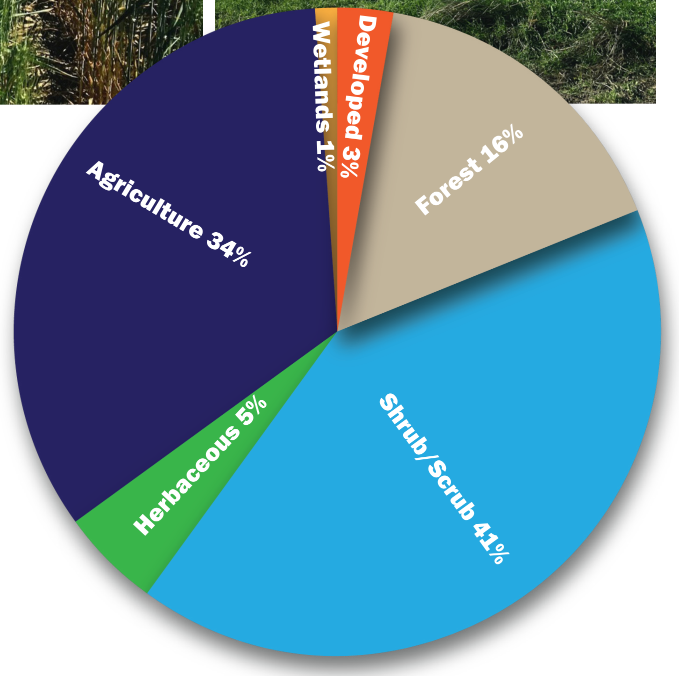
Herbaceous

Wetlands

Agriculture



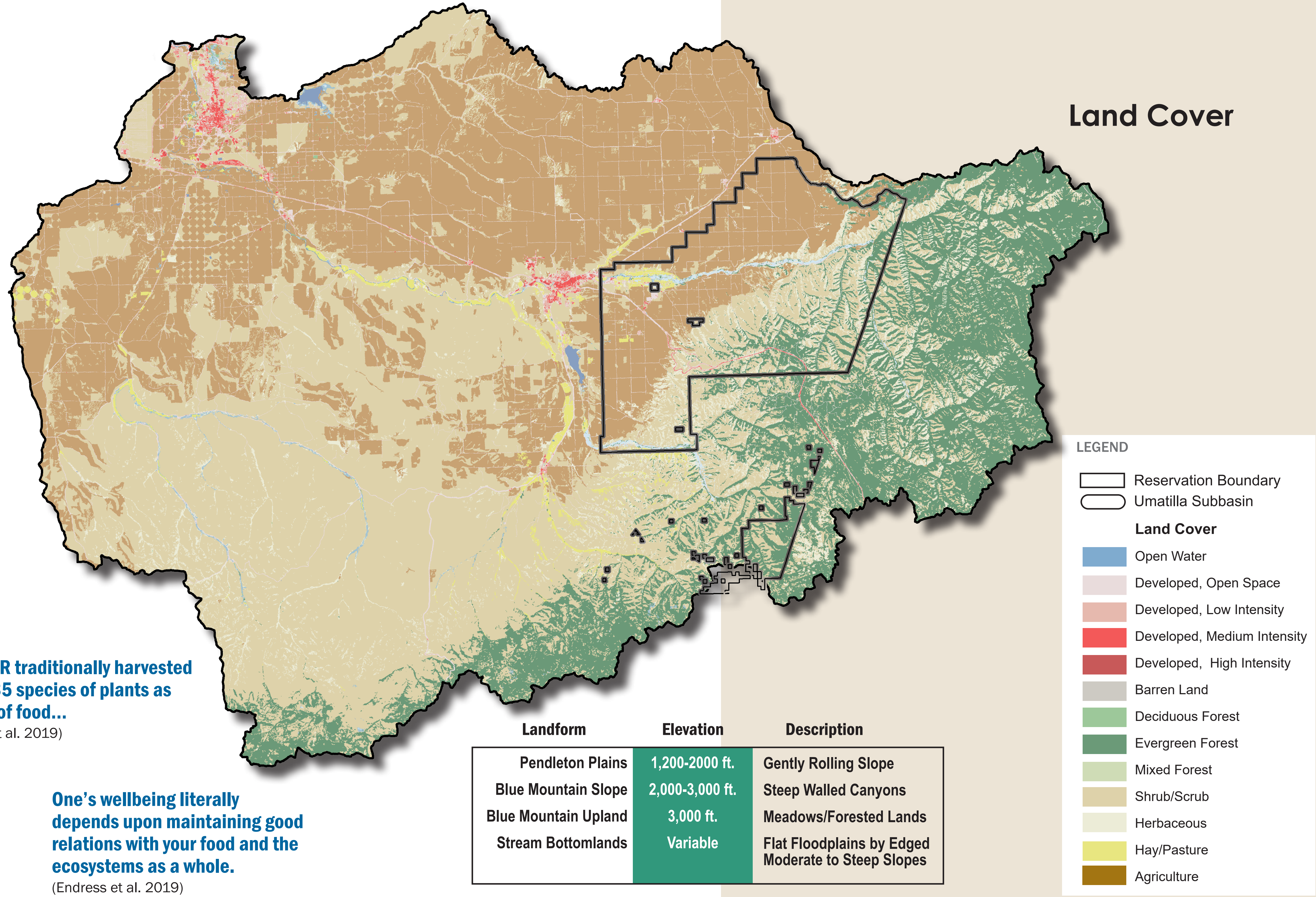
Shrubs/Scrub



Barren Land <1%
Open Water <1%

Land Cover in the Umatilla Subbasin

Land Cover



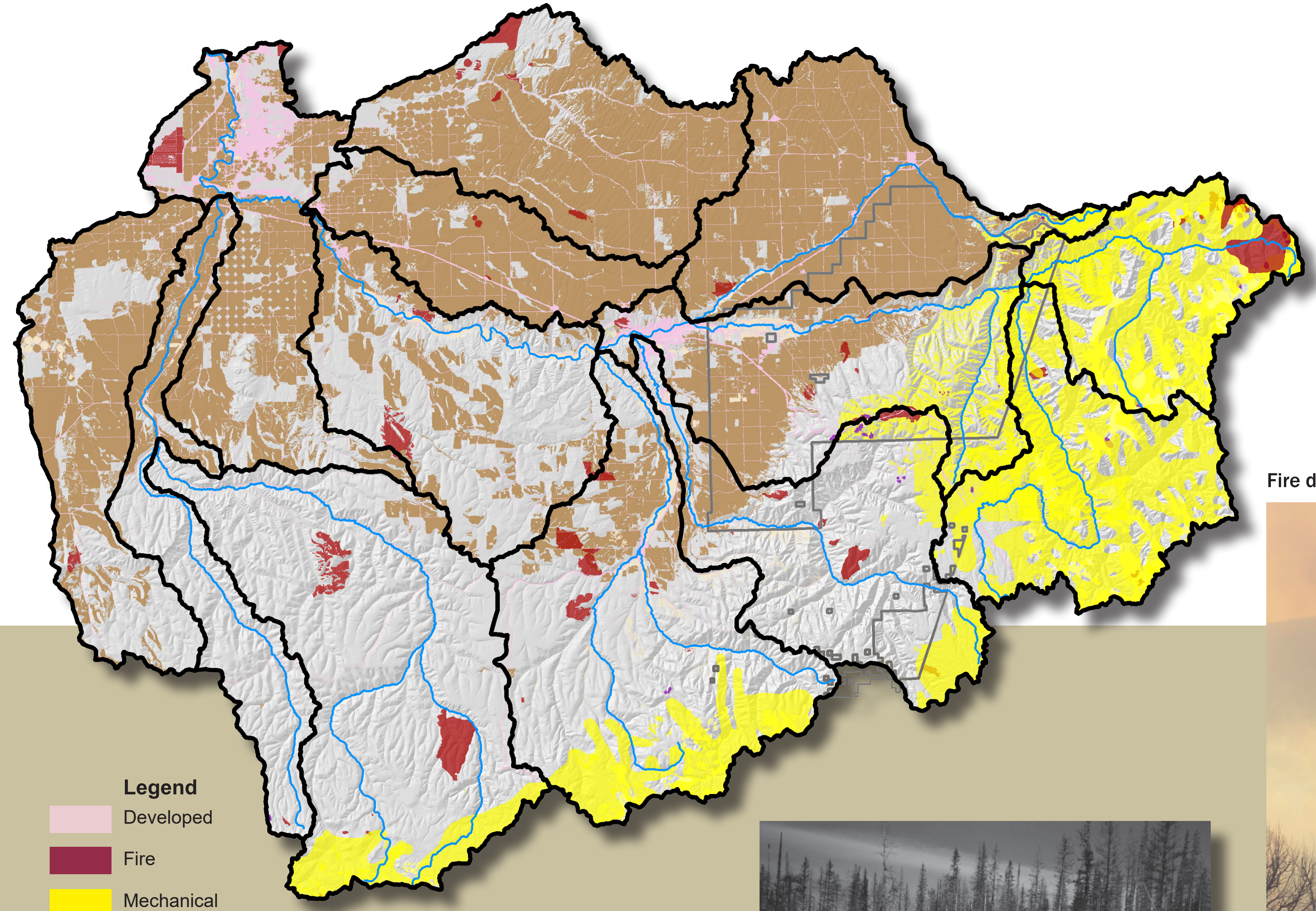
The CTUIR traditionally harvested about 135 species of plants as sources of food...
(Endress et al. 2019)

Landform	Elevation	Description
Pendleton Plains	1,200-2000 ft.	Gently Rolling Slope
Blue Mountain Slope	2,000-3,000 ft.	Steep Walled Canyons
Blue Mountain Upland	3,000 ft.	Meadows/Forested Lands
Stream Bottomlands	Variable	Flat Floodplains by Edged Moderate to Steep Slopes

One's wellbeing literally depends upon maintaining good relations with your food and the ecosystems as a whole.
(Endress et al. 2019)

Disturbances

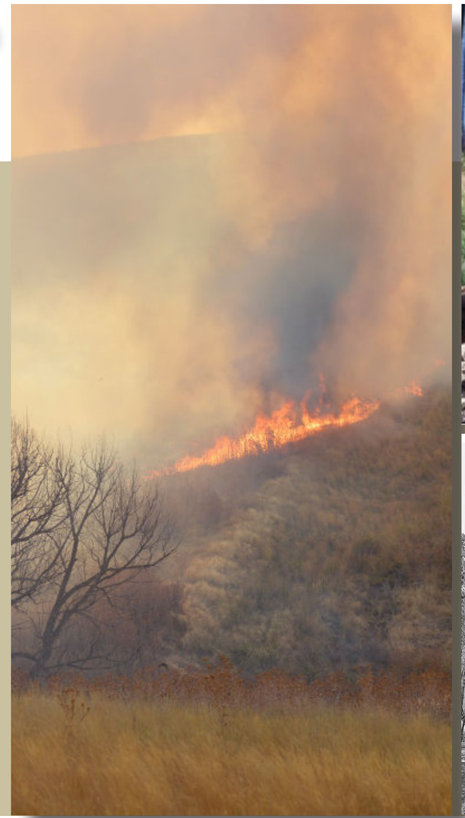
34% of available land in the Umatilla Subbasin is irrigated as cultivated crops.



Legend
- Developed
- Fire
- Mechanical
- Insect-Disease
- Cultivated Crops

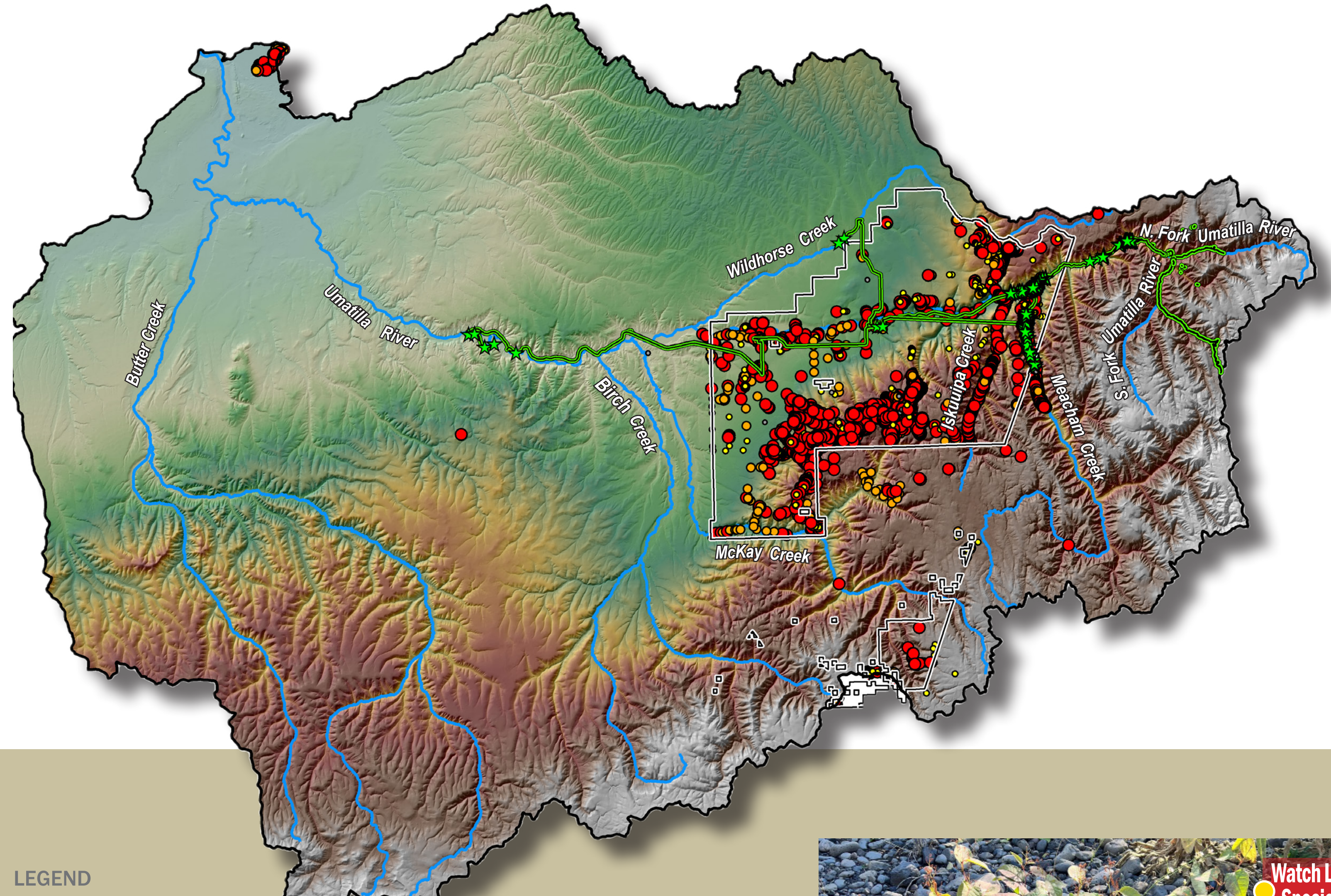
Cultivation in the Umatilla Subbasin.

Fire disturbance in the Umatilla Subbasin.



Mechanical disturbance in the Umatilla National Forest.

Invasive Plant Species 1/



LEGEND
- Reservation Boundary
- Umatilla Subbasin
- **Invasive Plants: CTUIR Integrated Weed Management Plan (IWMP) Designation**
- **PRIORITY 1**
- **PRIORITY 2**
- **PRIORITY 3**
- **Other Invasive Plant Locations (CTUIR/USFS)**

List of Priority 1 Species CTUIR IWMP (2018):
Bachelor's button
Bur chervil
Canada thistle
Common bugloss
Common crupina
Dalmation toadflax
Diffuse knapweed
Garlic mustard
Himalayan blackberry
Multiflora rose
Myrtle spurge
Purple loosestrife
Rush skeletonweed
Russian knapweed
Russian olive
Spikeweed
Spotted knapweed
Sulfur cinquefoil
Tansy ragwort
Tree of heaven
Whitetop (hoary cress)
Yellow flag iris
Yellow starthistle

Yellow flag iris in a wetland near Meacham Creek.

Scotch thistle in the Umatilla River floodplain.

Japanese Knotweed on the Umatilla River floodplain.

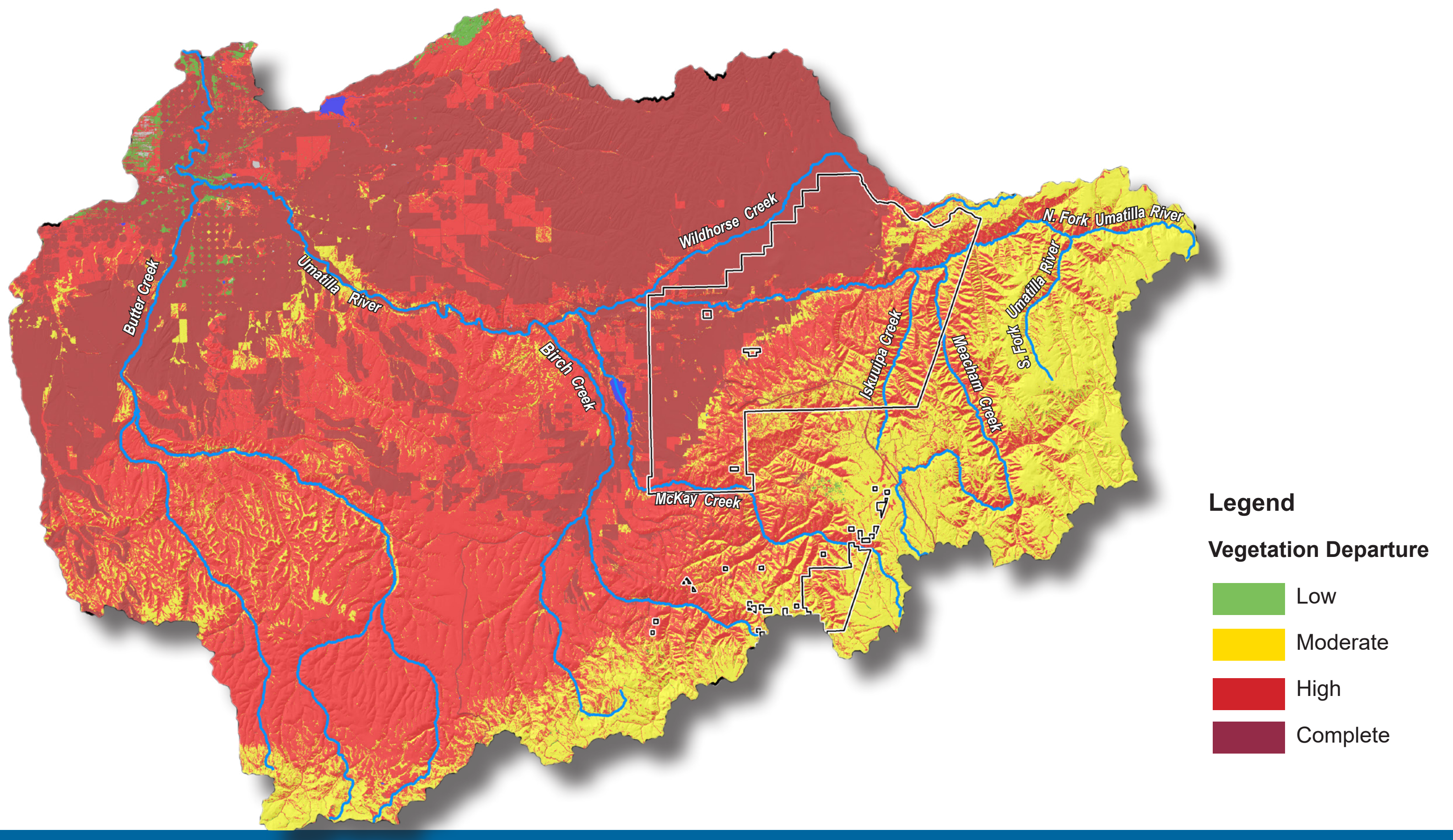
Reed canary grass in a wetland in the Umatilla River floodplain.

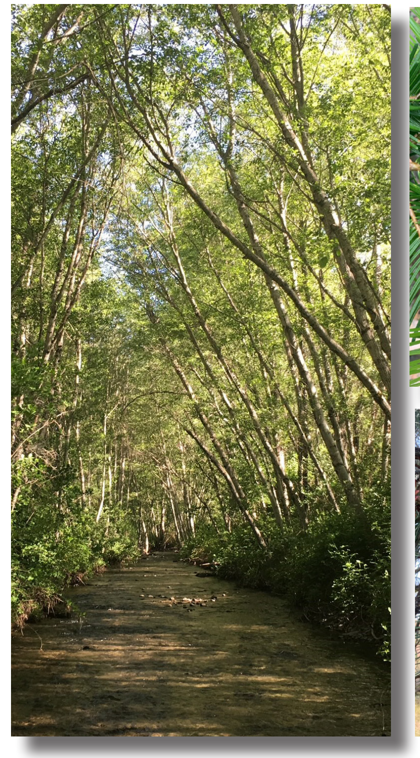
1/ Data is mostly limited to the CTUIR Reservation with minimal input for locations from Umatilla County and the USFS

The characteristics and types of vegetation across almost the entirety of the Umatilla Subbasin have been severely altered from historic conditions. The characteristic vegetation of each ecoregion has been changed by agriculture, logging, grazing, fire suppression, and the introduction of invasive species. As a result, less of the landscape still has the vibrant native plant communities that support the First Foods.

Historic accounts from Umatilla Tribal members identified thriving aspen stands along the Umatilla River. A study from O'Daniel and Schumacher (2001) found that the Pre-EuroAmerican settlement range of aspens is much larger than the current large stand that exists along the Umatilla River.

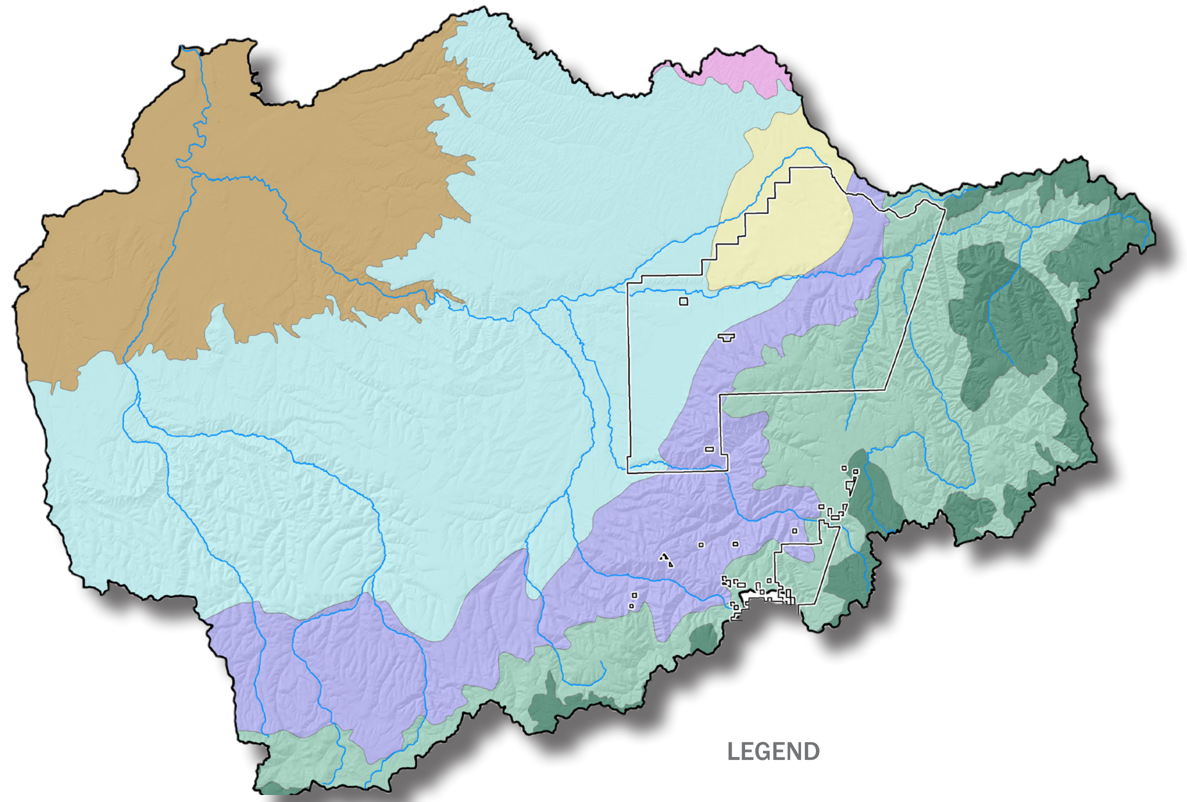
Vegetation Departure Historic Conditions





Ecoregions	Historic Vegetation Dominant - *Secondary*	Current Vegetation Dominant - *Invasive*	Dominant Departure from Historic Conditions
Mesic Forest	Douglas-Fir, ponderosa pine, mountain maple, Pacific ninebark *Grand fir, western larch, elk sedge*	Douglas-Fir, ponderosa pine, grand fir	MODERATE
Maritime-Influenced	Ponderosa pine, Douglas-Fir, grand fir, snowberry, spirea, aspen, red-osier dogwood *Pinegrass, Idaho fescue, bluebunch wheatgrass*	Ponderosa pine, Douglas-Fir, chokecherry, aspen *Invasive annual grasses*	HIGH
Deep Loess Foothill	Idaho fescue, Sandberg bluegrass, bluebunch wheatgrass	Agricultural crops, basin big sagebrush *Russian olive, reed canary grass, invasive annual grasses, ventenata and medusahead*	COMPLETE
Umatilla Plateau	Idaho fescue, Sandberg bluegrass, bluebunch wheatgrass	Agricultural crops, grazed range, stiff sagebrush *Invasive annual grasses, tumble mustard, ventenata and medusahead*	COMPLETE
Pleistocene Lake Basin	Basin big sagebrush, needle and thread grass, Indian ricegrass *Sandberg blugrass, bluebunch wheatgrass*	Agricultural crops, sagebrush steppe, rangeland *Ventenata and medusahead*	MODERATE
Umatilla Dissected Uplands	Bluebunch wheatgrass, Idaho fescue *Sandberg bluegrass*	Rangeland, agricultural crops *Ventenata and medusahead*	MODERATE
Yakima Folds	Needle and thread grass, bluebunch wheatgrass, Basin big sagebrush *Wyoming big sagebrush, Sandberg bluegrass*	Agricultural crops, shrub and grass covered rangeland	HIGH

Ecoregions



LEGEND

Ecoregions

- Deep Loess Foothills
- Maritime-Influenced Zone
- Mesic Forest Zone
- Pleistocene Lake Basins
- Umatilla Dissected Uplands
- Umatilla Plateau
- Yakima Folds

"Fires ignited by thunderstorms reset terrestrial vegetation communities... The [CTUIR] used fire to manage huckleberry fruit production and create foraging areas for big game."
(Quaempts et al. 2018)

Historic Conditions

- Varied heights, ages in the forests
- Increased fire frequency
- Decreased fire intensity
- Heterogeneity of vegetation structure and composition hinder spread of pathogens, insect epidemics, and fire
- Open overstories and historic fire disturbance improve understory health

Post- EuroAmerican Settlement

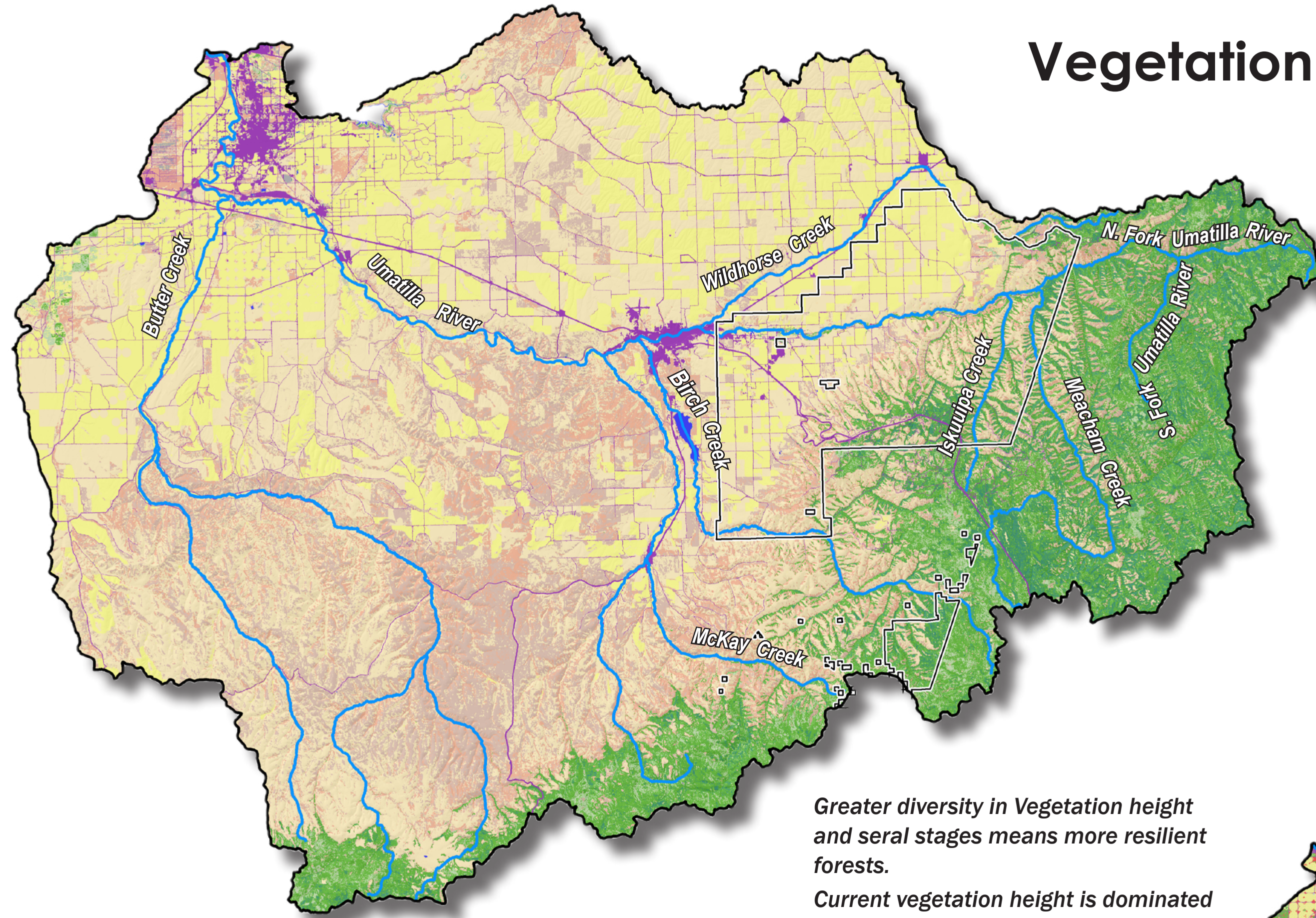
- Fire suppression
- Timber harvest
- Conversion to croplands
- Grazing

Current Conditions

- Large areas of forests that are similar heights and ages
- Increased fire intensity
- Species with decreased resistance to fire, climate changes, and insects or disease
- Continuity and homogeneity of vegetation structure and composition promote spread of pathogens, insect epidemics, and fire
- Closed overstories and lack of fire disturbance reduce understory health (e.g. unpalatable, decadent shrubs and reduced shrub abundance)

"Fire... was a key tool in natural resource stewardship utilized by the tribes of the CTUIR."
(Endress et al. 2019)

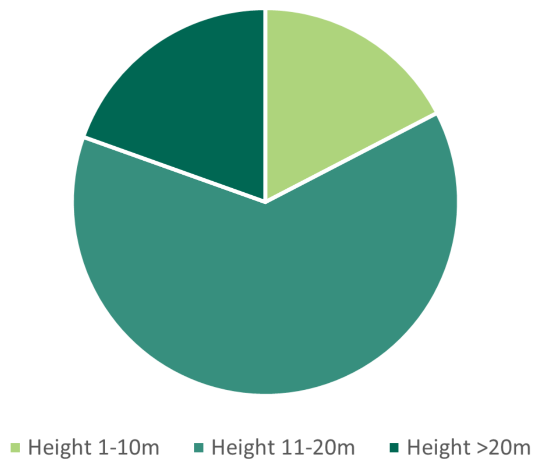
Vegetation Height



LEGEND

- Ag
- Barren
- Developed
- Height 0.1-0.2
- Height >0.2
- Open Water
- Quarries
- Shrub Height >2m
- Height 1-10m
- Height 11-20m
- Height >20m

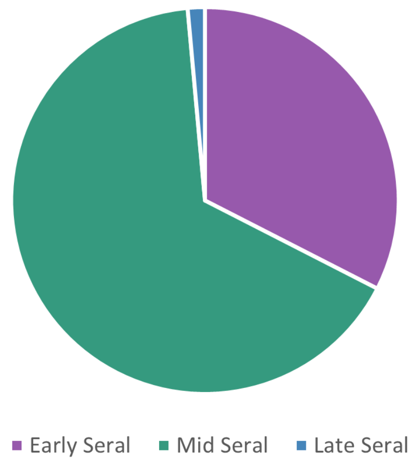
Current Tree Height Distribution



Greater diversity in Vegetation height and seral stages means more resilient forests.

Current vegetation height is dominated by trees between 11-20 meters tall and mid-seral stages.

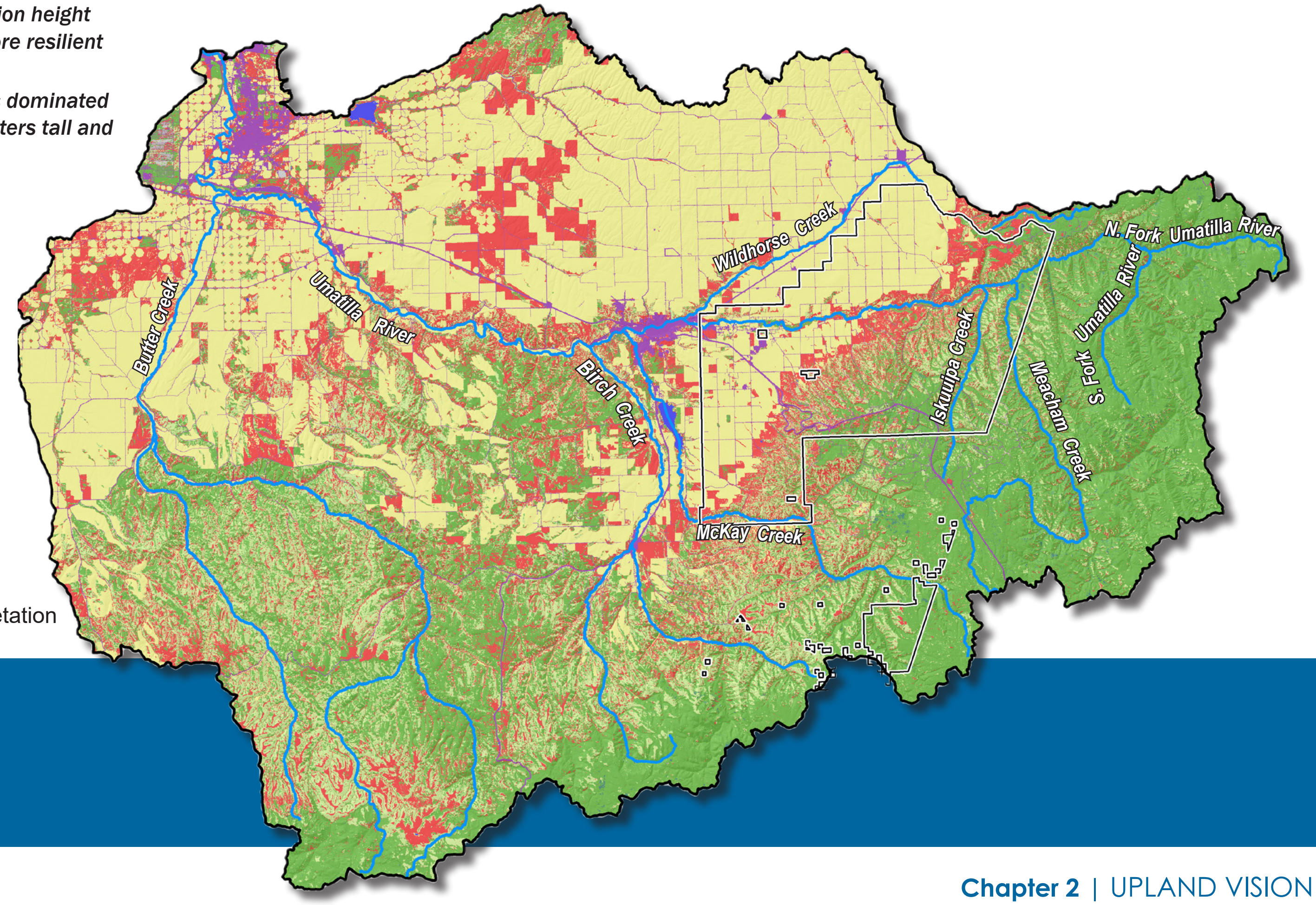
Current Seral Stage Distribution



Succession Class

LEGEND

- Ag
- Urban
- Sparsely vegetated
- Early Seral
- Mid Seral
- Late Seral
- Uncharacteristic Vegetation



CHAPTER THREE: Historic and Current River Vision Touchstone Conditions

For millennia, the waters and floodplains of the Umatilla River and its tributaries supported First Foods and sustained the Tribes. The Tribes gathered First Foods from the river, floodplain and uplands habitats throughout the annual cycle. However, the disturbances that began with Euro-American settlement have greatly reduced availability and access to these life-giving resources and severely altered the riverscape.

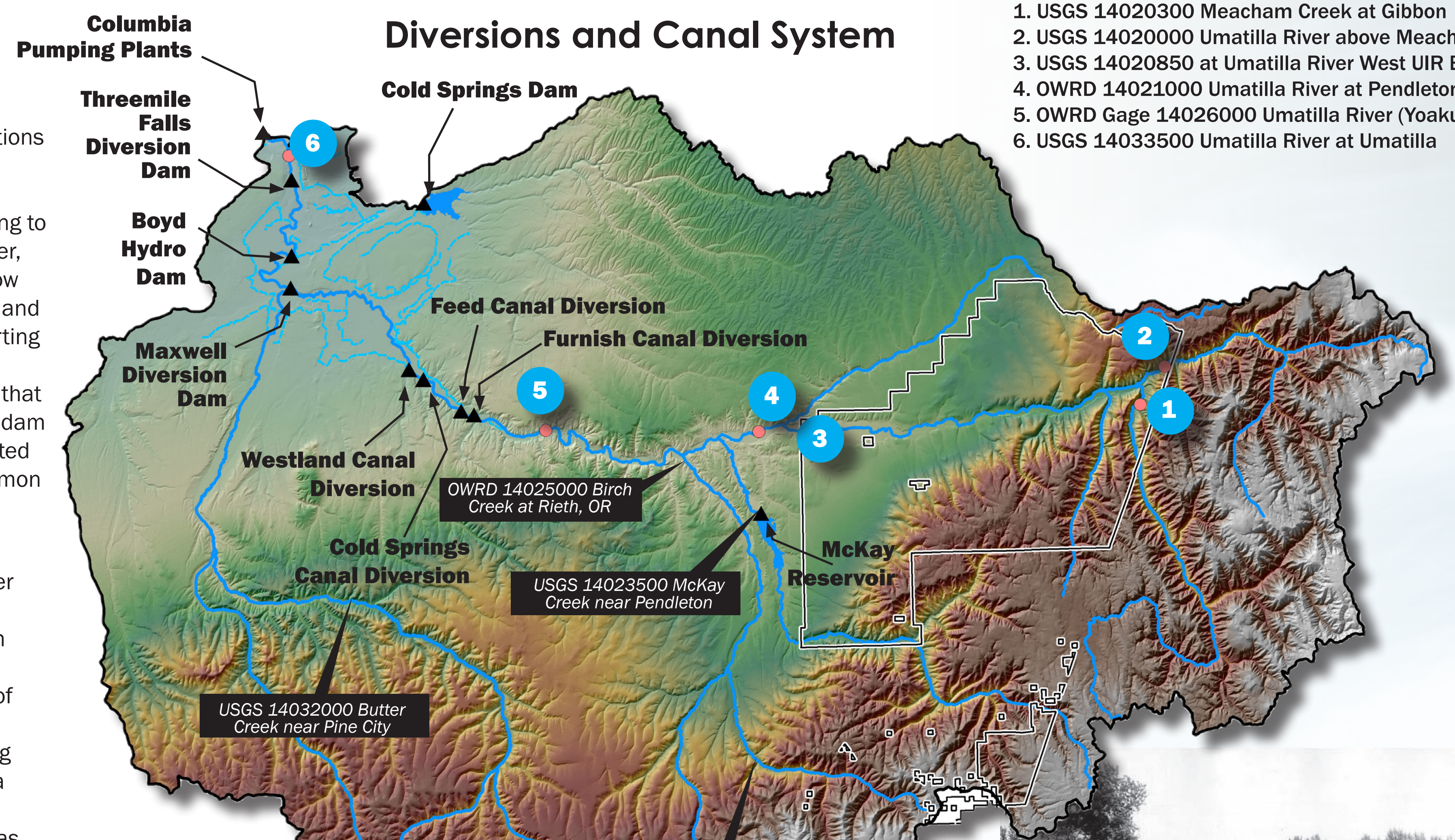
DISTURBANCES

	Constriction by flow control structures	Channel incision and dredging	Water withdrawals	Fine sediment input
Hydrology	Decreased flow	Water Quality Decrease (temperature, nitrates)	Decreased surface water flow and worsened water quality	Increased turbidity, decreased oxygen concentration
Geomorphology	Reduced capacity to absorb and hold water	Decreased channel diversity and increase in simplified channels, stream power and velocities	Decreased channel complexity and channel structure	Decreased permeability of the streambed and reduced rates of hyporheic exchange
Connectivity	Reduced vertical, longitudinal, and lateral exchange of water	Reduced vertical, longitudinal, and lateral exchange of water	Reduced patterns of floodplain water movement	Decrease in water exchange between the channel and floodplain sediments
Riparian Vegetation	Reduced bank stability and large wood inputs	Reduced riparian habitat and groundwater available for riparian vegetation	Decreased floodplain habitat and narrowing of riparian zone. Increased growth of noxious weeds	Reduced dry forest resistance and decreased bank stability
Aquatic Biota	Declined and reduced habitat availability, physical barriers for migratory fish	Reduced habitat availability and quality	Reduced habitat availability and connections between habitats	Reduced spawning, rearing, and migration success of aquatic species

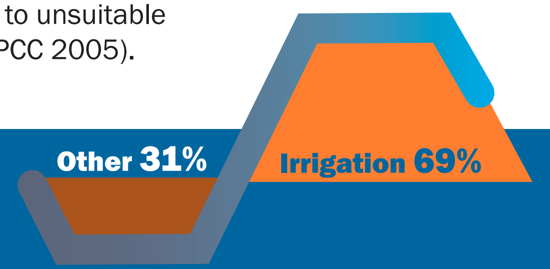
Water Quantity

Historically,the Umatilla Subbasin featured abundant sources of water with natural fluctuations in water availability following the trends of the seasons. Winter snowmelt flows were large and would taper off through the summer transitioning to groundwater flows through the summer. However, the seasonal diversity of cold and clean river flow always provided the floodplain/river complexity and function to support First Foods production. Starting in the 1800's, the floodplain and surrounding uplands were developed into agricultural lands that required excessive amounts of water. Irrigation dam construction and dewatering is generally accepted as the reason for the extirpation of Chinook salmon in the Umatilla Subbasin.

Current Conditions, have improved slightly with the introduction of the Umatilla Basin Water Exchange project resulting in increased flows and cooler water temperatures in the mainstem Umatilla River during critical periods. While the U.S. Fish and Wildlife Service and U.S. Bureau of Reclamation identified flows ranging from 150 cubic feet per second (cfs) and 300 cfs as being necessary for fish passage in the lower Umatilla River, the natural hydrograph has not been restored and numerous tributaries still run dry as the summer progresses. McKay Reservoir releases for fish are not continuous during the summer, and water temperatures in the river can become extreme at times. In addition, warmer epilimnetic waters can be discharged upon the depletion of the hypolimnion and can contribute to unsuitable habitat conditions for salmonids (NPCC 2005).

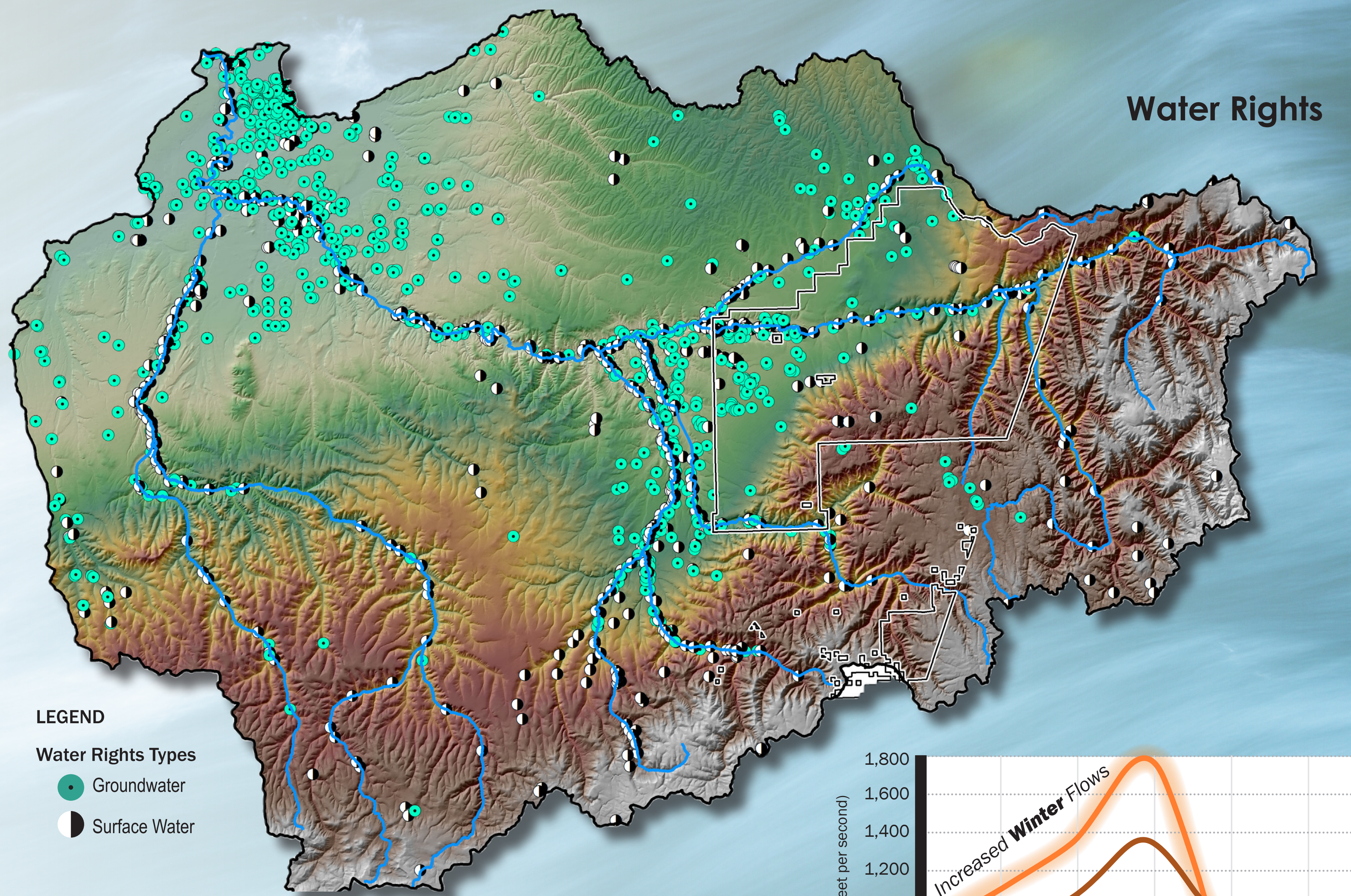


The Umatilla Stanfield Diversion Dam was constructed to feed Cold Springs Reservoir in 1907.



Surface Water Consumption in the Umatilla Subbasin

Source: Umatilla Subbasin 2050 Water Management Plan

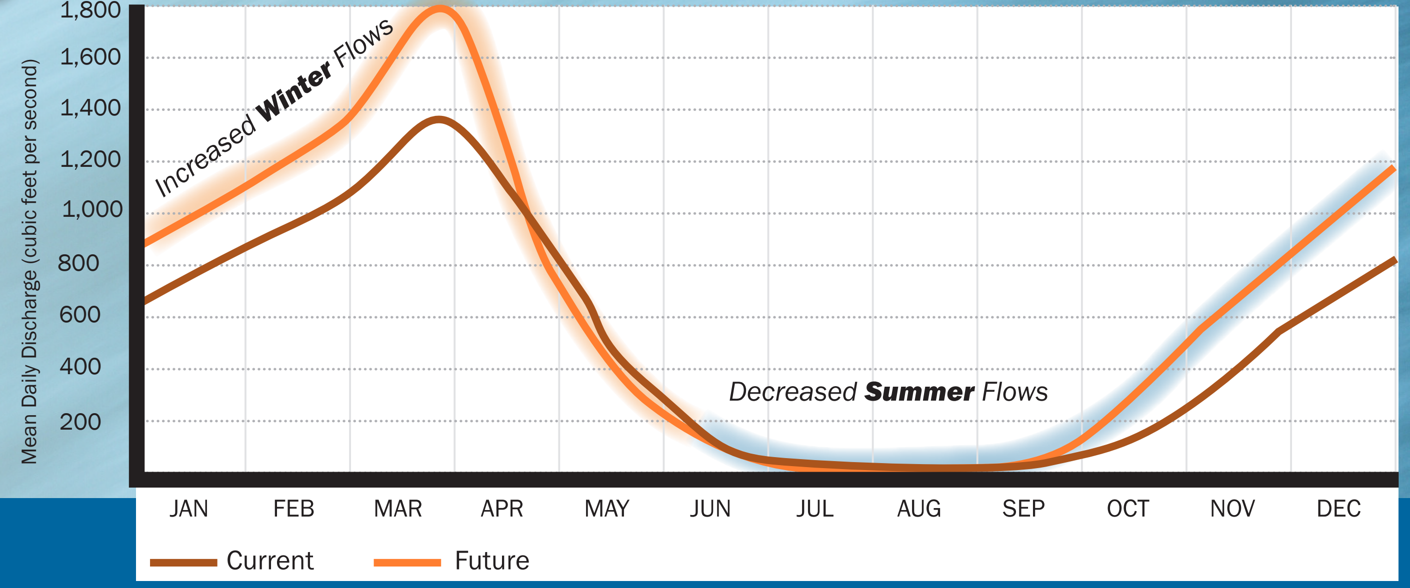


Groundwater recharge of the streams in the Umatilla Subbasin is largely driven by the presence of numerous springs overlying the basalt that forms the bedrock of the region. Development of these springs for irrigation and other purposes has further impacted the hydrology of the Umatilla River by reducing summer flows and increasing stream temperatures (USGS 1964).

O'Daniel (2005) correlated the exchange of groundwater with stream surface water (i.e., hyporheic exchange) and the impact this has on stream temperatures and stream flows in the Umatilla River. This research showed that the majority of thermal variation and in-stream flow variation in the Umatilla River is explained by the hyporheic exchange and further identified areas of high hyporheic exchange potential based on a number of geomorphic characteristics like valley width, stream slope, and floodplain width.

Future Conditions

Water quantity in the Umatilla Subbasin will continue to be an issue as increased summer temperatures and increased winter rainfall continue to alter the hydrograph. Winter flows will be larger but will fall off more quickly as snowmelt is diminished. Summer flows will decrease as available groundwater continues to decrease.



Major flooding near Birch Creek on the Umatilla River

Major flooding on the Umatilla River near Thorn Hollow

High velocity flows on the Umatilla River

Hydraulic Modeling

To further our knowledge of existing baseline stream hydrologic conditions, we developed a hydraulic model to understand how stream flow interacts with the floodplain landscape and existing structures. Hydraulic modeling is utilized to predict areas of flooding, identify areas where floodplains have been disconnected, identify locations of high velocities and high stream power that could impact aquatic species, and identify areas of high shear stress that could impact infrastructure and affect sediment transport.

Hydraulic modeling is also used to determine impacts to the hydraulic function of the Umatilla River. Impacts from roads, levees, railroads, and other development becomes clear as modeling results are viewed. Hydraulic modeling is also an essential tool for floodplain restoration. CTUIR will integrate this analysis into the development of the strategic restoration plan, a future outcome of this work. Hydraulic models are used to provide baseline analysis in identifying and designing restoration actions that restore a more natural and dynamic river system that supports natural flood dissipation, floodwater storage, and enhances processes that support clean water quality and habitats important for native fish.

Future conditions on the Umatilla River can also be modeled, like high flows and expected extreme low flows from climate change. The model shown here was based on red LiDAR, which lacks bathymetric elevations.

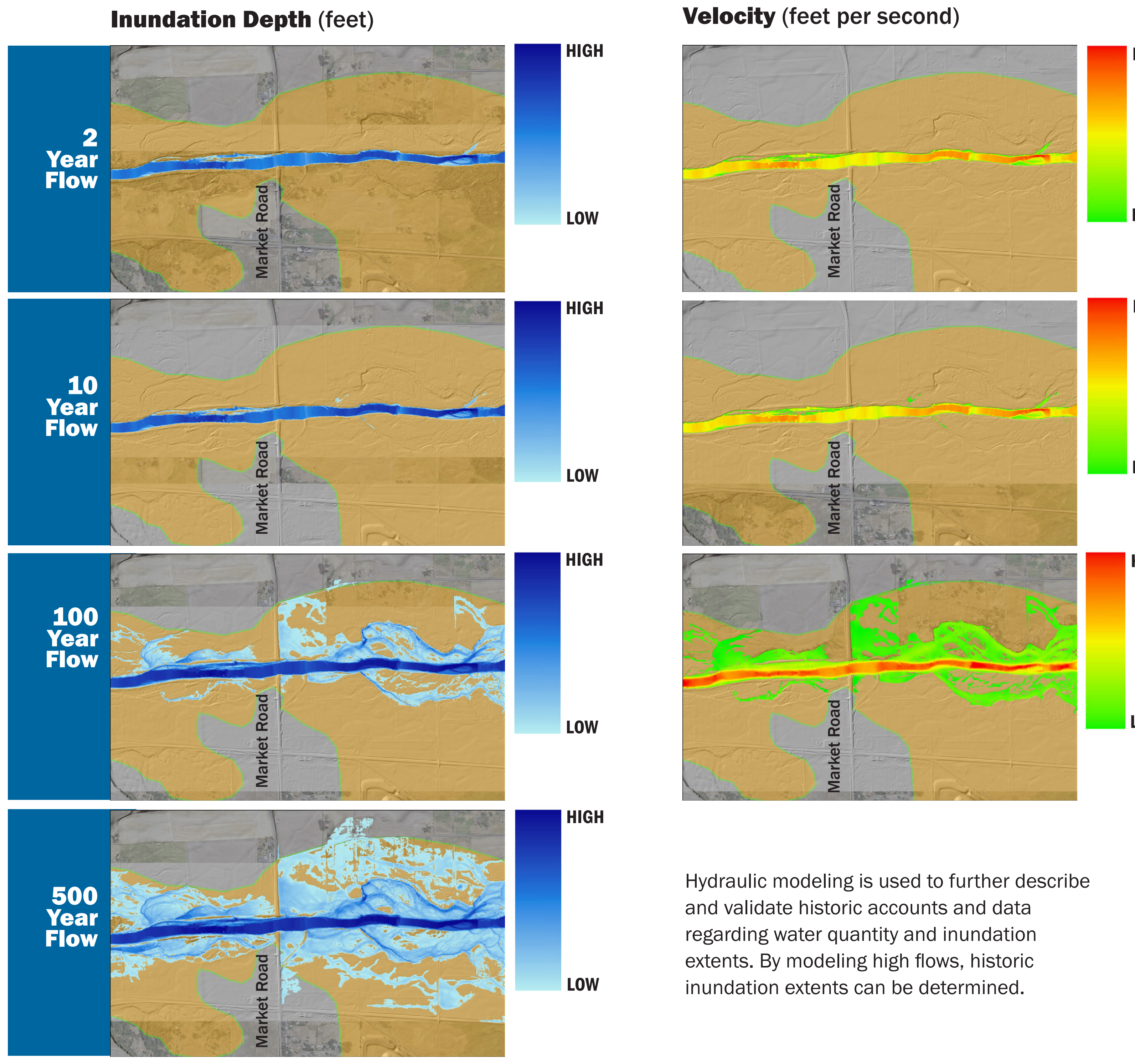
"It rained so heavily during our stay on the banks of the Umatilla that the water rose with amazing speed. We were compelled to break camp in a hurry."

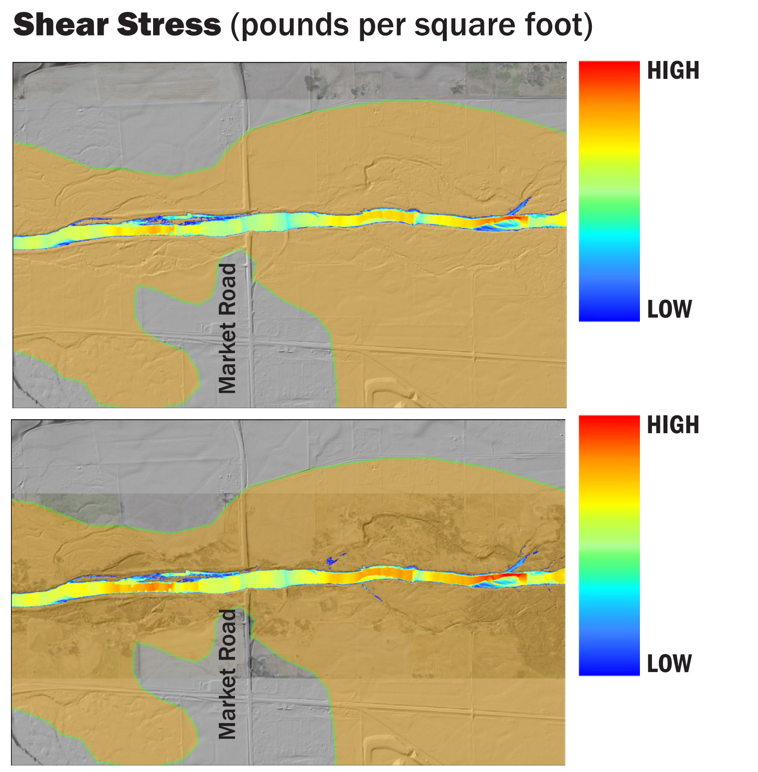
(Hunt Party account of the Umatilla River, 1821)

Umatilla River near Rieth with a train passing by.

Umatilla River near the mouth in 1962.

Flooding on the Umatilla River near Nolin, Oregon.





Historic Floodplain

Hydraulic modeling is used to further describe and validate historic accounts and data regarding water quantity and inundation extents. By modeling high flows, historic inundation extents can be determined.

Water Quality

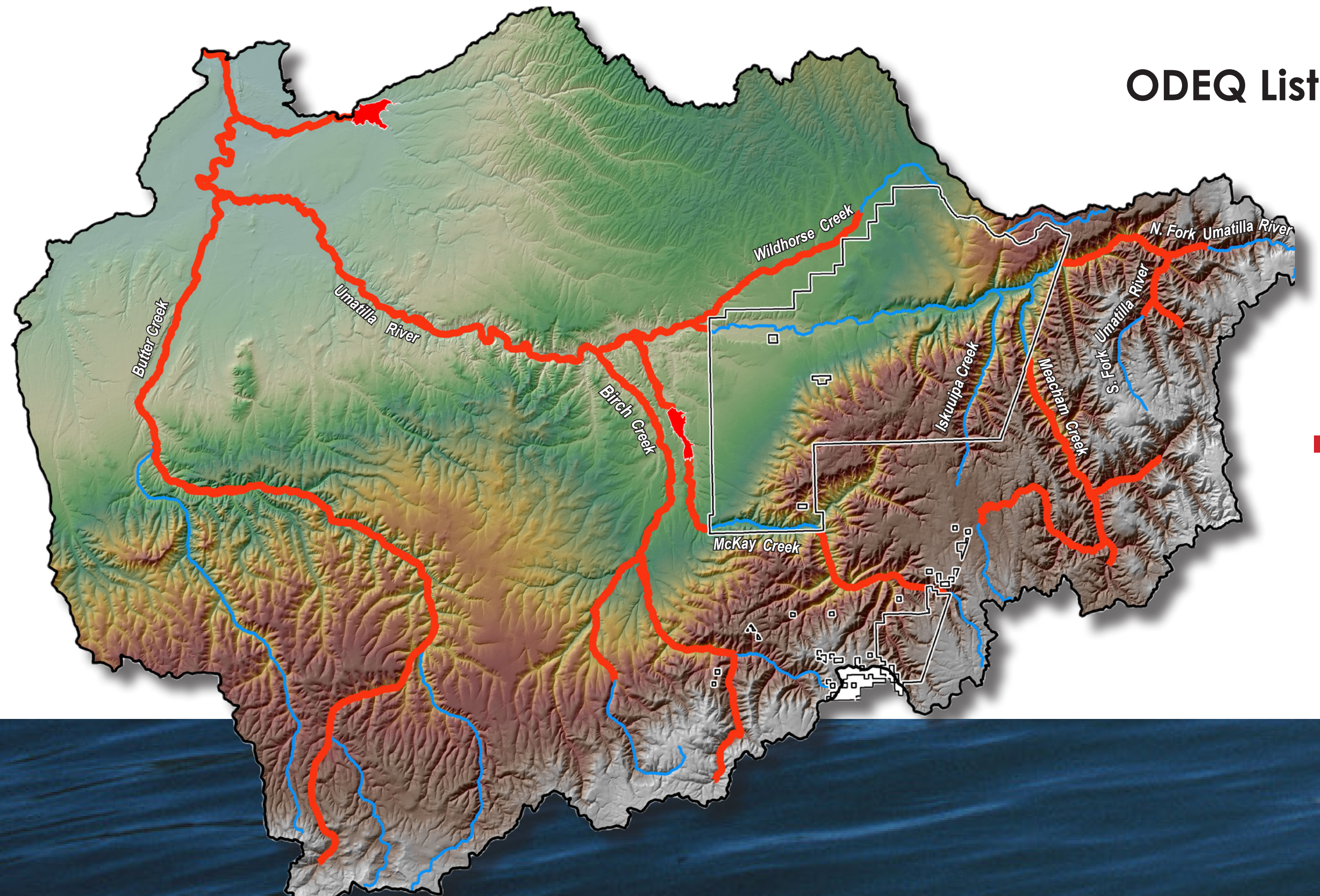
Water is both a First Food and a resource required to produce all other First Foods (Jones et al. 2008). Due to the cool, clean water that flowed for millenia from the Blue Mountains, the subbasin produced abundant and diverse natural resources where lamprey, salmon, steelhead, and other fish were seemingly infinite.

Currently, the presence of numerous irrigation withdrawals throughout the subbasin has led to the Umatilla River and its tributaries being over allocated. Some reaches are even completely dewatered while others have so little flow that they become thermal barriers to fish passage during low flow. Human activities have also loaded the Umatilla River with agricultural fertilizers, sewage, pesticides, and suspended sediments as well as urban and industrial pollution (Harrison 2020).

The Umatilla River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) was developed in 2001 by a collaborative group to establish water quality goals for streams of the Umatilla Subbasin in specific reference to salmonids and other aquatic species. The water quality goals were described by 'total maximum daily load' as defined by State and Federal law. The Clean Water Act mandates the establishment of TMDL's for waterbodies that do not meet water quality standards and a State planning process is used to implement the TMDL's. This document includes lays out steps towards meeting those goals and establishes baseline water quality standards for a number of different water quality metrics. The stakeholders committee provided recommendations while the technical committee formed the basis for the watershed goals.

CTUIR has its own Water Quality Management Plan from January 2008, and is self-governing for implementing the water quality restoration goals of the Tribal TMDL for waters of the CTUIR.

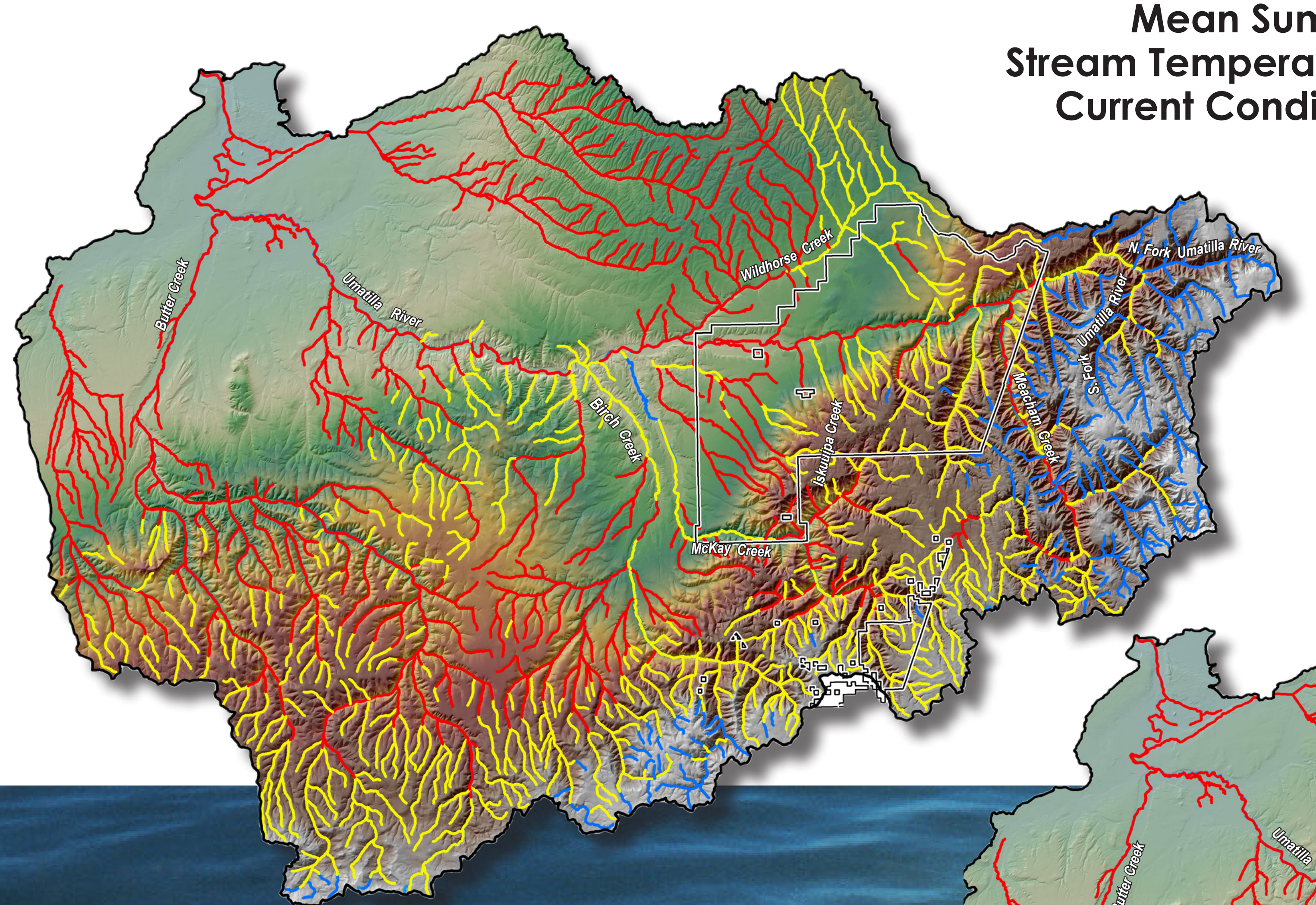
ODEQ Listing



Impairment	TMDL (if applicable) *	Streams/Waterbodies
	N/A	Umatilla River, Butter Creek, Wildhorse Creek Birch Creek, McKay Creek, McKay Reservoir
IronMethylmercury	N/A	Umatilla River, Cold Springs Reservoir, McKay Reservoir
Turbidity	80 mg/L @ 30 NTU Turbidity	Umatilla River
Arsenic	N/A	Wildhorse Creek
BioCriteria	Water Quality Management Plan Goals	Wildhorse Creek, Birch Creek, McKay Creek
Nitrates	10 mg/L	Wildhorse Creek
Phosphorous	N/A	McKay Creek
Fecal Coliform	30-Day Log Mean of 126 E. Coli organisms per 100 ml (min. of 5 samples)	Umatilla River, McKay Creek
	No sample over 406 E. Coli organisms per 100 ml	Umatilla River, McKay Creek
Temperature	Oregon Bull Trout 50°F	North Fork Meacham Creek, North Fork Umatilla River, South Fork Umatilla River
	Rearing 64° F	Umatilla River, Johnson Creek, Birch Creek, West Birch Creek, McKay Creek, Wildhorse Creek, Meacham Creek, Owsley Creek
Excess Algal Growth	Addressed through Temperature TMDL	Umatilla River
pH	Addressed through Temperature TMDL	Umatilla River, Butter Creek, Johnson Creek, Birch Creek, McKay Creek
Sedimentation	Water Quality Management Plan Goals	Umatilla River, North Fork Umatilla River, West Birch Creek, Meacham Creek, North Fork Meacham Creek
Ammonia	Chronic: 0.08 - 0.085 mg/L-N at 25°C	Cold Springs Reservoir to Umatilla River
	Acute: 0.59 - 13.48 mg/L-N at 25°C	Cold Springs Reservoir to Umatilla River
Flow Modification	Water Quality Management Plan Goals	Umatilla River, Birch Creek
Habitat Modification	Water Quality Management Plan Goals	Umatilla River, Birch Creek, West Birch Creek, McKay Creek, Meacham Creek, North Fork Meacham Creek

** From the Umatilla River Basin TMDL and WQMP*

Mean Summer Stream Temperatures Current Conditions

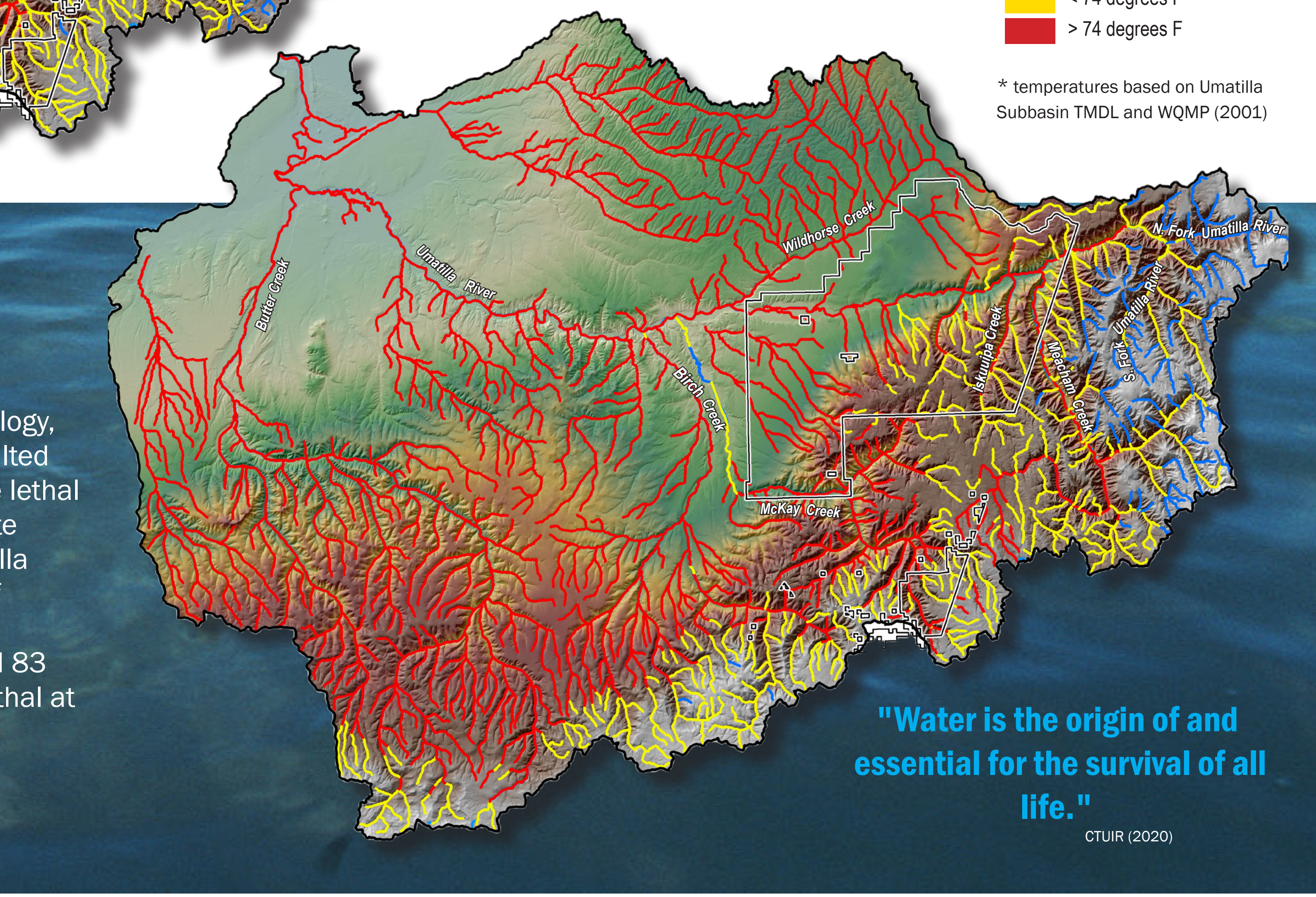


As described in the Umatilla Subbasin TMDL and WQMP (2001), salmonids are highly sensitive to stream temperatures. The standards set forth for the temperature TMDL in the plan relies on using these indicator species (the most sensitive species), assuming that if these species are protected, others will be as well. Temperatures between 64 and 74 degrees F are considered sub-lethal which can lead to death of salmonids within weeks to months. Temperatures greater than 74 degrees F can lead to death within hours to days.

Mean Summer Stream Temperatures Future Conditions

LEGEND
- Reservation Boundary
- Umatilla Subbasin
- < 64 degrees F
- < 74 degrees F
- > 74 degrees F

* temperatures based on Umatilla Subbasin TMDL and WQMP (2001)



The removal of riparian vegetation, altered subbasin hydrology, and modified and straightened stream channels have resulted in increased summer temperatures in streams that can be lethal to native aquatic species. By 2099, climate models indicate the majorityof stream temperatures in August in the Umatilla Subbasin will be greater than 64 degrees F. No sections of the mainstem Umatilla River will be optimal, 4 miles of the mainstem Umatilla River will be considered sub-lethal, and 83 miles of the mainstem Umatilla River will be considered lethal at mean summer stream temperatures.

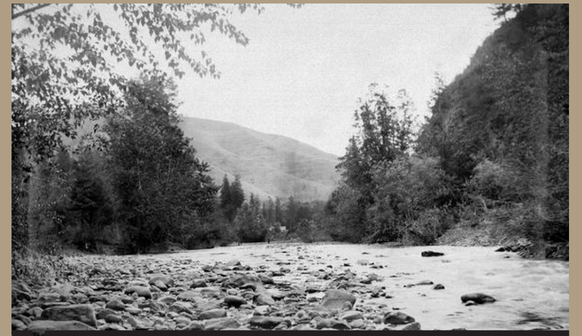
"Water is the origin of and essential for the survival of all life."
CTUIR (2020)

Valley Forms - Relative Elevation Modeling

A high-resolution topographic surface was created with acquired aerial Light Detection and Ranging (LiDaR) data. From that, a Relative Elevation Model (REM) was developed. The REM shows not just where the river is now, but also where the river used to be.

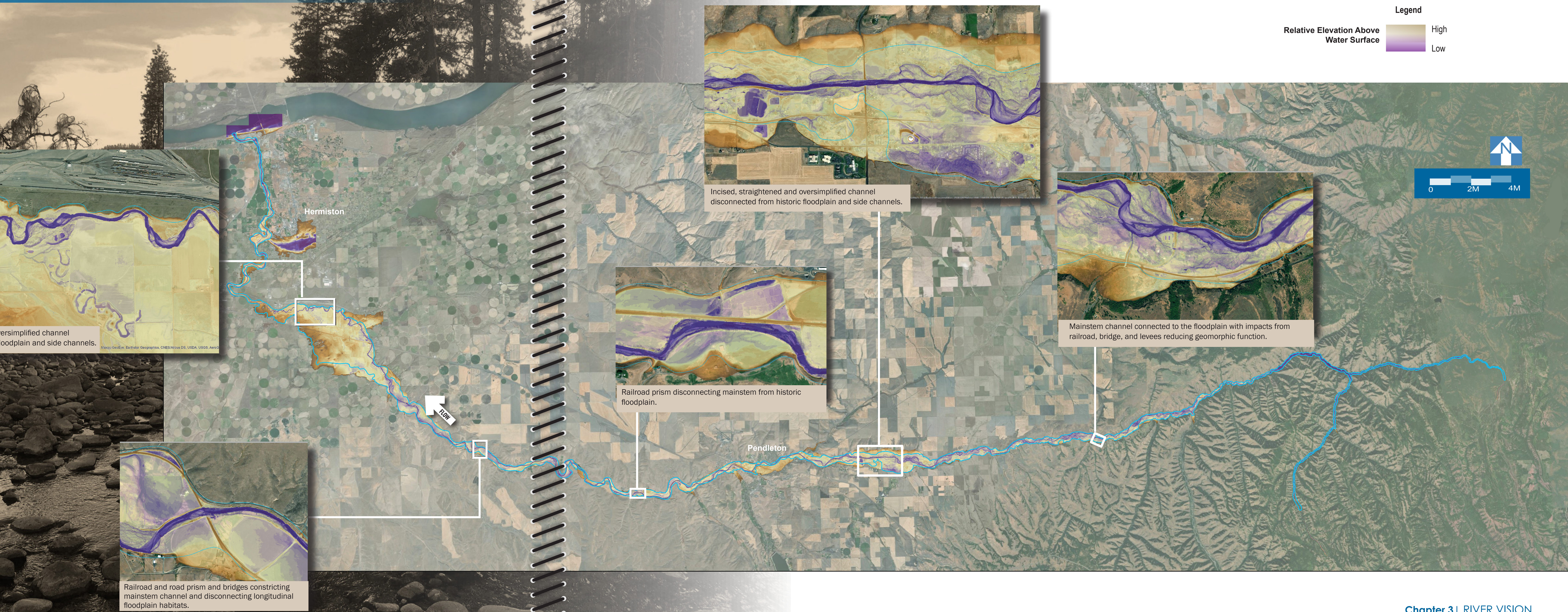
Historically, the Umatilla River would have been more frequently connected to the floodplain in depositional reaches (i.e., reaches where slope is decreased and sediment is deposited more readily) with the relative elevation of the channel within a few feet of the floodplain elevation. However, because of the construction of flood control measures, straightening of the channel, removal of large wood, and construction of roads and railroads, in many places the river has been converted to a transport reach (i.e., reaches where slope is increased and sediment is transported downstream) and no longer has access to areas it once occupied.

Frequently connected floodplains means frequent inundation resulting in off-channel features such as wetlands and side channels that are important for fish habitat.



Historic photo of the Umatilla River with an accessible floodplain.

Historic photo of rip rap placed in the early 1900's to straighten the Umatilla River.



Sinuosity

Pre-EuroAmerican Settlement Conditions

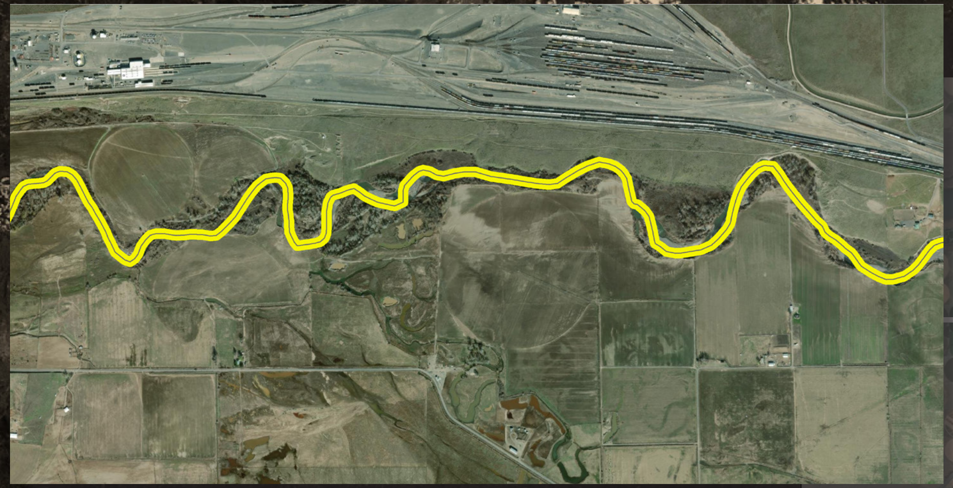
Since time immemorial, prior to the natural state of the Umatilla River would have been dynamic with a highly variable channel and sinuous plan-form. Channels would freely migrate and meander across the full breadth of the available floodplain.

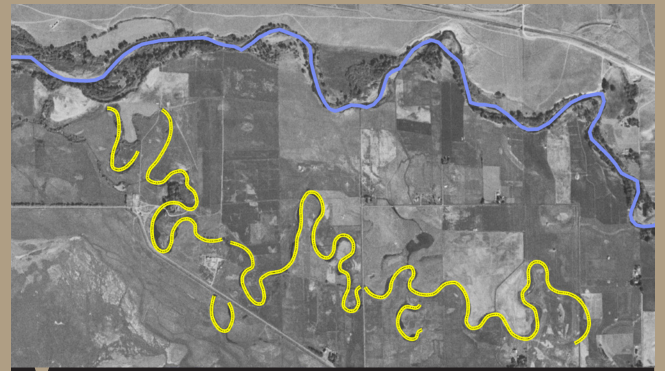
Historic Conditions

The arrival of the railroad to the Umatilla Subbasin in the 1800's brought construction of rail systems, levees, dikes, and flow control structures that have over-simplified the plan-form of the Umatilla River. Where once stood abundant floodplain now is occupied by agricultural lands and other development.

Current Conditions

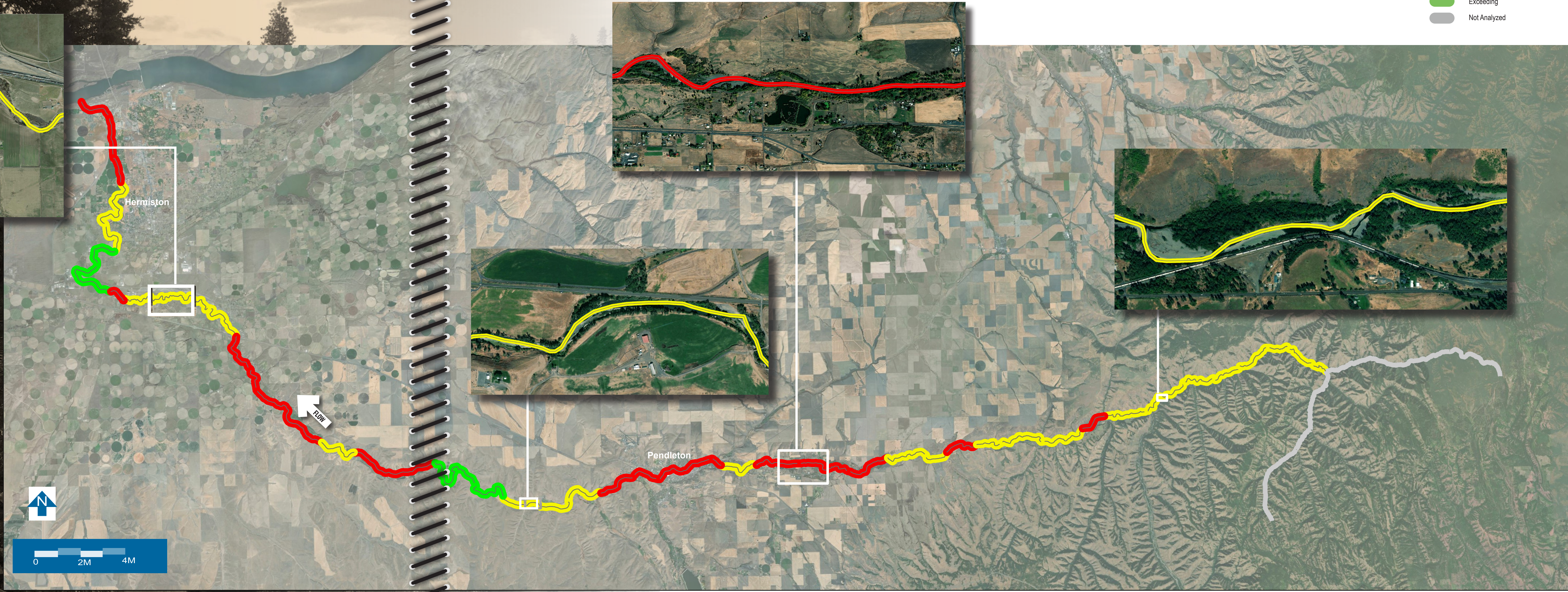
The current levee, dike, and flow control system combined with the impacts of continued development in the floodplain has over-simplified the Umatilla River and reduced sinuosity and meander lengths.





Mapped sinuosity of the Umatilla River in 1952 (blue) compared to the historic sinuosity visible in the relic channels in the floodplain (yellow).

Long stretches of the Umatilla River are now straightened, like this stretch near Rieth, by levees or berms and adjacent floodplain development.



[1/] A formula to calculate expected sinuosity (Lazarus and Constantine 2013) was utilized to identify the reaches that were more similar to historic conditions and those that were less similar to historic conditions.

Legend

Sinuosity [1/]

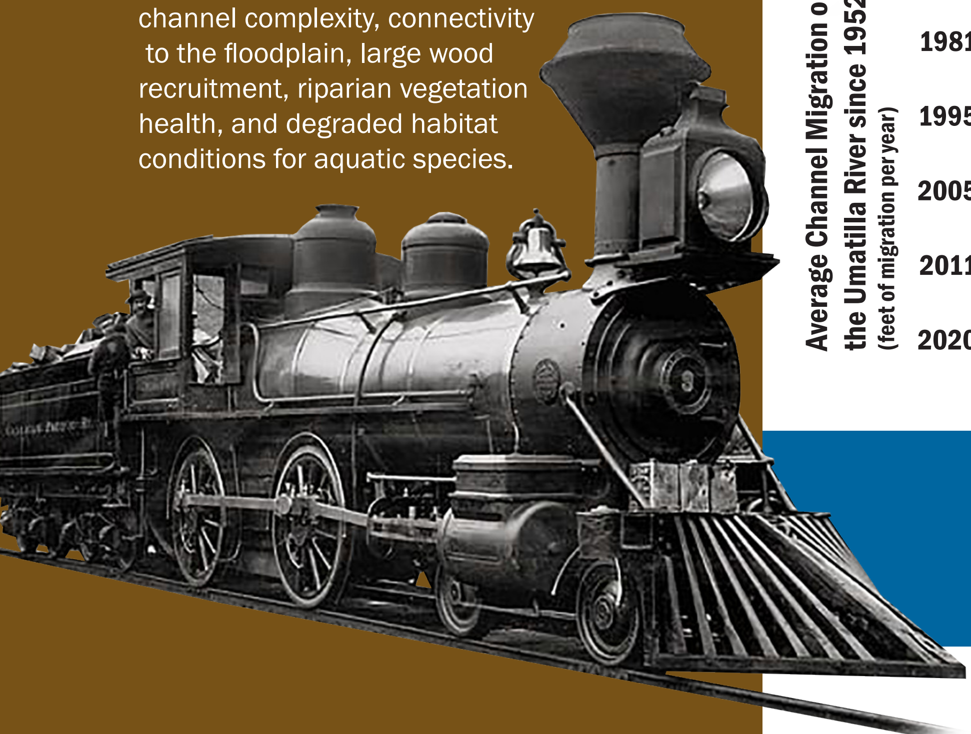
- Unsatisfactory
- Meeting
- Exceeding
- Not Analyzed

Channel Migration and Avulsion

The arrival of the railroad to the Umatilla Subbasin in the 1800's brought construction of rail systems, levees, dikes, and flow control structures.

This period also brought the development of cities like Pendleton that required protection of road systems and infrastructure in the floodplain. This required further protection against flood damage through the building of more levee systems and flow control structures which further diminished channel migration and removed water from springs across the Umatilla Subbasin.

As previously discussed, the transition of depositional reaches to transport reaches on the Umatilla River as a result of Euro-American settlement has reduced the frequency of channel migration and avulsion. The reduction of channel migration and avulsion has reduced channel complexity, connectivity to the floodplain, large wood recruitment, riparian vegetation health, and degraded habitat conditions for aquatic species.



Pre-EuroAmerican Settlement

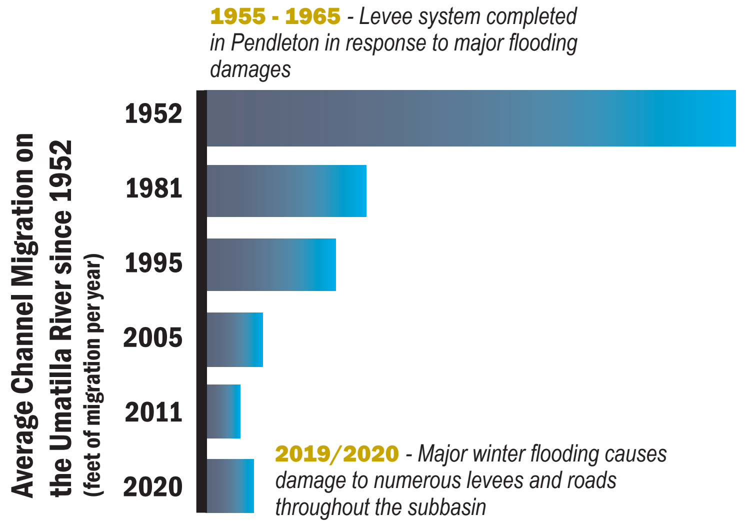
Prior to Euro-American settlement, the natural state of the channel structure of the Umatilla River would have been dynamic with multiple channels occupied throughout the year based on flows and avulsions occurring frequently as sediment dynamics facilitated natural processes.

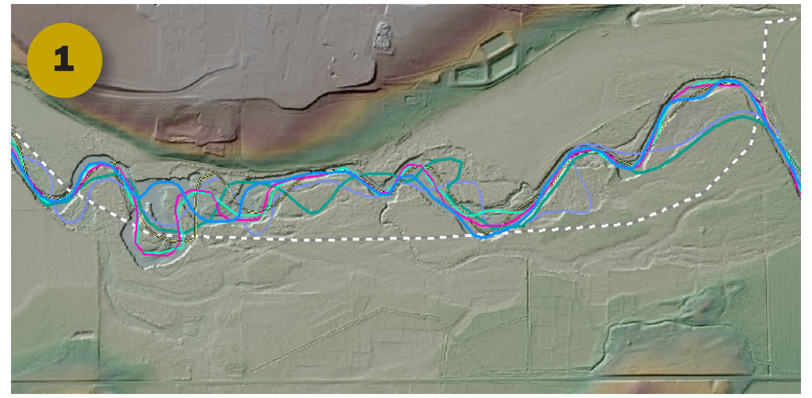
Current Conditions

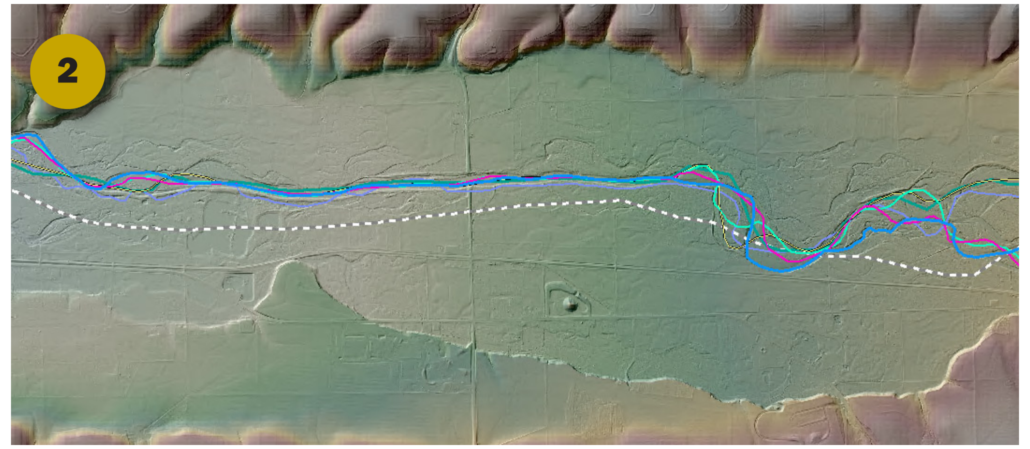
The current levee, dike, and flow control system combined with the impacts of continued development in the floodplain has over-simplified the Umatilla River and reduced channel migration to a fraction of historic levels.

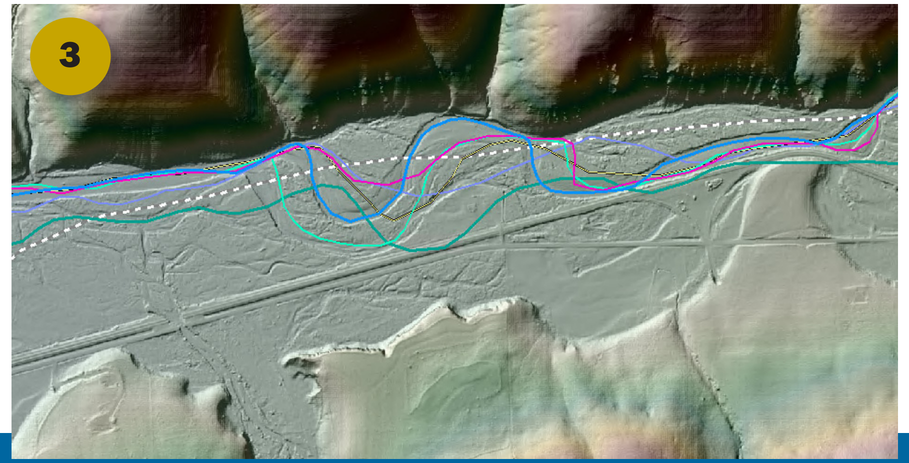
Channels freely migrate laterally across the floodplain

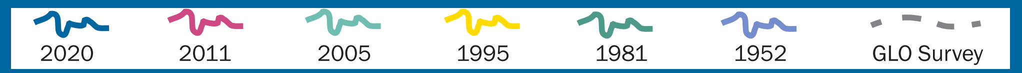
Longitudinal, lateral, and vertical water flow in the Umatilla River provides habitat connections that are necessary to support aquatic species and First Foods (Jones et al. 2008)



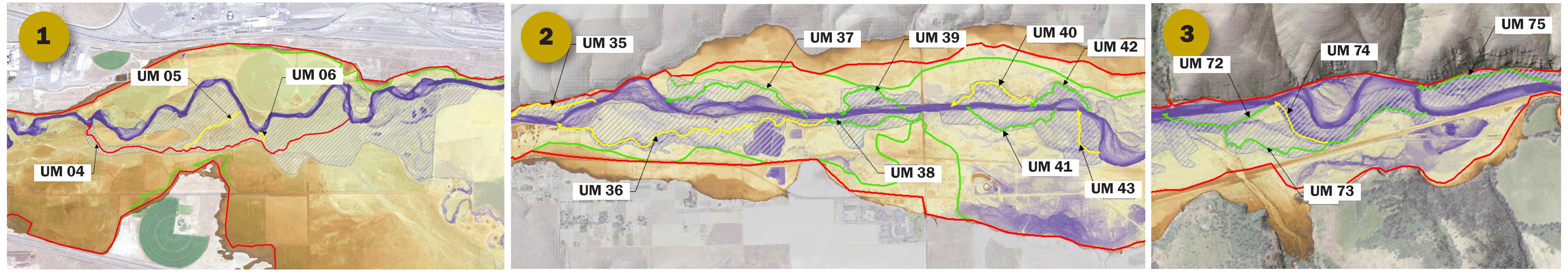




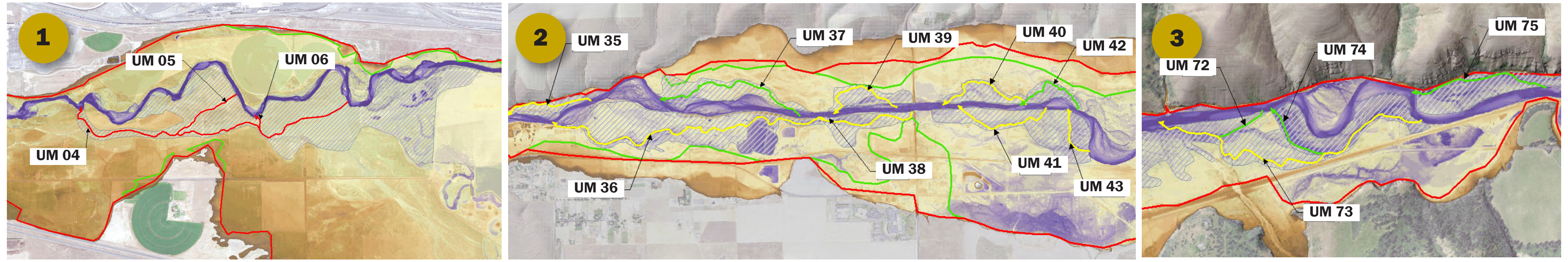




Channel Reoccupation Potential

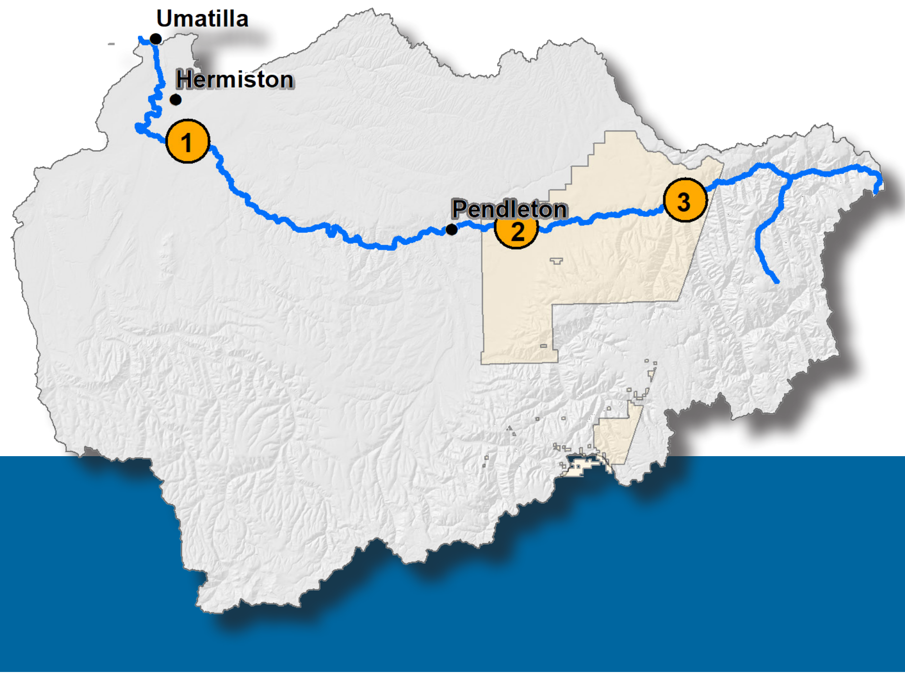


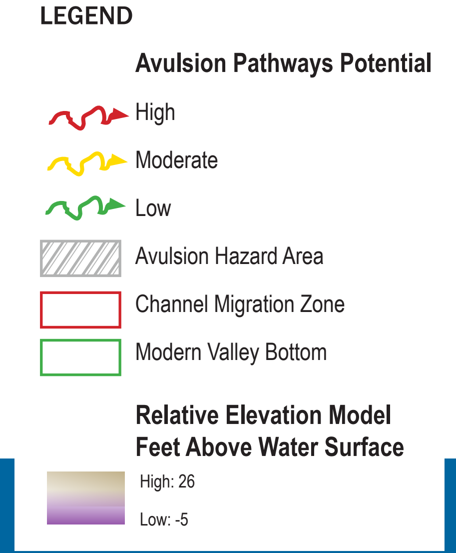
Increased Inundation Potential



The Relative Elevation Model was utilized to identify potential pathways of avulsion for the Umatilla River. Hydraulic modeling, channel migration zone analyses, and gradient differences were used to identify the potential for avulsion pathways to have increased inundation or to experience channel reoccupation. Increased inundation potential was analyzed within avulsion pathways based on the current hydraulic geometry of the pathway and hydrologic conditions. Channel reoccupation potential was analyzed for the potential of a full reoccupation of an avulsion pathway by the mainstem channel based on analysis of historic channel locations.

Potential avulsion pathways were labeled as "UMxx" where the xx is the corresponding number for the pathway. The model is shown at three different locations along the Umatilla River labeled 1, 2, and 3 showing channel migration analysis (left) and potential avulsion pathways (above).





Large Wood

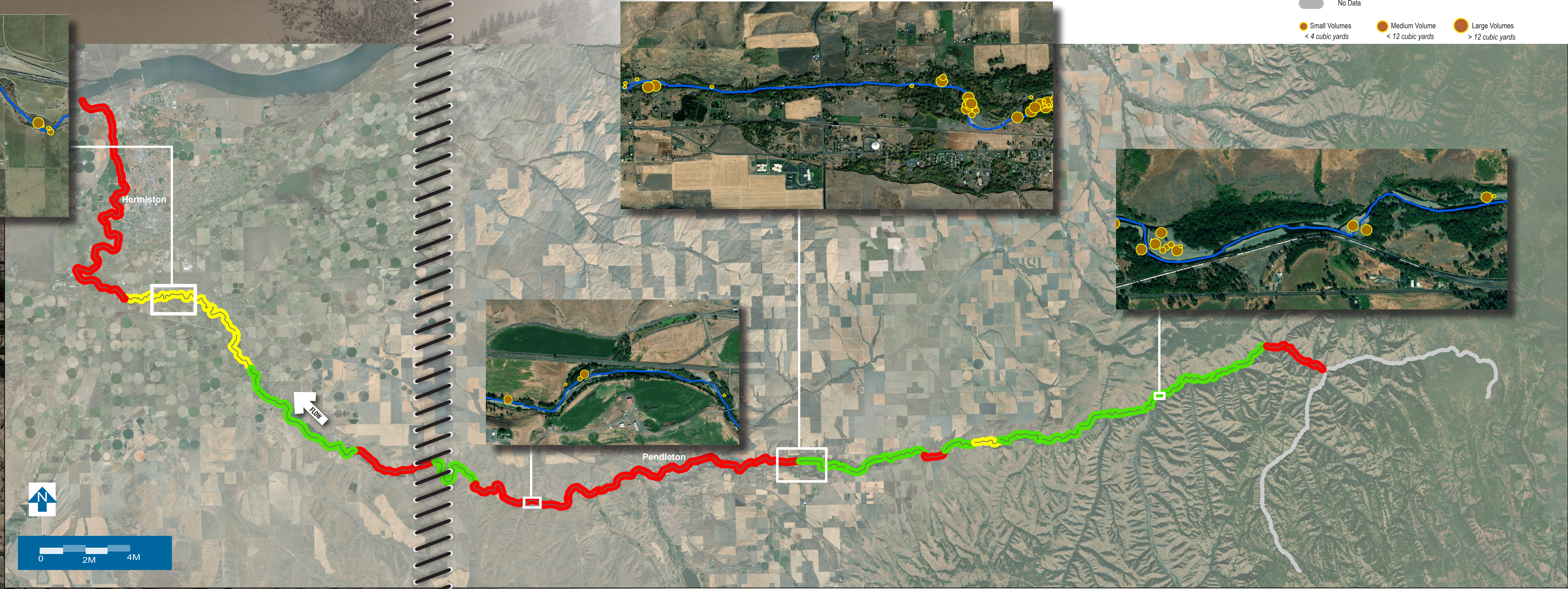
Historically, the Umatilla River would have interacted with the floodplain and healthy riparian areas at high flows. The healthy riparian areas would have provided numerous sources of large wood in the channel in form of voluminous log jams and large "key pieces" of wood that formed the basis for log jams. These log jams and key pieces of wood helped to promote sorting of sediment which in turn provided a foundation for the growth of healthy vegetation in the floodplain that was aided by the reduction of stream power with the spreading of flood flows across the floodplain. These healthy floodplains produced large wood for recruitment by the channel to improve channel diversity and channel complexity for aquatic species.

As a result of Euro-American settlement, logging, conversion of land to agriculture, water withdrawals, and development, native riparian vegetation has been reduced. These changes have reduced the abundance and composition of large wood in the channel and decreases channel complexity and shade for aquatic species.

Key pieces of large wood in Meacham Creek.

Example of a large log jam built around key pieces.

Smaller wood pieces now dominate the Umatilla River.



1/ Large wood volume thresholds from Fox and Bolton (2007)

Legend

Large Wood Volumes 1/

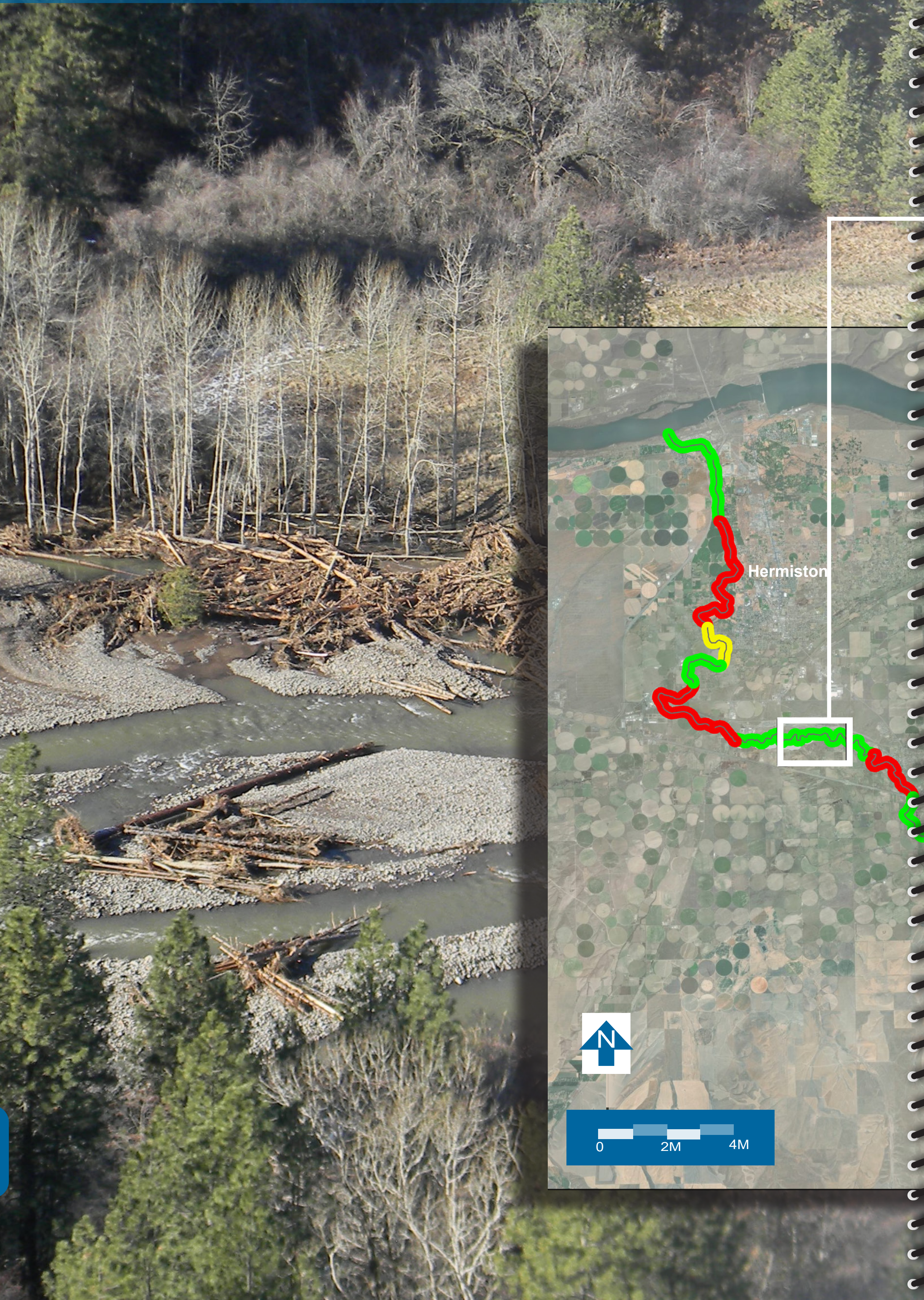
Less than 147 cubic yards per mile	Unsatisfactory
Between 147 and 316 cubic yards per mile	Meeting
More than 316 cubic yards per mile	Exceeding
	No Data

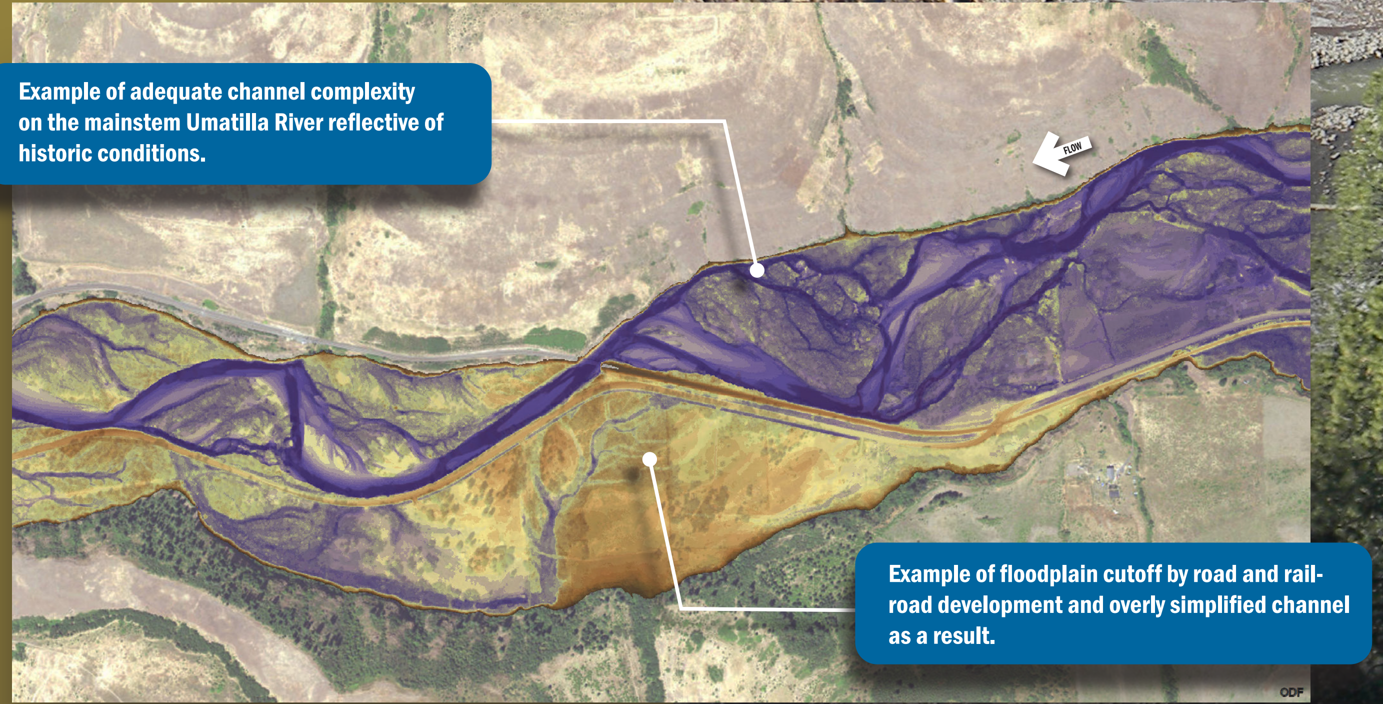
Small Volumes < 4 cubic yards
Medium Volume < 12 cubic yards
Large Volumes > 12 cubic yards

Channel Complexity

Historically, the Umatilla River would have had a complex channel, created through the interactions between high flows, the well-connected floodplains and healthy riparian vegetation, and large wood jams. This complex structure provided ample habitat at a wide range of flows throughout the subbasin.

Following Euro-American settlement, channels have been oversimplified and straightened and cutoff off from off-channel habitat by levees, dikes, railroads, and roads. This simplification of the channel structure has reduced available habitat for salmonids and other aquatic species all throughout the Umatilla Subbasin.

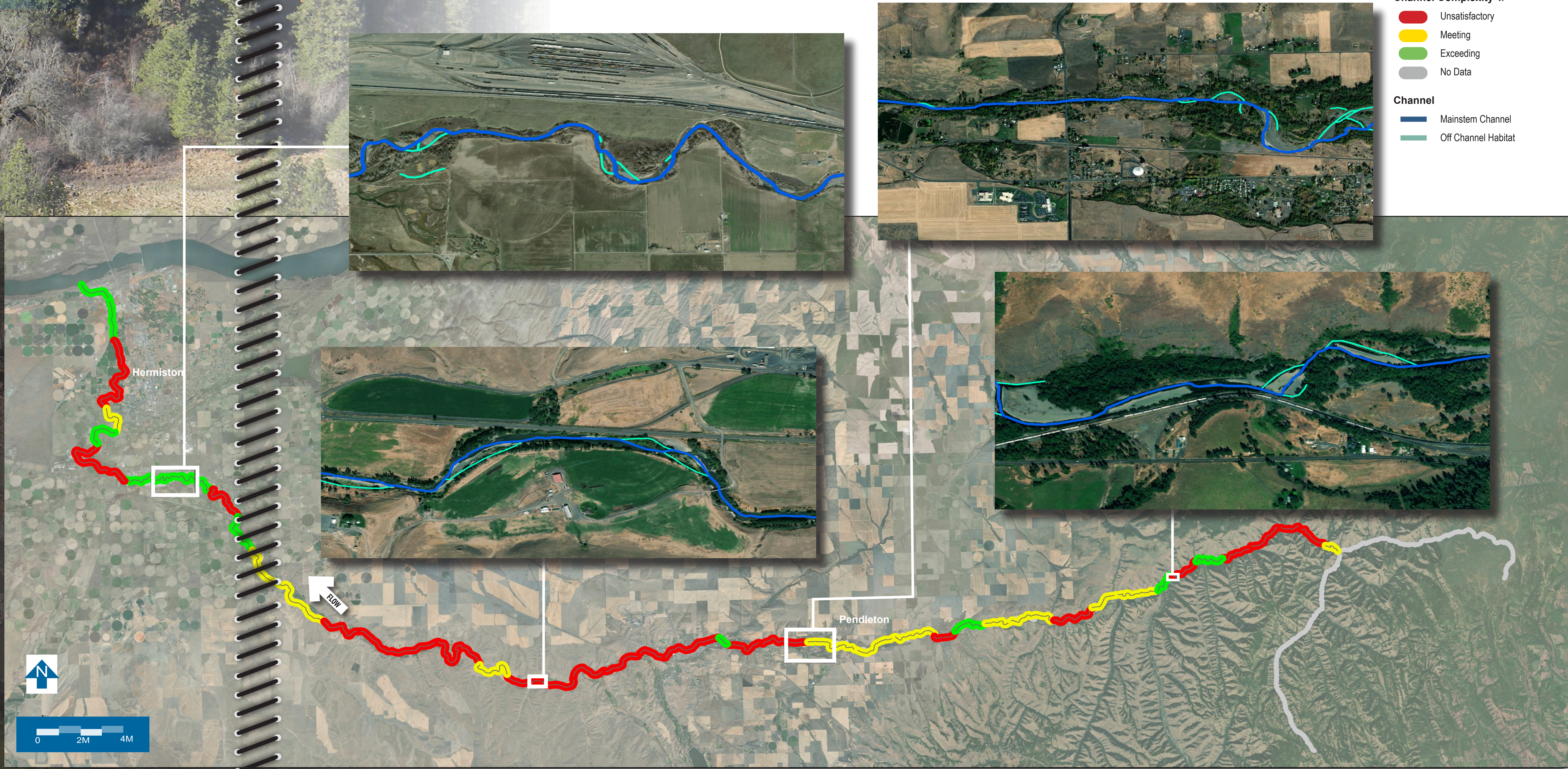




Example of adequate channel complexity on the mainstem Umatilla River reflective of historic conditions.

Example of floodplain cutoff by road and railroad development and overly simplified channel as a result.

1/ Channel complexity was calculated based on historic 1952 aerials to compare existing channel complexity with historic conditions. Reaches with better current channel complexity than historic conditions were identified as exceeding, reaches with similar current channel complexity to historic conditions were identified as meeting, and reaches with poor channel complexity compared to historic conditions were identified as unsatisfactory.



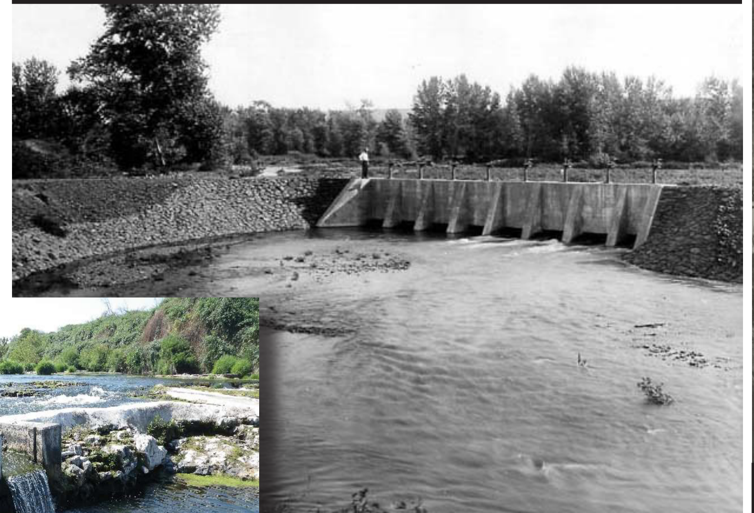
Passage Barriers

Historically, the Umatilla River would have flowed unimpeded from its headwaters to its confluence with the Columbia River. Additionally, the Umatilla River was well-connected with its floodplains and off-channel habitats such as seasonal ponds and side channels. This unimpeded longitudinal and lateral connectivity provided uninterrupted passage for aquatic species to move between habitats and migrate throughout the river network during all seasons of the year. . This unimpeded passage would have provided fish access to cold water habitat for spawning and rearing which is important for climate resiliency.

However, the construction of flow control structures, road and railroad development, culverts, dewatering from irrigation withdrawals, and thermal barriers caused by higher water temperatures, have diminished historic connectivity. This has impacted the ability of aquatic species to migrate freely through the river corridor and off-channel habitats, and has reduced the availability and presence of other First Foods that rely on flowing water. This also impacts the flow of sediment and debris (i.e., trees) which alters the quality and quantity of habitat for aquatic species and impedes natural processes.

The free-flowing movement of both water and aquatic species provided abundant First Foods for the CTUIR.

Stanfield diversion dam on the Umatilla River, September 1907



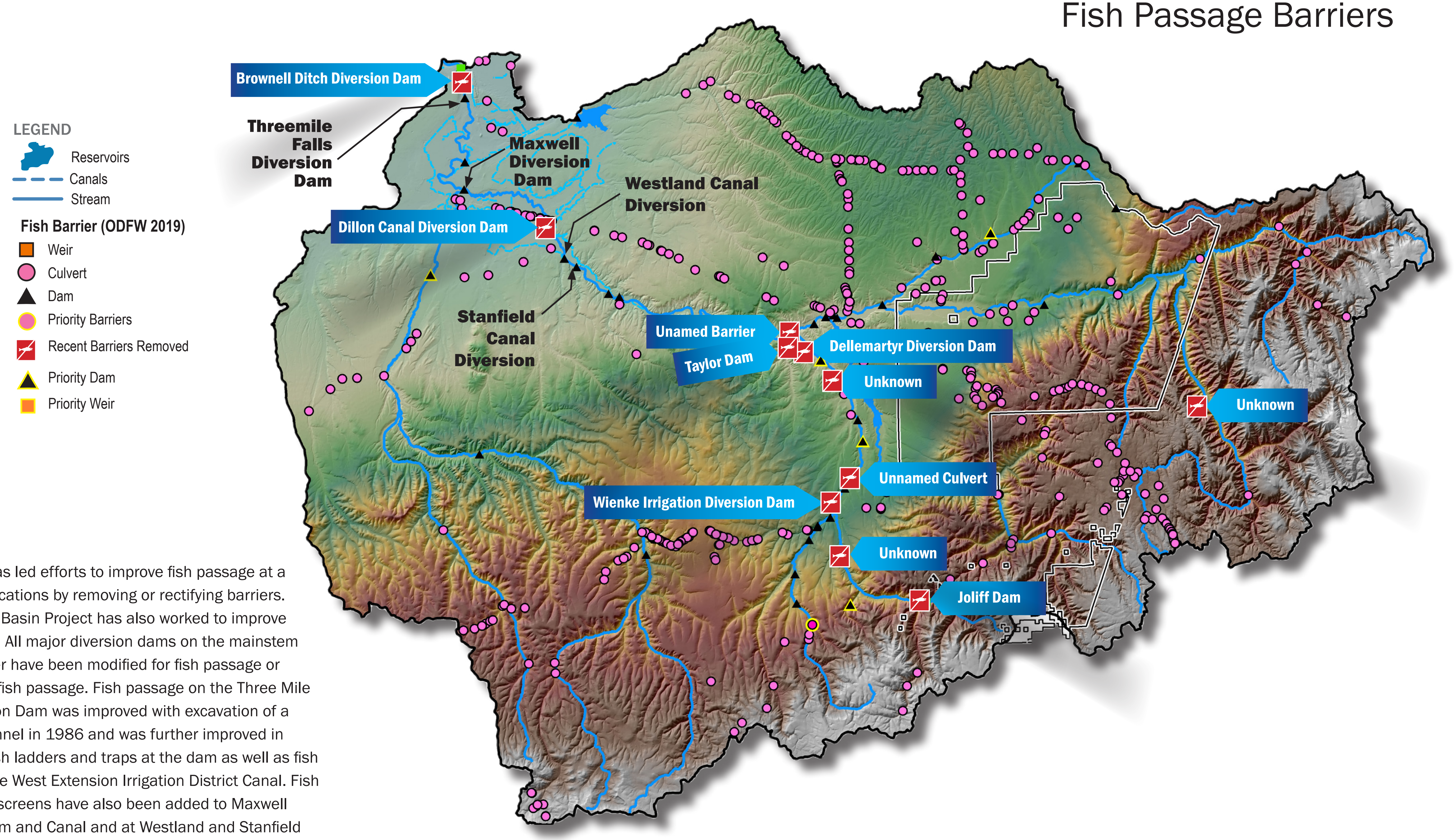
Construction of Three Mile Falls Diversion Dam on the Umatilla River / 1914

Brownell Diversion Dam on the Umatilla River prior to removal

McKay Dam on McKay Creek

Three Mile Falls Diversion Dam on the Umatilla River

Fish Passage Barriers



The CTUIR has led efforts to improve fish passage at a number of locations by removing or rectifying barriers. The Umatilla Basin Project has also worked to improve fish passage. All major diversion dams on the mainstem Umatilla River have been modified for fish passage or removed for fish passage. Fish passage on the Three Mile Falls Diversion Dam was improved with excavation of a low flow channel in 1986 and was further improved in 1988 with fish ladders and traps at the dam as well as fish screens in the West Extension Irrigation District Canal. Fish ladders and screens have also been added to Maxwell Diversion Dam and Canal and at Westland and Stanfield Canal diversions.

Hydrology - Geomorphology - **Connectivity** - Riparian Vegetation - Aquatic Biota

Prior to EuroAmerican settlement, the Umatilla River would have fully occupied the floodplain, from valley wall to valley wall. Winter flows would have shaped the floodplain based on sediment deposition and large log jams, creating a diverse array of habitats for flora and fauna. Abundant beaver activity would have had a major influence on the health and functionality of the floodplain landscape surrounding the Umatilla River and tributaries.

However, the construction of the railroad system and accompanying roads, levees, and dikes limited the connection between the river and the floodplain. The Umatilla River has responded to these constraints on its lateral connectivity by becoming heavily incised, over-simplified and disconnected from the floodplain except at the highest flows.

Current conditions in the floodplain are highly influenced by the locations of levees, dikes, flood control structures, and development like roads, railroads, infrastructure, and agriculture.

Bridges, dikes, levees, roads, railroads, and other associated infrastructure decrease the capacity of the Umatilla River and it's tributaries to pass flow as well as sediment and trees. This reduced functionality further hampers salmonid habitat and increases flooding risk.

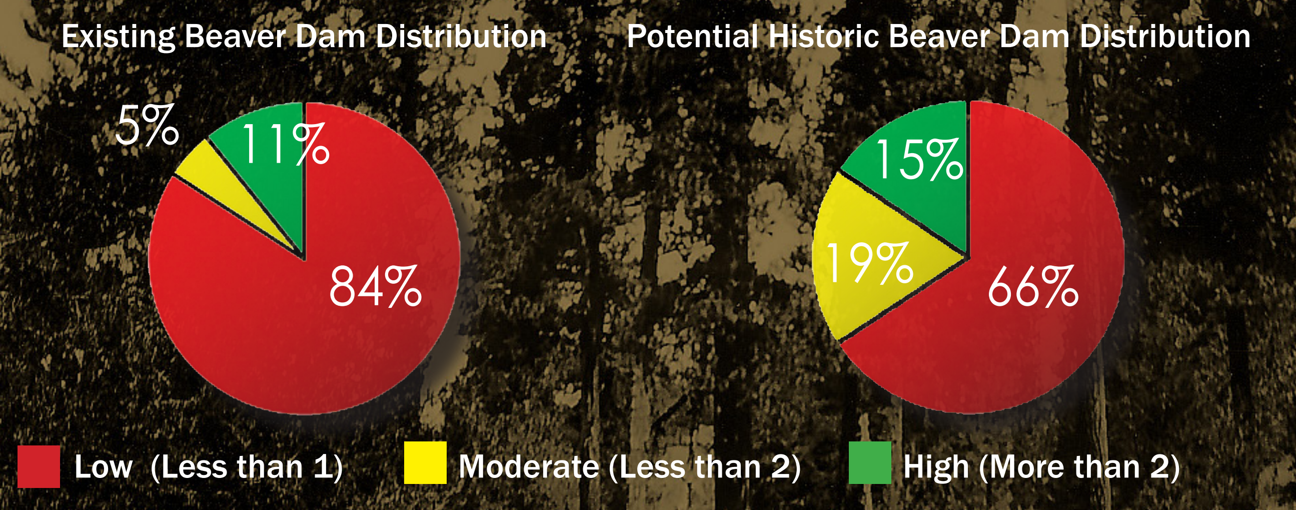

Barnhart
C'
C
FLOW
C
500 Year Flood
Railroad infrastructure disconnecting floodplain
C'
D'
D
Rieth Levee
FLOW
D
Railroad infrastructure disconnecting floodplain
D'
500 Year Flood
E'
E
FLOW
Mission Bridge
Mission Bridge and road infrastructure restricting mainstem flow and floodplain connection
E
E'
500 Year Flood
Mission Bridge
North Cayuse Road Bridge
Rieth Levee
Barnhart
FLOW
500 Year Flood Extents
Primary Study Area
Historic Floodplain Extents
Cross Sections
Berms
Roads/Railroad Lines
USACE Levee
F
F'
North Cayuse Road bridge constricting mainstem flow
500 Year Flood
F'
F
FLOW
North Cayuse Road Bridge
0
1M
2M

Hydrology - Geomorphology - **Connectivity** - Riparian Vegetation - Aquatic Biota

Beavers

Very few written records exist that describe the historical riparian and wetland vegetation in the Umatilla River Subbasin (USFS 1998), although early accounts by explorers and Tribal oral histories emphasized the abundance of beaver dams in the Umatilla River and its tributaries. Records do exist that tell the story of the extirpation of beavers from the landscape by fur traders in the mid-1800s (Ott 2003). By the time the settlers were traveling through the Umatilla Subbasin during the Oregon Trail era the beavers and their associated ponds and wetlands were mostly gone (USFS 1998).

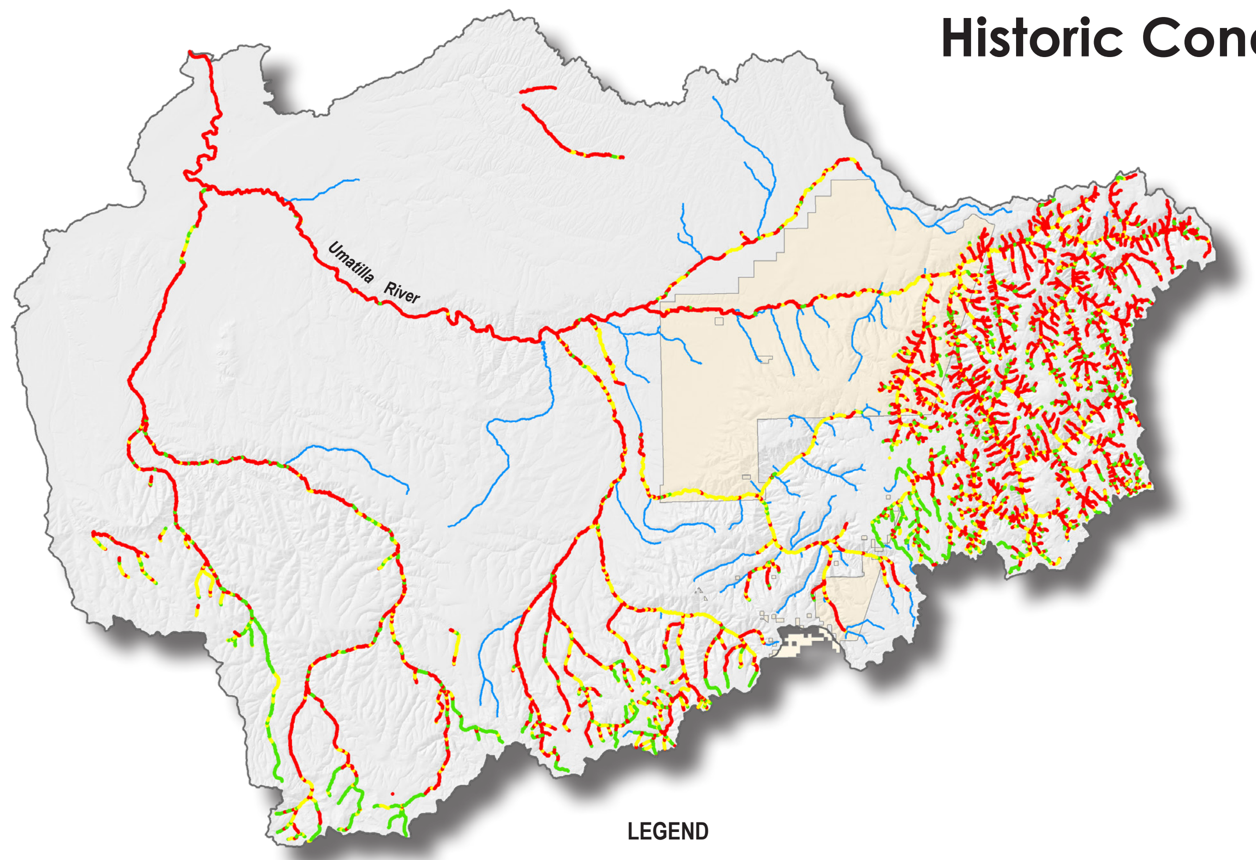
Beaver dams increase water storage in headwater streams, raise the water table in riparian zones, and increase the area of moist riparian and wetland habitats (Kay 1994). The extirpation of beavers from the landscape likely resulted in lowered water tables in riparian areas reducing the wetted ground suitable for riparian plants as well as the loss of wetlands in the floodplains (Swanson et.al. 2010).



"Beaver must be abundant here, for many places were filled by their dams."
(Hunt Party account of the Umatilla River, 1821)

Historic photo of a beaver dam on Camas Creek, Umatilla National Forest.

Historic Conditions



Evidence of beaver activity on the Umatilla River near Birch Creek in 2019.

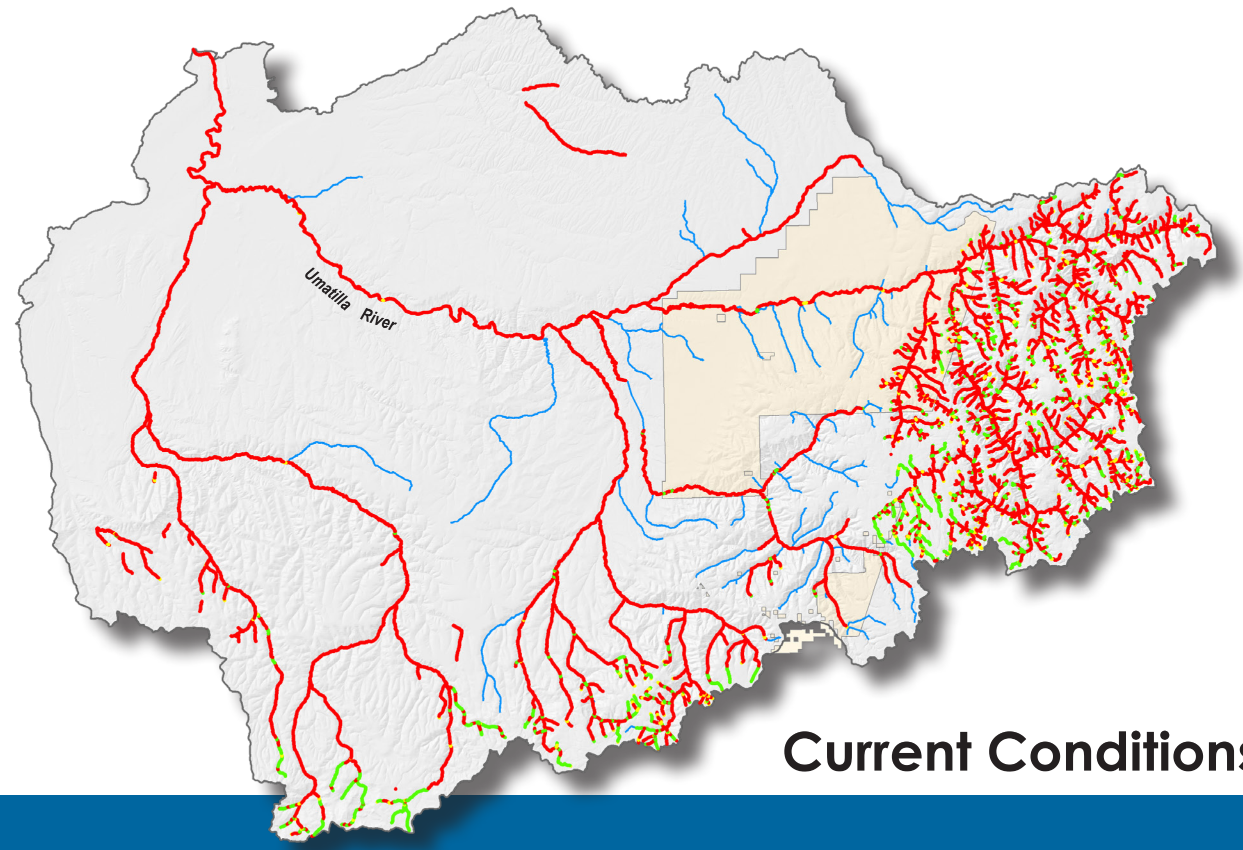
LEGEND

Beaver Dam Abundance 1/

- Low <1
- Moderate <2
- High >2
- Not Calculated

1/ Data from CTUIR Beaver Restoration Assessment Tool (BRAT). Potential beaver dams from the BRAT results are assumed to be historic conditions.

Quality wetland habitat with a beaver lodge on Meacham Creek.

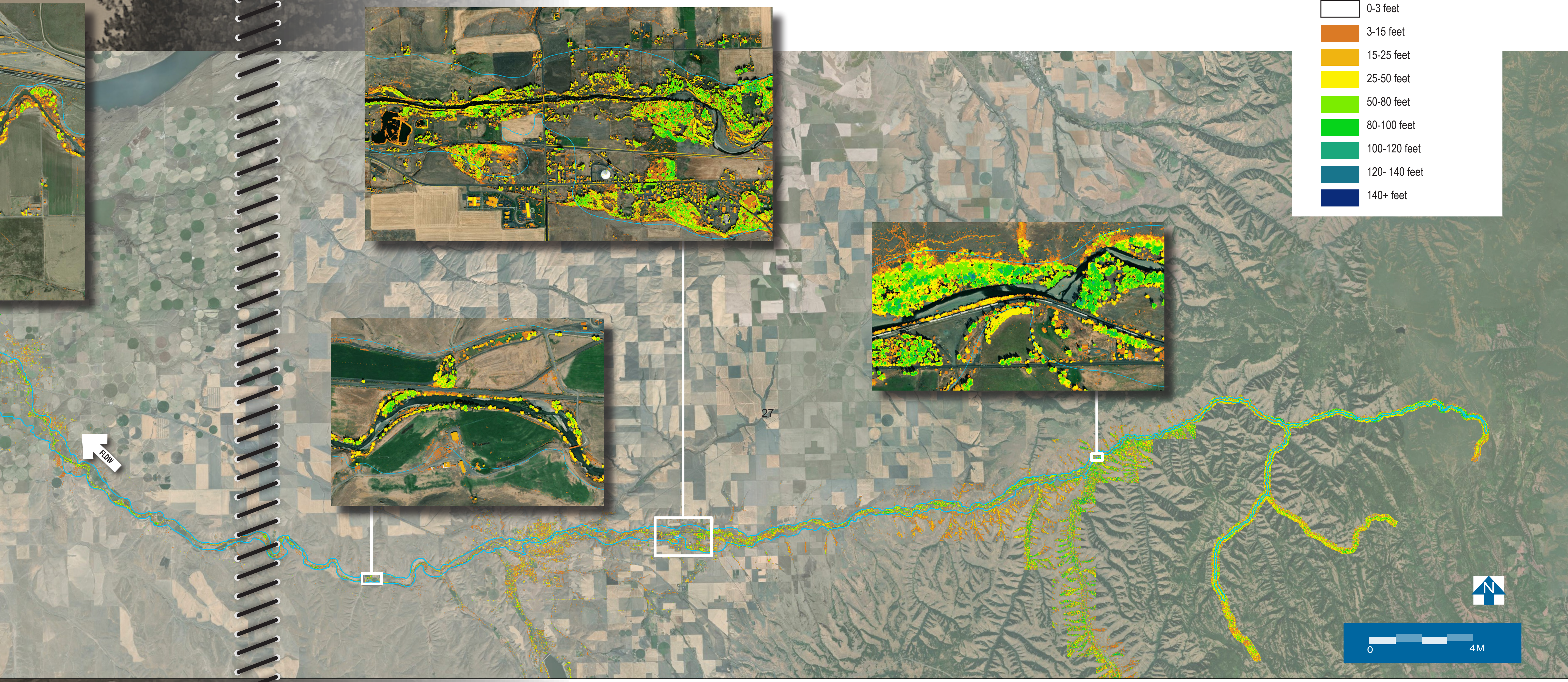


Current Conditions

Canopy Height

The same LiDAR data that was used for the mapping of relative elevations in the floodplain was used to model canopy heights. Historically, the river bottoms were dense with trees, including cottonwood, willow, and other species. Since time immemorial, the CTUIR managed these stands using controlled fires in order to create the conditions needed to support the First Foods.

However, much of these riparian forests were cleared for agriculture, timber, and for development. The heavily incised, over-simplified, and disconnected river from the floodplain, shown in the previous REM under Geomorphology section (page 19), reduces the ability for riparian vegetation to reestablish and flourish, since it is harder for their roots to find water.



Cottonwood and willow stand on braided floodplain similar to what settlers described on Umatilla River when crossing near Pendleton (USFS 1998).

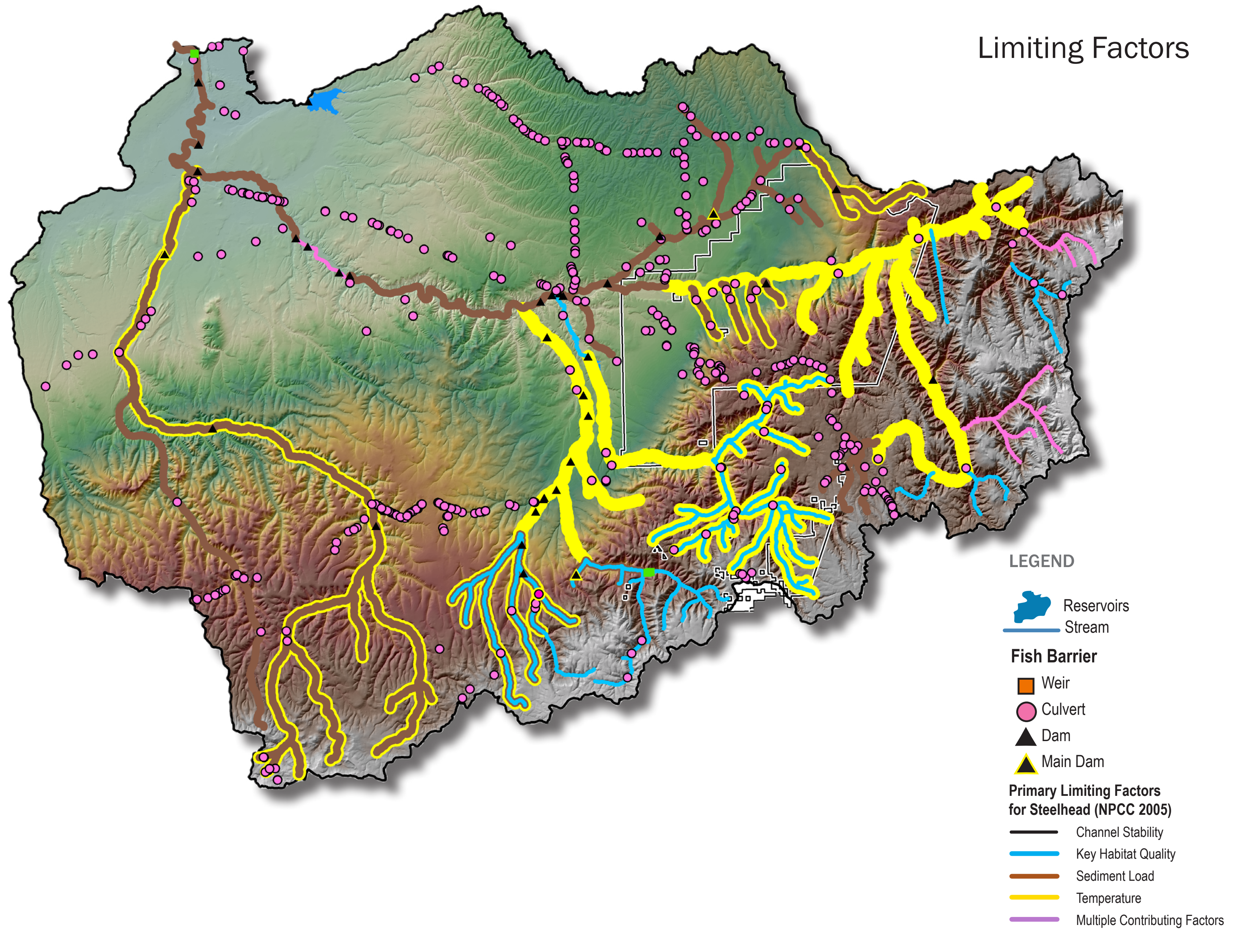
Historic conditions on the Umatilla River would have looked similar to this photo near Bingham Springs with ample canopy providing protection and shade for aquatic species and increased wood available for recruitment to the channel

Current conditions in the lower Umatilla River

Limiting Factors

The term **"limiting factors"** refers to impairments of key habitat attributes that limit the growth and abundance of fish populations. Limiting factors are often described as "bottlenecks" in the life cycle. Most fish population limiting factors referred to in this document are reflective of changes to the aquatic and riparian habitat conditions that stem from the longterm conversion of land uses. For example, the extensive irrigation withdrawals that lead to low flow conditions in the river, and the loss of riparian vegetation due to grazing and agriculture, both exacerbate high summertime water temperatures. Dikes and levees built to straighten and consolidate the river channel have led to sedimentation downstream and greatly reduced in-channel habitat complexity and flood dissipation.

The limiting factors listed here are focused mostly on focal aquatic species (i.e., salmonids). However, as discussed in Brim Box et al. (2006), a significant overlap exists between the limiting factors for salmonids and for freshwater mussels, another species of particular importance to the CTUIR. Limiting factors for freshwater mussels include sedimentation and sediment characteristics, channel modifications (i.e., key habitat quality), dams and impoundments, loss of host native fish species (i.e., decline in salmonid populations), and impacts from non-native fishes.




Construction of a small bridge over the lower Umatilla River in the early 1900's.


Channelized portion of the mainstem Umatilla River with minimal riparian vegetation.

Table. Most significant limiting factors identified within the subbasin for each focal species (NPCC 2005).

Spring Chinook	Steelhead	Bull Trout	Pacific Lamprey
High Temperature	High Temperature	Channel Complexity	Stream Flow Reductions
Habitat Diversity	Sediment	High Temperature	Habitat Quality
Sediment Load	Barriers	Channel Form	Water Quality
Habitat Quantity	Habitat Quality	Riparian Conditions	Barriers
Barriers			


Degraded section of Birch Creek, an important tributary to the Umatilla River.

Spring Chinook Salmon

Oncorhynchus tshawytscha

Chinook salmon begin their lifecycle in tributary and mainstem reaches where they hatch and emerge from the gravel during winter and spring months. High spring flows during snow melt initiate their migration downstream, where they further grow into smolts, and then continue their migration to the Columbia River and eventually the Pacific Ocean. After spending two to four years in saltwater they begin migrating back from the Pacific Ocean to the Columbia River in late winter and early spring, entering the lower Umatilla River in early summer. Their upstream migration continues into the late summer, as they make their way to spawning locations in the fall. After spawning and completing their lifecycle, the fish die, and their bodies provide critical nutrients to the surrounding riparian ecosystem communities of plants, birds, and animals.

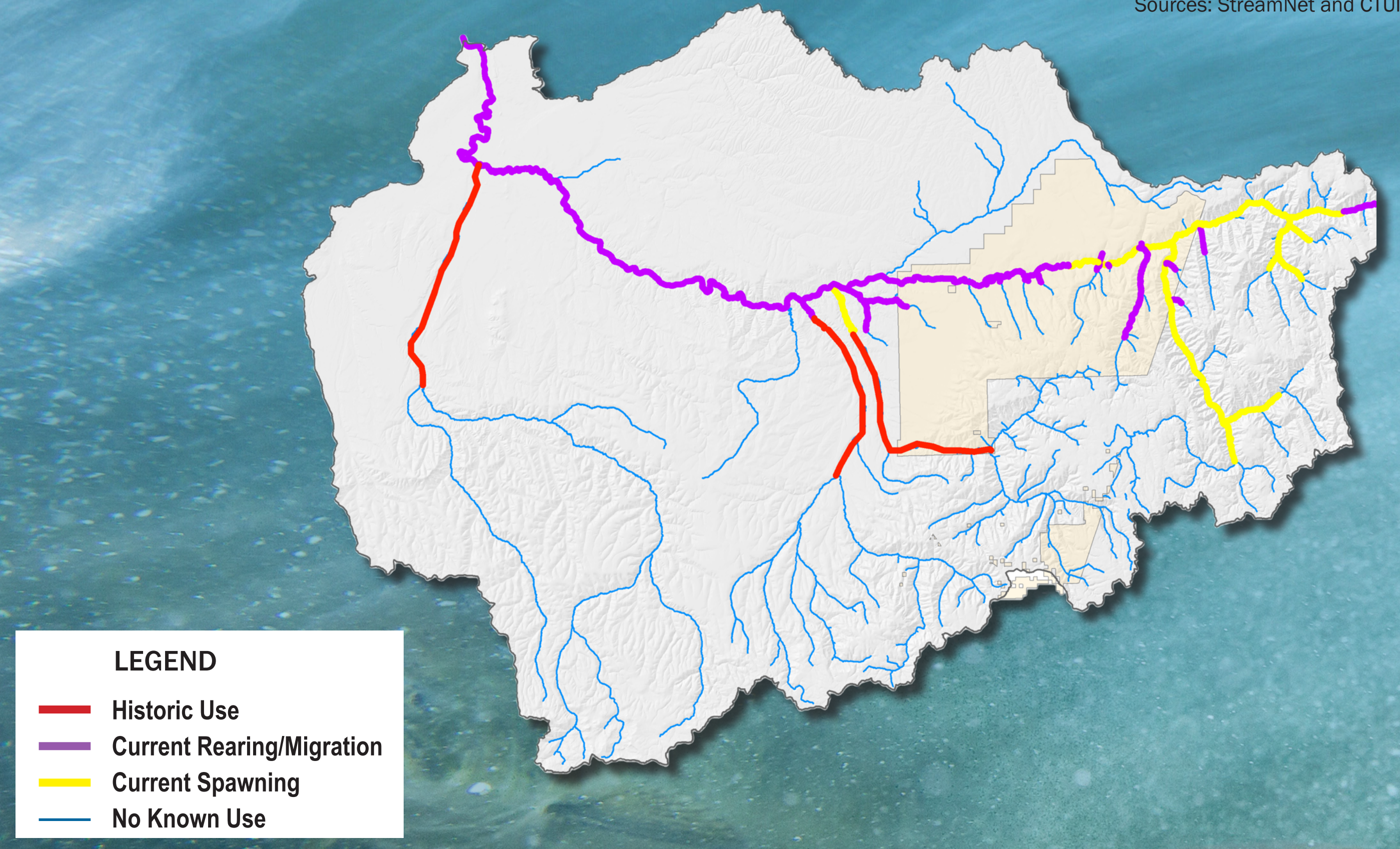
The CTUIR, in coordination with Oregon Department of Fish and Wildlife, compiles information regarding mitigation re-introduction efforts for spring Chinook and fall Chinook salmon as well as Coho salmon. The Umatilla Basin Natural Production Monitoring and Evaluation Project annually provides updates on the goals of the Umatilla Hatchery Master Plan from 1990 with updates in 1999 to mitigate the extermination of salmonids in the Umatilla Subbasin. The goal is to provide quality information to managers and researchers working to enhance and restore anadromous salmonids in the Umatilla Subbasin.

Historically, **the extent of spring Chinook salmon spawning is believed to include the Umatilla River mainstem down to RM 50, upper McKay Creek, Birch Creek, and Butter Creek.**

Currently, **Spring Chinook salmon spawn in the mainstem of the Umatilla River above RM 86, in the North Fork and South Fork, in Meacham Creek and North Fork Meacham Creek, and potentially in the lower portion of McKay Creek.**

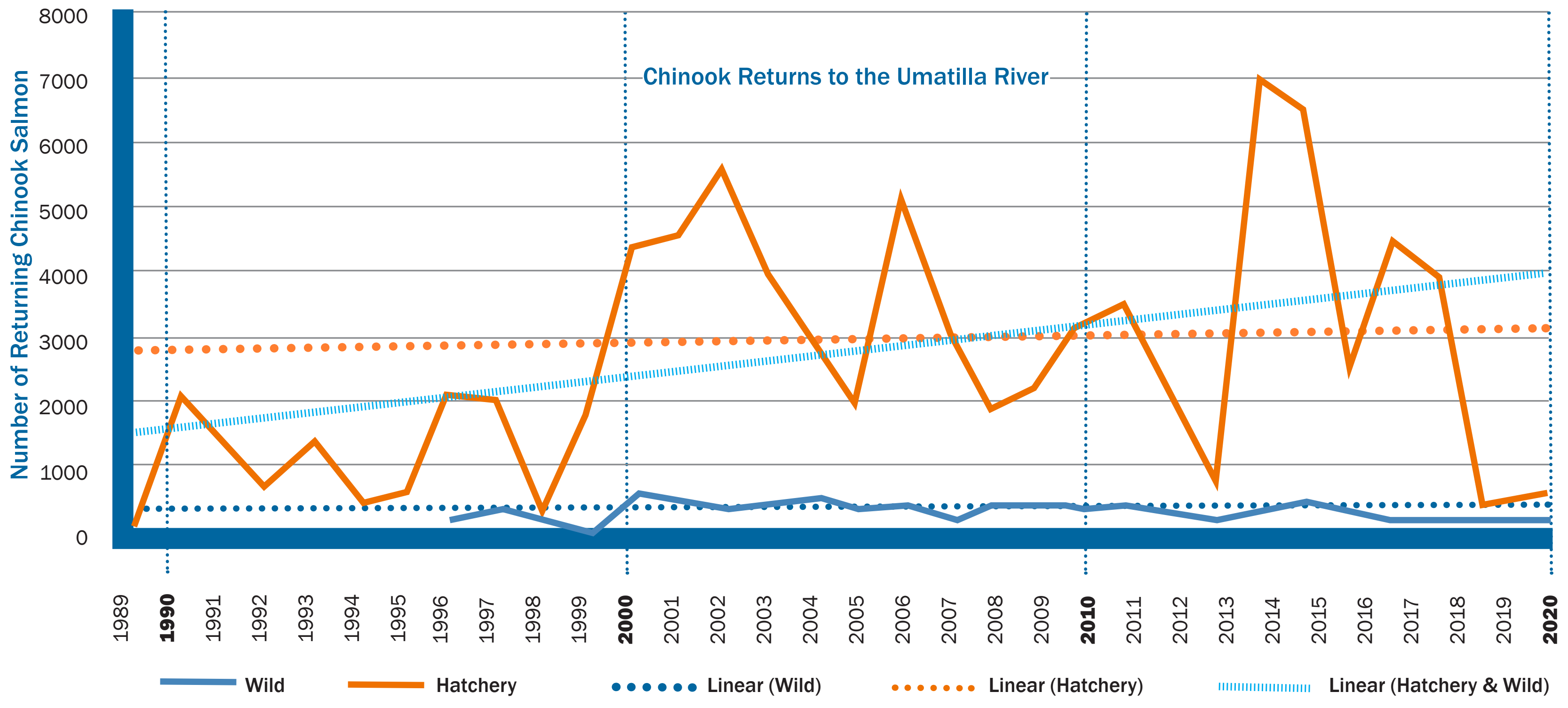
Spring Chinook Salmon Distribution

Sources: StreamNet and CTUIR



Current Population Status

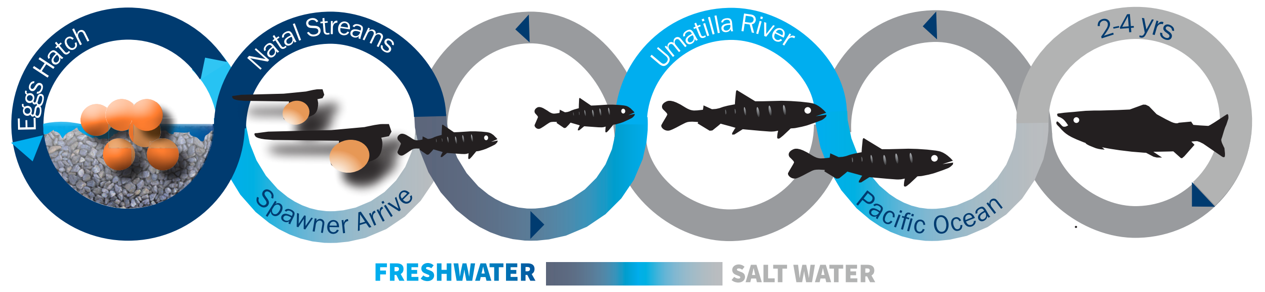
Spring Chinook salmon were extirpated from the Umatilla Subbasin in the early 1920's as a result of a variety of human activities including irrigation diversion dams, habitat destruction, high water temperatures, and reduced flows. Spring Chinook salmon were reintroduced in 1986 with Carson stock to the subbasin, and in 1998 with local Umatilla River adult returns, through fishery enhancement efforts by the CTUIR. The Umatilla River spring and fall Chinook salmon populations are harvested/supplemented by a hatchery facilities co-managed and operated by the CTUIR on the Umatilla River, as well as additional out-of-basin hatchery (NPCC 2005, ODFW 2020a).



LIFECYCLE

Spring Chinook Salmon

- Eggs hatch and alevins emerge from gravels in late winter to early spring (February through May).
- Juveniles rear in natal streams through the summer into fall, then migrate to the mainstem Umatilla River to continue rearing. The majority of juvenile Chinook overwinter in freshwater habitats until migrating to the Pacific Ocean the following spring as smolts.
- Smolts enter the Pacific Ocean and spend 2 to 4 years feeding and migrating. Adults return to the Columbia River in early spring to begin upstream migration back to natal streams including the Umatilla River.
- Spawners arrive in natal streams between April and July, where they hold and stage before digging nests (redds) and spawning in the fall.



Summer Steelhead

Oncorhynchus mykiss

Summer steelhead have a wide distribution range and often utilize small headwater reaches for spawning and rearing. The tribes of the region historically relied on steelhead as a food source throughout the year, with longer freshwater life patterns allowing for greater opportunity for harvest (NPCC 2005).

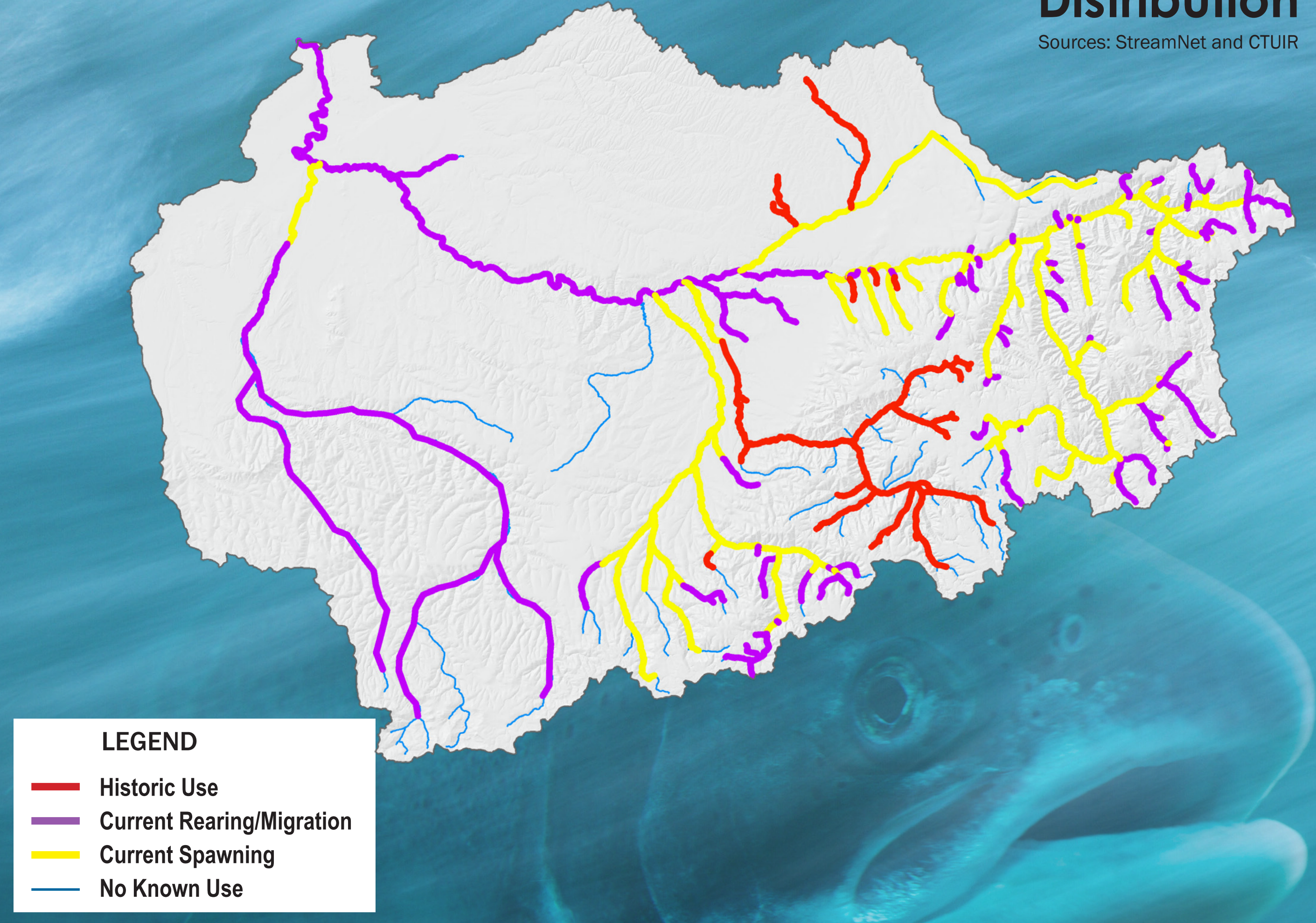
Anthropogenic impacts in the Umatilla River have caused and reduced abundance and distribution of adult and juvenile summer steelhead populations. Currently, Umatilla River summer steelhead spawning occurs in the upper mainstem, the North and South Forks, Meacham Creek, and the upper Birch Creek watershed. The fishery is supplemented by hatchery stocks in the Umatilla River. Naturally produced steelhead in the subbasin are protected and are listed as Threatened under the Endangered Species Act (ESA).

The CTUIR, in coordination with Oregon Department of Fish and Wildlife, compiles information regarding enhancement efforts for summer steelhead. The Umatilla Basin Natural Production Monitoring and Evaluation Project annually provides updates on the goals of the Umatilla Hatchery Master Plan from 1990 with updates in 1999. The goal is to provide quality information to managers and researchers working to enhance and restore anadromous salmonids in the Umatilla Subbasin. The purpose of the steelhead endemic program is to augment harvest, however, wild parentage is utilized in the broodstock to maintain genetic composition of the stock.

The CTUIR Umatilla Basin Natural Production and Monitoring and Evaluation Project conducted fish surveys to establish presence and distribution of salmonids, particularly redband trout or steelhead, in the North Fork McKay Creek watershed. Salmonids sampled in the area were healthy and present in multiple size classes confirming that the watershed contains vital habitat, spawning and rearing of existing resident populations, and could sustain an anadromous population given the restoration of passage at McKay Dam (Johnson et al. 2022). Out-planting hatchery steelhead into McKay Creek reservoir also demonstrated that steelhead can successfully migrate to the headwaters, spawn, and return back to the reservoir (Bonifer et al. 2023).

Summer Steelhead Distribution

Sources: StreamNet and CTUIR



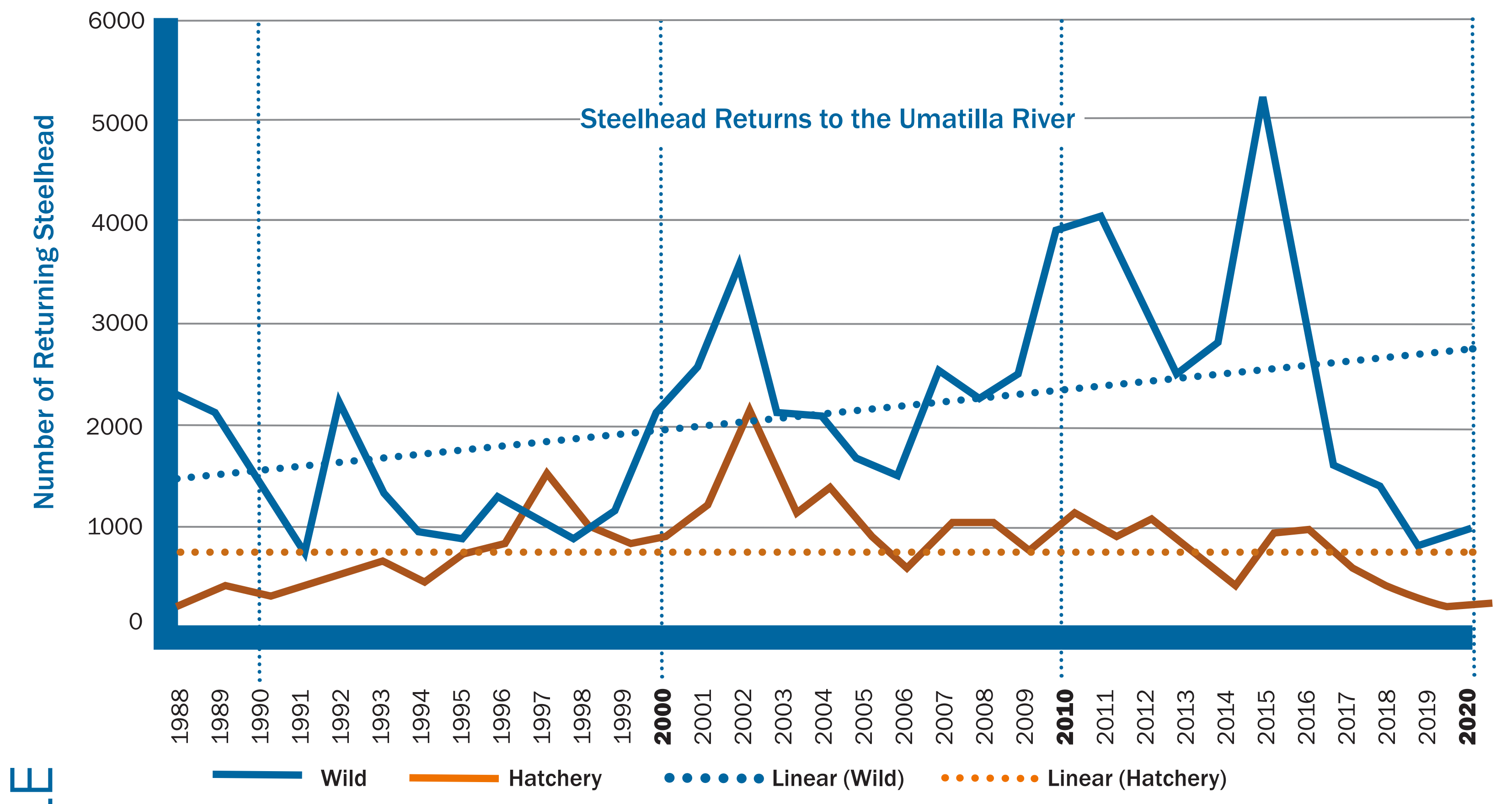
Historically, steelhead are believed to have spawned in McKay Creek (above the current reservoir) and in the upper reaches of Butter Creek and Wildhorse Creek.

Currently, steelhead spawn more extensively throughout the Umatilla Subbasin than Chinook salmon. While there is considerable overlap, steelhead also utilize upper reaches of tributary habitat. Meacham Creek, Birch Creek, and their respective tributaries are considered major steelhead producers, with additional spawning occurring in the upper mainstem Umatilla River (above the Mission Creek confluence (RM 61), South Fork Umatilla River, Iskuulpa Creek, and many other tributaries.

Photo: Getty Images.com.

Current Population Status

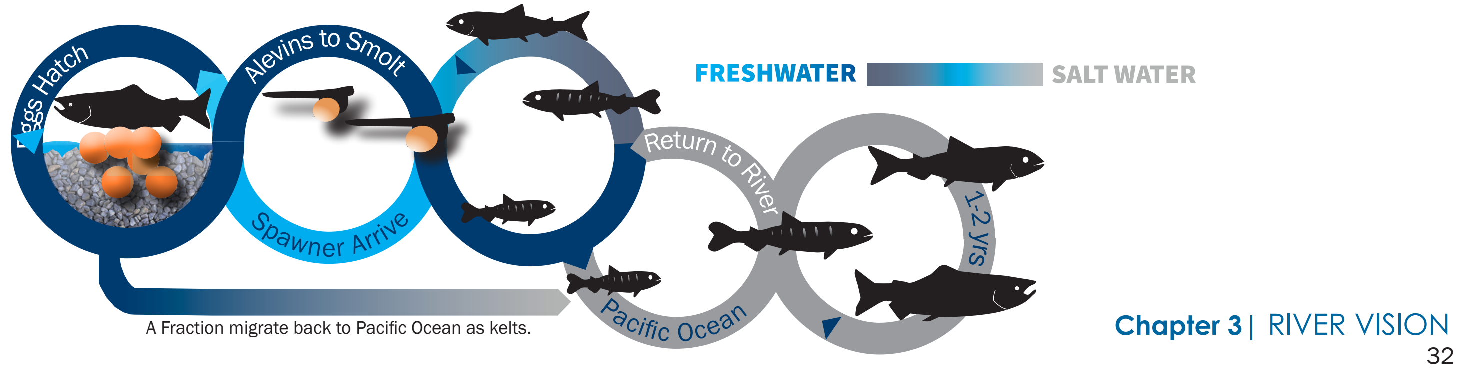
Like Chinook salmon, the **summer steelhead** population in the Umatilla Subbasin significantly declined in the early 1920's, due to a variety of human impacts including the construction of the dams, overfishing and habitat destruction (NPCC 2005). On March 25, 1999, the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries) listed Oregon's Mid-Columbia River steelhead populations as threatened under the ESA (69 Federal Register [FR] 33101). The Umatilla Subbasin population along with the John Day, Yakima, and Walla Walla subbasins, is part of the Middle Columbia River steelhead evolutionarily significant unit (ESU). NOAA Fisheries revised its species determinations for West Coast steelhead under the ESA, delineating anadromous, steelhead-only distinct population segments (DPS). NOAA Fisheries listed the Middle Columbia River steelhead DPS as threatened on January 5, 2006 (NMFS 2021)



LIFECYCLE

Summer Steelhead

- Eggs hatch in late spring through early summer.
- Fry/parr rear in natal streams for 1 to 4 years. Some rearing occurs outside of natal stream in mainstem Umatilla River.
- Juvenile steelhead will either stay in freshwater for their entire life as resident redband rainbow trout or migrate to the ocean and become steelhead.
- Smolts migrate to Pacific Ocean throughout the year, with peak migrations in the spring or fall
- Subadults spend 1 to 2 years in ocean, then reenter the Columbia River in the spring and early summer to begin upstream migration.
- Adults migrate from the Columbia River back to the Umatilla River in the summer through fall, where they overwinter in the mainstem of the Umatilla River, and then enter tributary streams the following spring.
- Steelhead spawn in the spring. A small fraction of spawners do not die, but migrate back to Pacific Ocean as kelts.



Bull Trout
Salvelinus confluentus

Bull trout, a member of the char family, are known for being dependent on good water quality, particularly cold water temperature, and high habitat complexity. They are found throughout the Umatilla Indian Reservation and inhabit cold water areas in tributaries to the Umatilla River. Bull trout are similar to salmon and steelhead in that they have migrations patterns throughout river networks but differ as they do not go to the ocean. Although bull trout were not as significant of a food source compared to salmon or steelhead, they provided opportunity for Tribal harvest throughout the year.

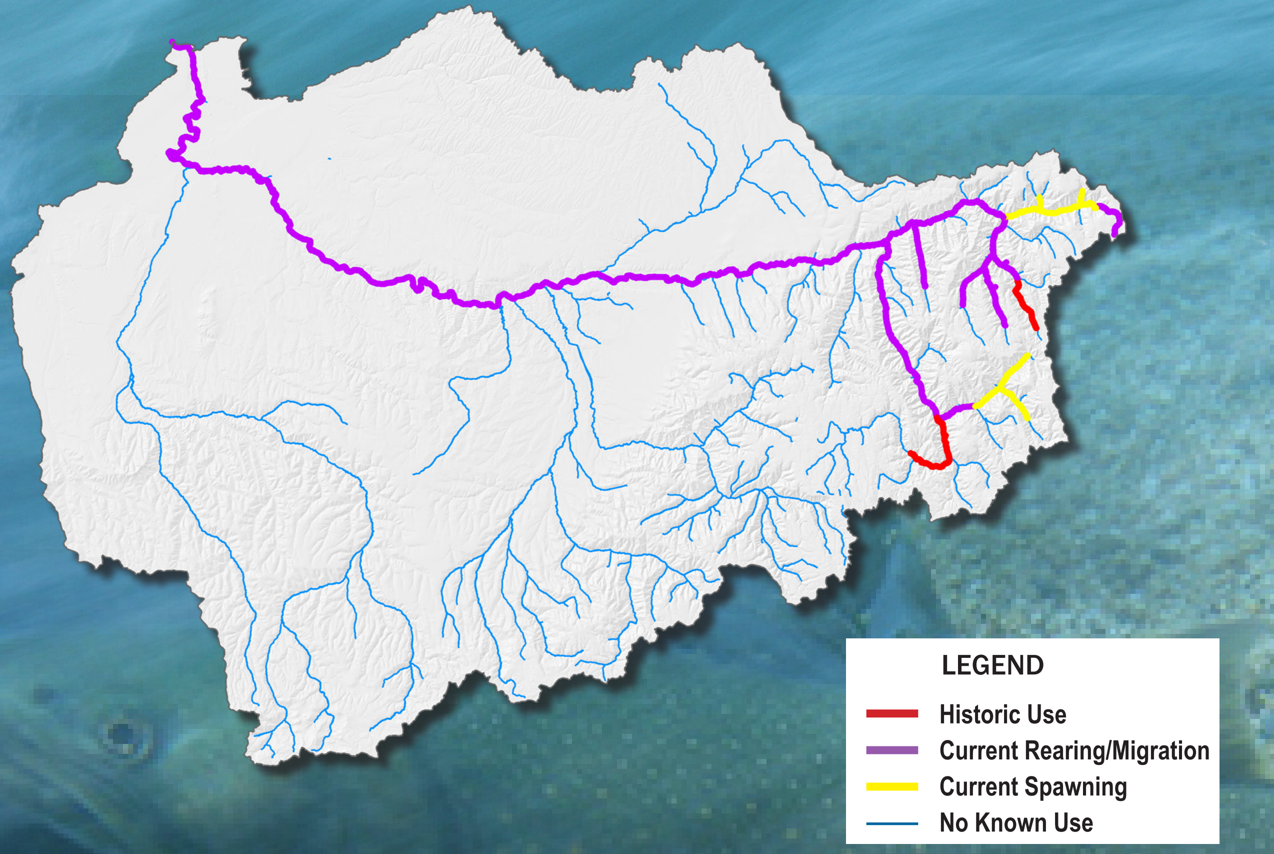
As year-round river residents, they rely on very cold water for all of their life stages. Bull trout spawn in the fall with young juveniles emerging from gravels during winter months. Juveniles will rear for two to three years, and can either remain resident individuals, become "adfluvial" and migrate between river and lake habitats, or become "fluvial" migrating between river segments.

Historically, bull trout were throught to utilize almost all stream and river segments in the Umatilla Subbasin. Currently, this distribution has decreased with warming in-stream temperatures, decreased water quality and habitat, and the inability to practice adfluvial lifecycles to the Columbia River due to poor conditions in the lower Umatilla River. Bull trout spawn in predominantly in the North Fork Umatilla River, with some additional production in the South Fork Umatilla River and North Fork Meacham Creek.

Currently, bull trout spawn predominantly in the North Fork Umatilla River, with some additional production in the South Fork Umatilla River and North Fork Meacham Creek.

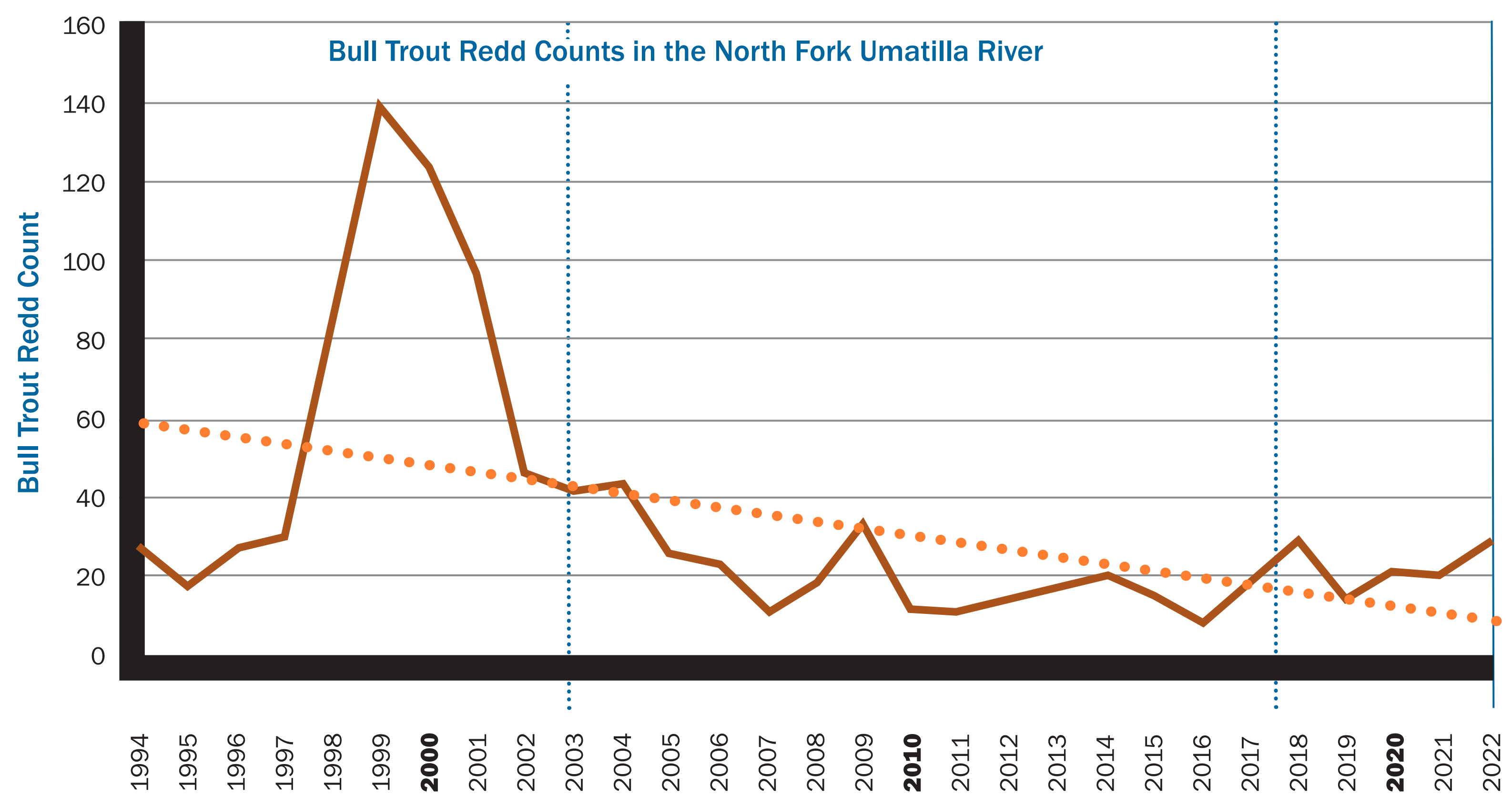
Bull Trout Distribution

Sources: StreamNet and CTUIR



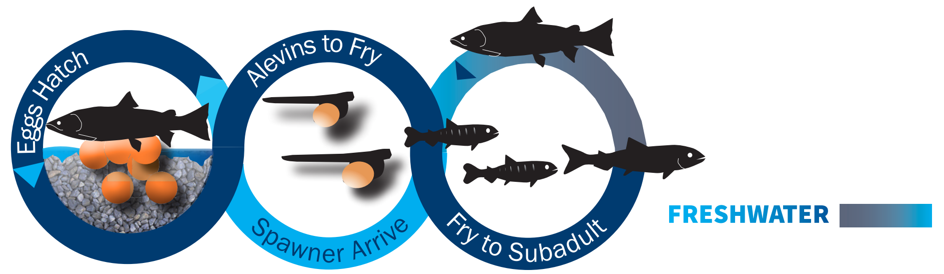
Current Population Status

Bull trout populations in the Umatilla Subbasin have declined due to a variety of human impacts, namely loss of suitable habitat, and high water temperatures. Columbia River bull trout were listed as threatened under the ESA (62 FR 31647) on June 10, 1998. Critical habitat was designated on October 18, 2010 (75 FR 63898), which designates many areas of the Umatilla Indian Reservation as bull trout critical habitat. These areas include the Meacham Creek and Umatilla River watersheds, as part of the Lower Middle Columbia Recovery Unit (USFWS 2015).



LIFECYCLE
Bull Trout

- Eggs hatch from gravels in winter and spring.
- Juveniles rear in cold freshwater streams for 4 to 7 years.
- Bull trout will either stay in natal streams or migrate to different streams in same basin.
- Adults spawn in the fall and do not die after spawning.



Pacific Lamprey

Entosphenus tridentatus

Pacific lamprey are an anadromous fish species present in the streams and rivers of the Umatilla Indian Reservation throughout the year. Although lamprey are known for being parasitic during their ocean life-history phase, lamprey are actually filter feeders for a majority of their life, living burrowed in fine substrates in low velocity areas of streams and rivers. Pacific lamprey are a culturally significant species to the CTUIR. As a food source, lamprey historically provided high nutrient value and subsistence to the Tribes (NPCC 2005).

Pacific lamprey eggs hatch in late spring to summer, and larvae, also known as ammocoetes, burrow into the stream substrates to rear for a period lasting up to 7 years before migrating to the Pacific Ocean. In the mid-summer through fall, larvae undergo a morphological and physiological transformation into juveniles, also known as macrophthalmia, which prepares them for a parasitic lifestyle in the ocean. After spending 1-7 years in the saltwater, they migrate upstream into freshwater tributaries where they are attracted to pheromones emitted by larvae during the spring and summer months. Here they overwinter in the mainstem and tributaries until finishing their spawning migration the following spring. Like salmon, lamprey die after spawning.

Historically, lamprey were distributed widely throughout the Umatilla Subbasin from the mainstem to the headwaters. However, as with salmon and steelhead, Pacific lamprey were blocked from historic habitats by the construction of mainstem dams on the Columbia River. Other smaller diversion structures and road crossings further depleted access to historic habitats.

Currently, distribution of Pacific lamprey is the result of an active translocation program through the CTUIR.

Pacific Lamprey Distribution

Sources: StreamNet and CTUIR

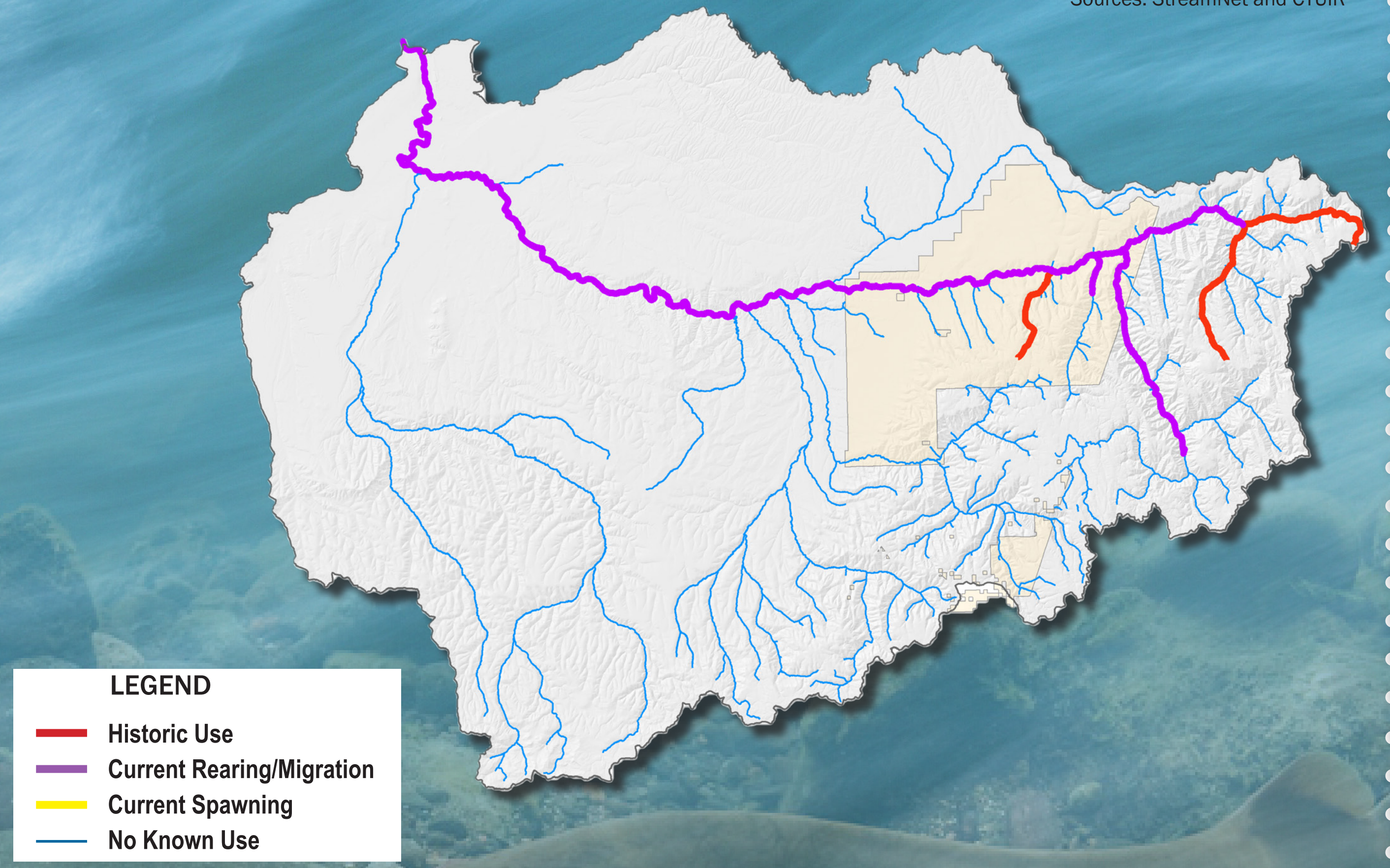
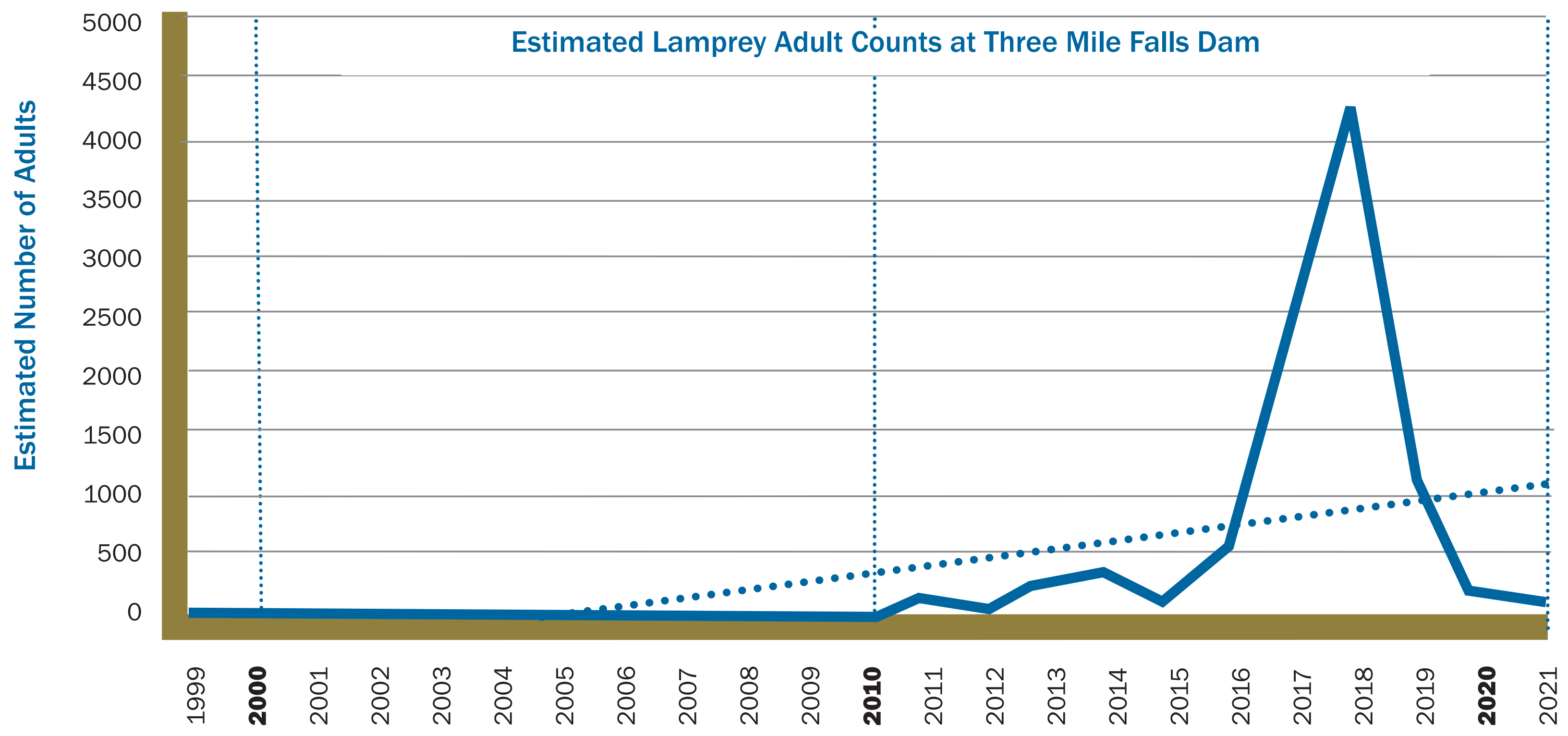


Photo: Jeremy Monroe, Freshwaters Illustrated, Flickr.com

Current Population Status

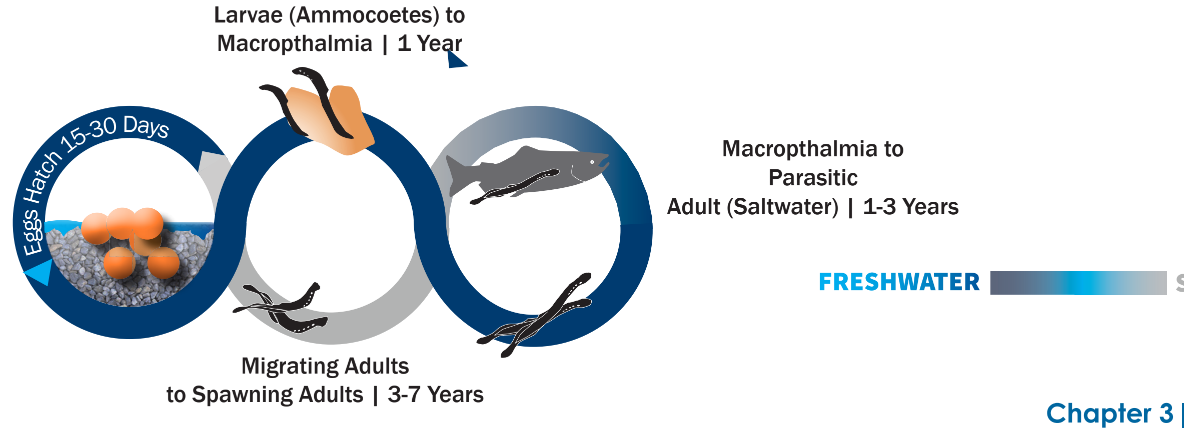
Pacific lamprey were once so abundant throughout the Umatilla Subbasin that they were sometimes considered to be a nuisance. However, their population was adversely affected by the establishment of dams on the Columbia River, and declined dramatically in the mid-1970s, following rotenone treatments conducted by the Oregon Department of Fish and Wildlife in 1967 and 1974. The Pacific lamprey of the Umatilla Subbasin were considered extirpated, until the CTUIR reintroduction efforts began in 2000. Pacific lampreys were listed as an Oregon State Sensitive Species in 1993 and became an "at risk" species in Oregon in 2006 (ODFW 2020b). The current population of lamprey in the Umatilla Subbasin is believed to be extremely low, and remains the focus of a restoration initiative by the Tribes (CTUIR 2014).



LIFECYCLE

Pacific Lamprey

- Eggs typically hatch in the fall and winter
- Larvae (ammocoetes) rear for 3 to 7 years in stream beds before metamorphosing into parasitic macropthalmia beginning in the summer
- Macrophtalmia move downstream into the Columbia River as they emigrate to the ocean between late fall and spring



PERIODICITY

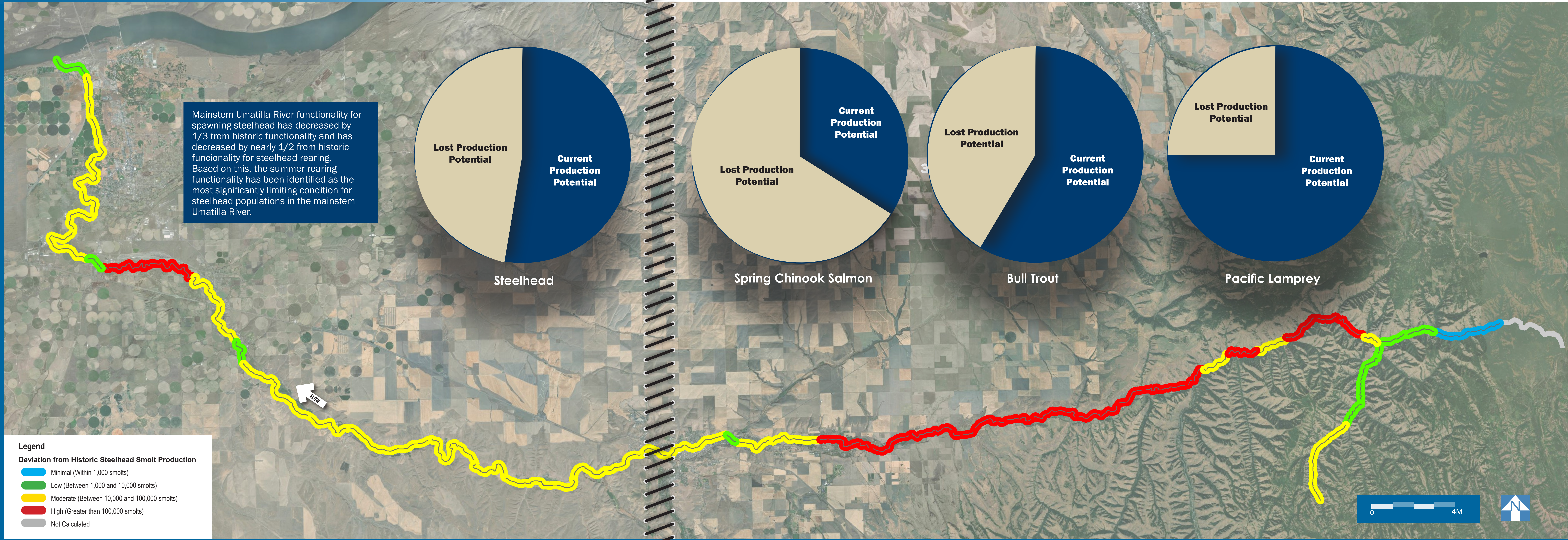
Periodicity refers to the use and timing of different fish species and life stages. This figure shows the peak use based on life stage for the four focal species for the Umatilla River throughout the year. For a detailed periodicity chart showing all uses and timing for the focal species, see the Technical Appendix.

Smolt Production

A smolt production potential (SPP) calculator provides a tool for comparing the relative value of existing habitats for focal fish species and for identifying which habitat factors are most likely to be limiting production. The habitat-based approach is meant to be simple and to incorporate subbasin-specific data whenever possible.

The tool uses observed fish densities in different habitat types (for example, riffles, glides, and pools) and multiplies them by the area of each habitat type within a reach, then sums across all reaches in the study area. Seasonal abundance in spawning habitats, summer rearing habitats, and winter rearing habitats, is converted to the eventual number of outmigrating smolts to allow comparisons based on a common metric. Results demonstrate the potential production capacity of available habitats.

The model uses an approach similar to one that has been applied widely in the Pacific Northwest (e.g., Reeves 1989, Beechie 1994) with several modifications to incorporate available data provided by the CTUIR. This tool was specifically developed for the CTUIR and allows for updating/ modification of input parameters, formulas, and calculations when new data become available. The tool was utilized for summer steelhead, spring Chinook salmon, bull trout, and Pacific lamprey. More details regarding the approach, methods, and results are provided in the technical appendix.

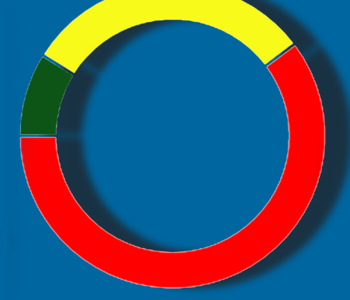


Habitat Suitability

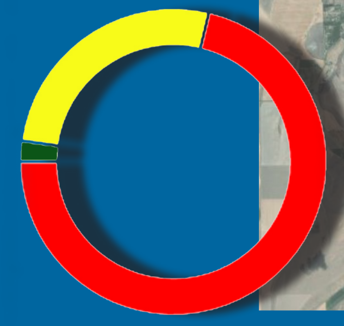
Habitat suitability modeling utilizes the relationship between physical characteristics and habitat suitability, or preference. This relationship is determined by suitability curves that relate relevant physical stream characteristics such as depth, velocity, and habitat needs. These parameters are combined into a single Habitat Suitability Index (HSI) based on the species and life stage.
The habitat suitability models are used to evaluate those areas having satisfactory conditions under existing conditions relative to other more impacted areas, which will help focus restoration efforts to areas with higher potential benefits. Results were compiled into low, medium, and high suitability for each reach, species, life-stage, and flow.

Due to the lack of bathymetric data available in the mainstem Umatilla River, habitat suitability modeling was completed only in the **floodplain of the Umatilla River** for Chinook salmon spawning and rearing, steelhead spawning and rearing, bull trout spawning and rearing, and Pacific lamprey rearing at the 10- and 100-year recurrence intervals.

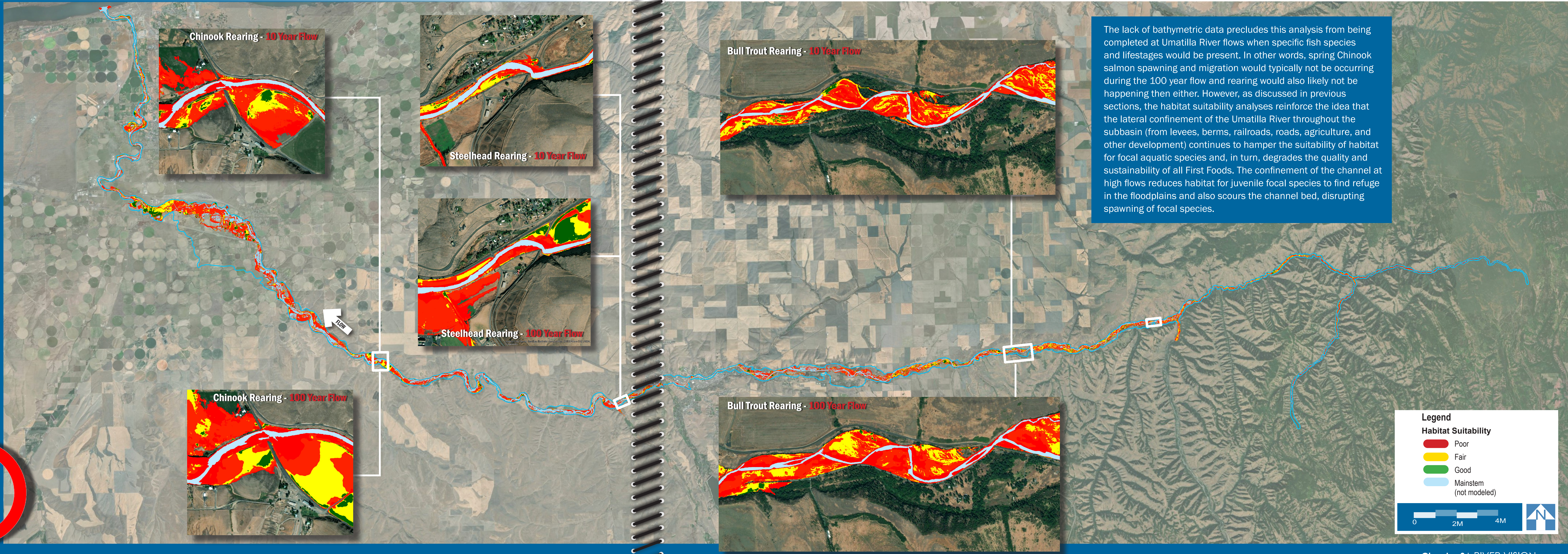
Steelhead Floodplain Rearing Habitat - 10 Year Flow



Bull Trout Floodplain Rearing Habitat - 10 Year Flow



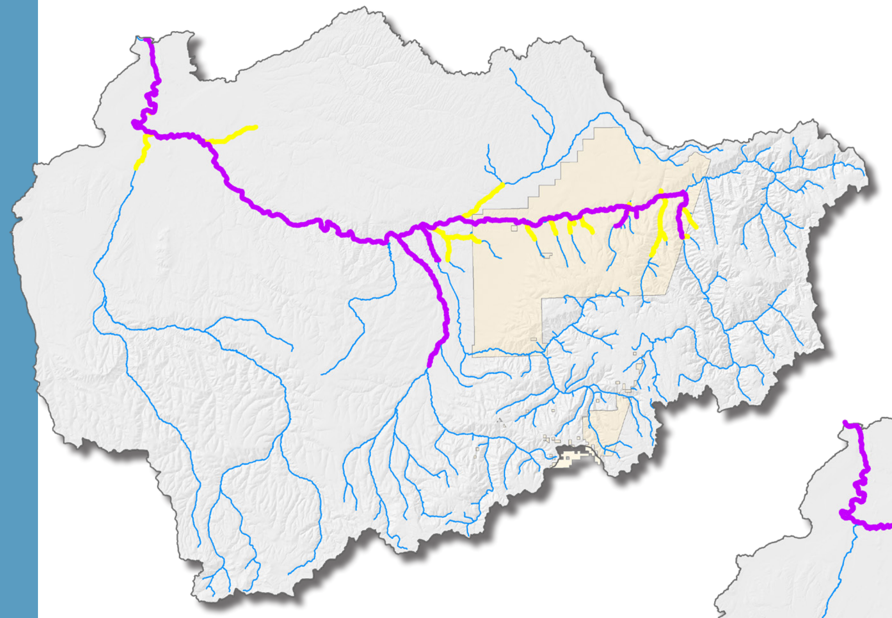
The lack of bathymetric data precludes this analysis from being completed at Umatilla River flows when specific fish species and lifestages would be present. In other words, spring Chinook salmon spawning and migration would typically not be occurring during the 100 year flow and rearing would also likely not be happening then either. However, as discussed in previous sections, the habitat suitability analyses reinforce the idea that the lateral confinement of the Umatilla River throughout the subbasin (from levees, berms, railroads, roads, agriculture, and other development) continues to hamper the suitability of habitat for focal aquatic species and, in turn, degrades the quality and sustainability of all First Foods. The confinement of the channel at high flows reduces habitat for juvenile focal species to find refuge in the floodplains and also scours the channel bed, disrupting spawning of focal species.



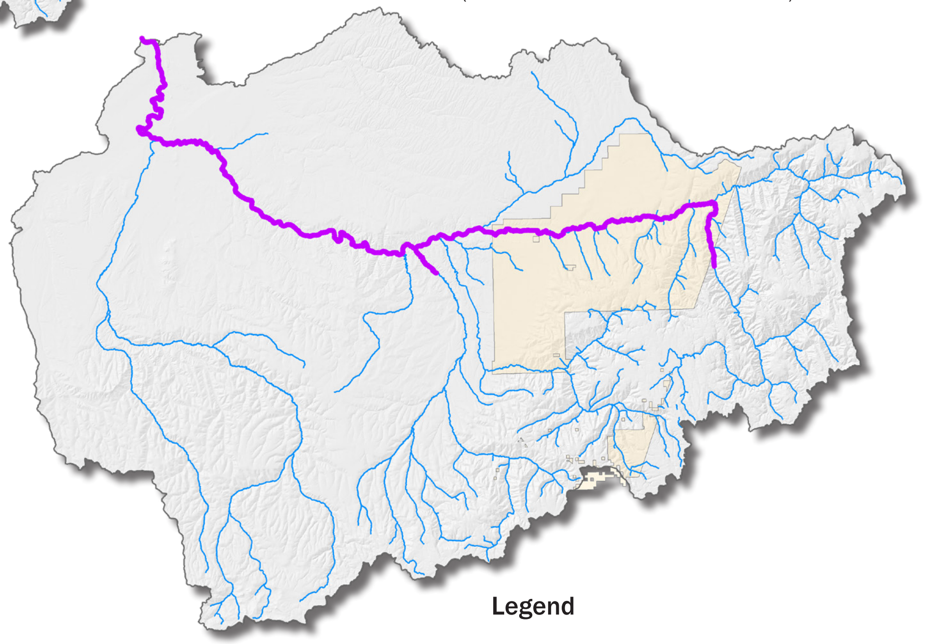
Other Species - **NATIVE**

In addition to the focal fish species discussed previously, there are **15 species** native to the subbasin and **11 introduced species** (NPCC 2005). Natives species of importance, in addition to the four focal species, include fall Chinook salmon, Coho salmon, and mussels. In the Umatilla Subbasin, there are two genera of freshwater mussels known to occur (Anodonta and Gonidea) although more genera were historically present (Brim Box 2006). For more information see the Xerces Society for Invertebrate Conservation (Xerces) and the CTUIR Mussel Project database: https://xerces.org/endangered-species/freshwater-mussels/database.

The overall reduction of native aquatic species (i.e., focal species, fall Chinook salmon, Coho salmon, mussels) as well as aquatic and riparian vegetation impacts the functionality of the Umatilla Subbasin for First Foods and impacts all life.

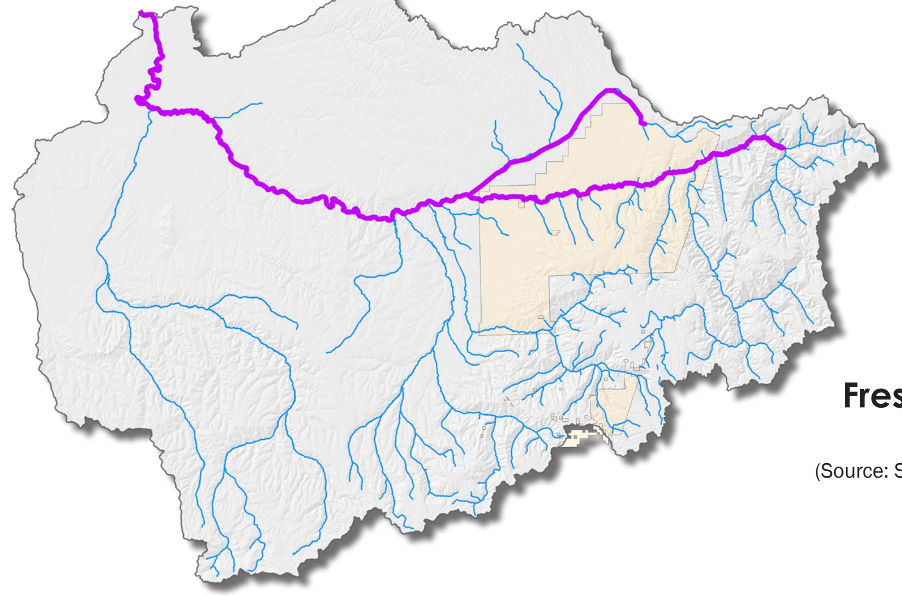


Coho Salmon Distribution
(Source: StreamNet and NPCC 2005)



Fall Chinook Salmon Distribution"
(Source: StreamNet and NPCC 2005)

Legend
Spawning and Rearing

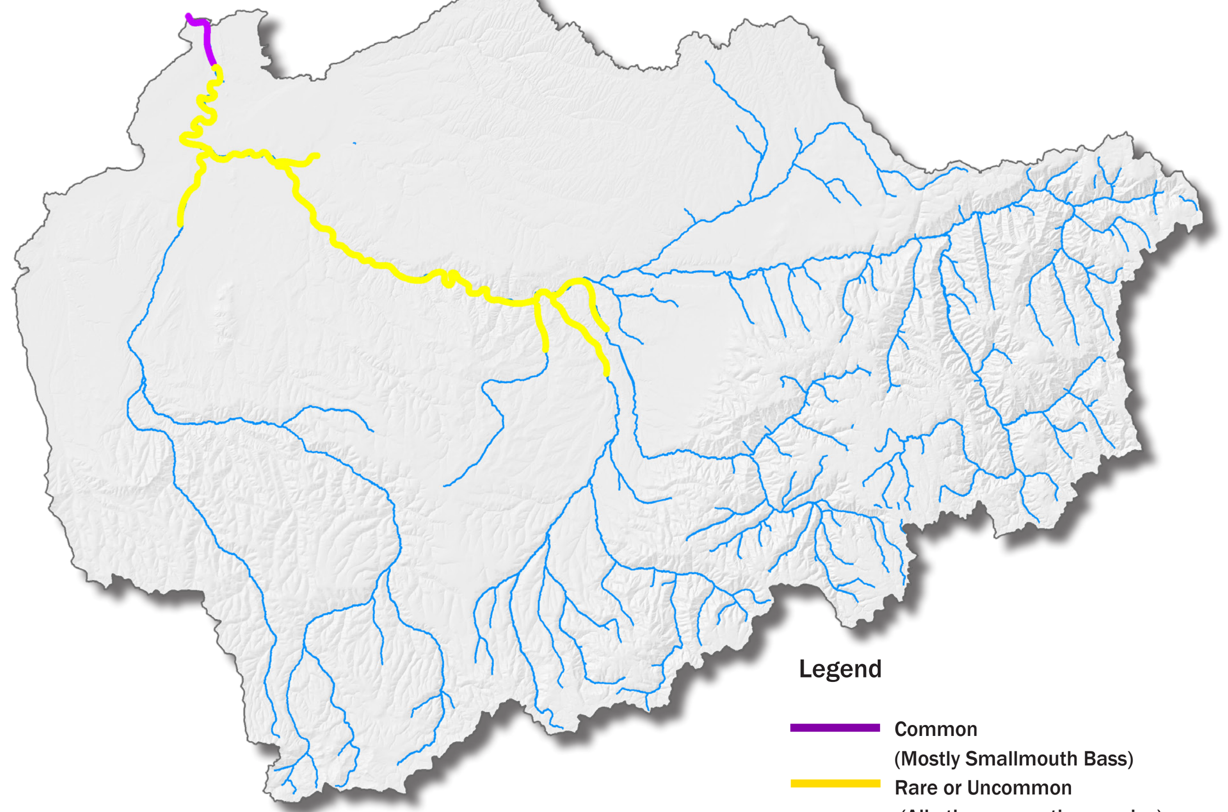


Current Freshwater Mussel Distribution
(Source: StreamNet and NPCC 2005)

Other Species - **INTRODUCED**

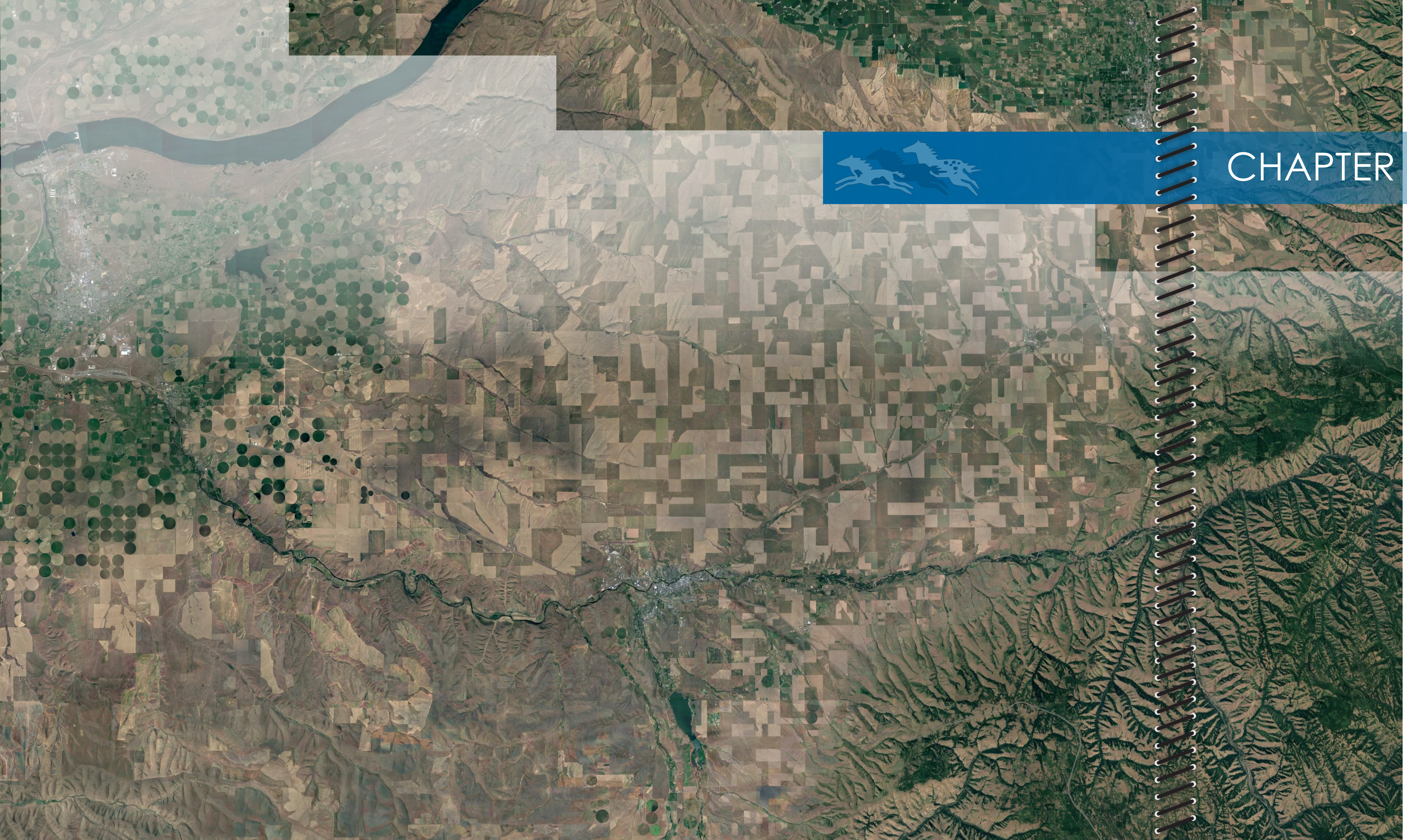
Introduced species in the Umatilla Subbasin include warm-water species like **back crappie, common carp, smallmouth bass, largemouth bass, yellow perch, and others.** Most of these introductions were intentionally made by ODFW to create sport fisheries, however illegal releases of exotic species have been made by the public.

Water development efforts intended to maximize water storage and seasonal use for agricultural production in the Umatilla Subbasin may have contributed to introduction of exotic species. Introductions of exotic fish species to the McKay Reservoir were made prior to 1970 by ODFW. And, although the Reservoir is managed by U.S. Bureau of Reclamation and U.S. Fish and Wildlife to primarily support irrigation water, flood protection, and wildlife habitat, the stored water is optimal for supporting warmwater fisheries. The most significant dispersal was that of smallmouth bass, which can now be found in the lower Umatilla River (NPCC 2005). A potential risk exists for expansion of warm-water species upstream from 3 Mile Dam and downstream migration of warm-water species out of McKay Reservoir into the Umatilla River.



Legend
Common
(Mostly Smallmouth Bass)
Rare or Uncommon
(All other non-native species)

Distribution and occurrence of non-native warm-water species in the Umatilla Subbasin (NPCC 2005)



CHAPTER FOUR: Umatilla River Assessment Summary

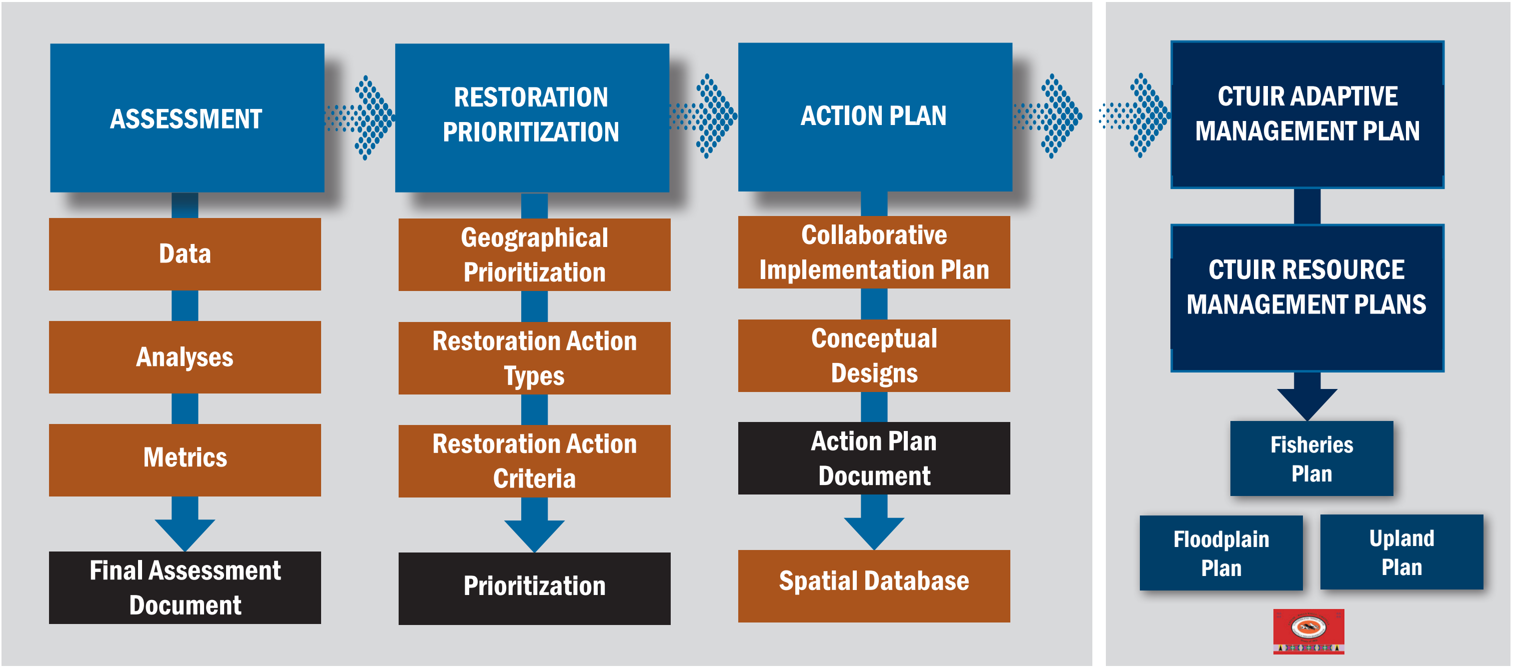
Chapter 1 presented cultural and historical foundation for the CTUIR's reciprocal management of the Umatilla Subbasin and the First Foods, based on the River Vision and Upland Vision touchstones.

Chapters 2 and **3** presented the historical and current conditions, organized by touchstones, for the secondary and primary study areas.

This chapter summarizes the deviation from the historical conditions to the current conditions, based on the information in the preceding chapters. The results of this assessment will be used to prioritize areas where restoration and protection actions might occur, and develop an action plan based on desired future conditions. The implementation of identified actions are intended to restore River Vision and Upland Vision touchstone conditions across the secondary and primary study areas.

Umatilla River Assessment and Action Plan

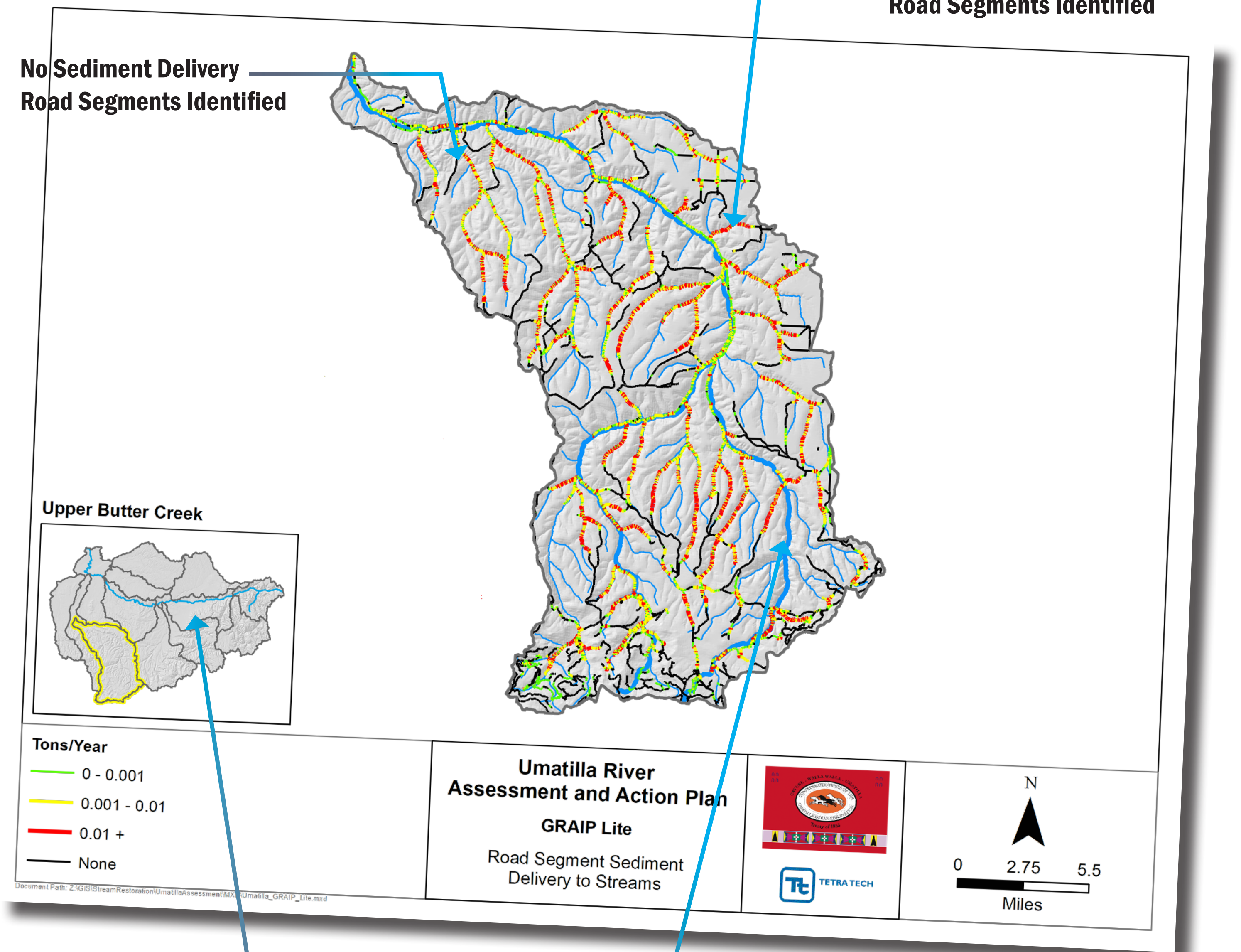
CTUIR Management Tools



Technical Appendices

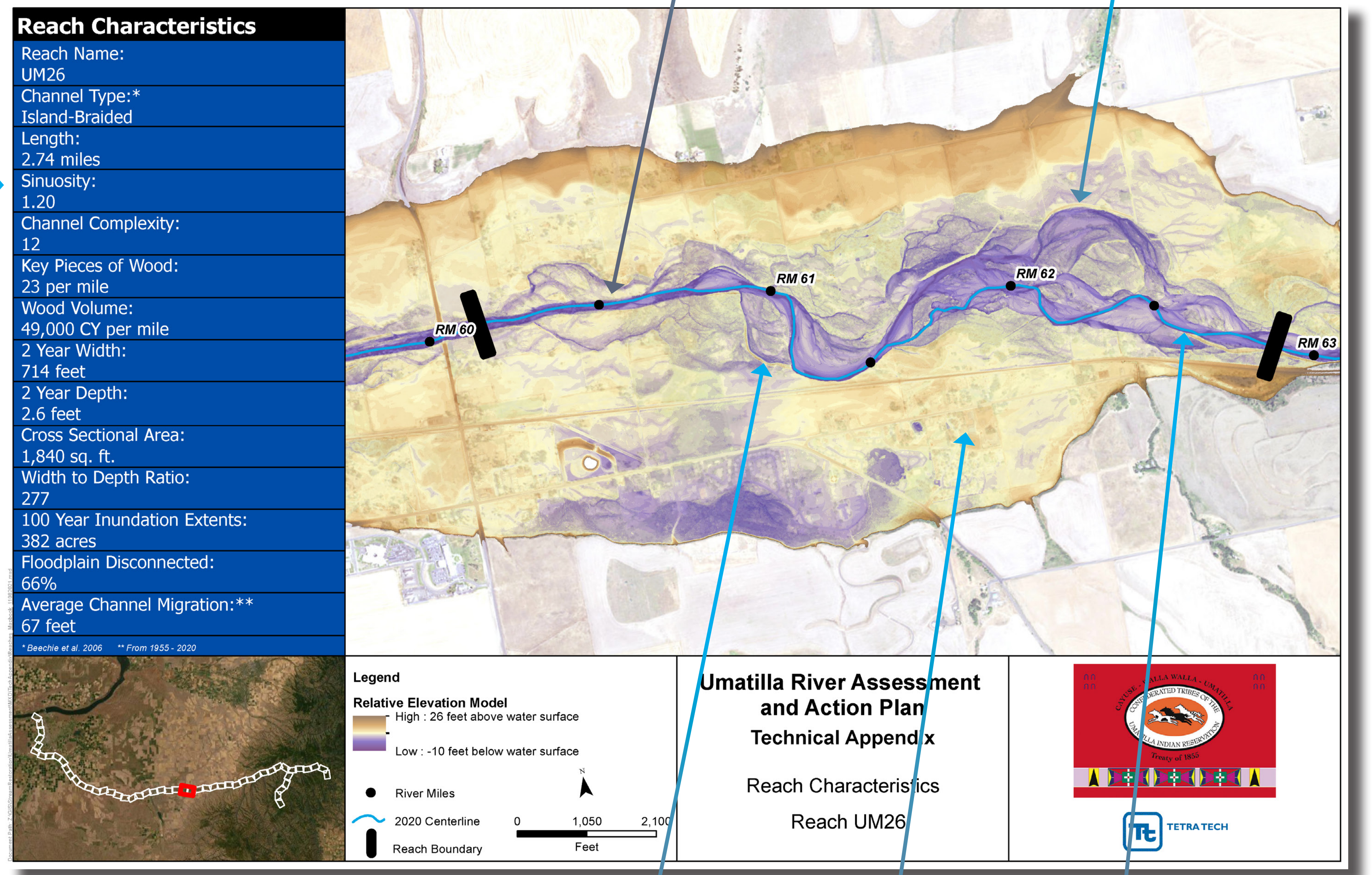
This assessment document is accompanied by associated Technical Appendices. These appendices include the detailed analyses used to assess the conditions of the Upland Vision and River Vision touchstones for **Chapters 2 and 3** of this assessment.

The Technical Appendices include **technical summaries, spreadsheets, GIS databases, mapbooks, and other data-driven analysis products.**



Geomorphic Road Analysis and Inventory Package (GRAIP) Lite

Detailed Summary of Reach Characteristics



Reach Characteristics

Upland Vision Touchstones

Uplands Functions Key Findings

Based on analyses presented in Chapter 2 in the assessment and further described in the Technical Appendices, departure from historic uplands conditions have been identified for each subwatershed. The more departed the subwatershed from historic conditions, the higher the prioritization for the subwatershed for restoration actions.

More than 150 years of impacts to the landscape has converted areas of First Foods production to agriculture, timber harvest, and development further reducing availability of foods and reducing range for wildlife

HYDROLOGIC FUNCTION

By 2080, mean summer streamflows in the mainstem Umatilla River are expected to decrease between 20 and 60 cubic feet per second (cfs) between Meacham Creek and Birch Creek and by more than 60 cfs from Birch Creek to the confluence with the Columbia River (Isaak et al. 2017)

Umatilla Subbasin will shift from a mix of snow-and-rain dominant hydrology to that of a rain-dominant hydrology with peak flows anticipated to shift from April to February or March (Hamlet et al. 2013)

By 2099, summer flows are expected to decrease by 7 percent and winter flows are expected to increase by 32 percent (Climatetoolbox.org)

SOIL STABILITY

54 percent of the soils are highly erodible (NRCS 2021) and 29 percent of the subbasin is high or very highly susceptible to landslides (DOGAMI 2016)

Roads are contributing an extra 343 tons of sediment per year to streams in the subbasin

85 miles of streams in the subbasin are receiving more than 60 tons of sediment per year from roads

LANDSCAPE PATTERNS

34 percent of the land has been converted to agriculture (NLCD 2011)

Only 62 percent of the subbasin remains as either herbaceous land, wetlands, or scrub/shrub (NLCD 2011)

23,000 acres of the subbasin have been impacted by high intensity fires between 2004 – 2014 (LANDFIRE 2016)

70,000 acres of the subbasin have been impacted by mechanical disturbances (i.e., logging)

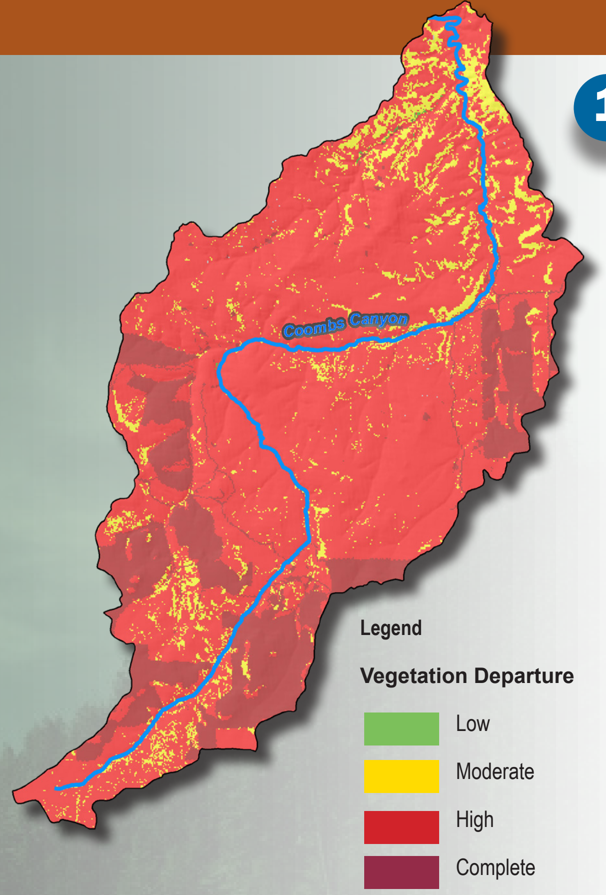
700 acres of the subbasin have been impacted by insects/disease (LANDFIRE 2016)

BIOTIC INTEGRITY

57 percent of the vegetation in the subbasin is highly departed from historic conditions (LANDFIRE 2016)

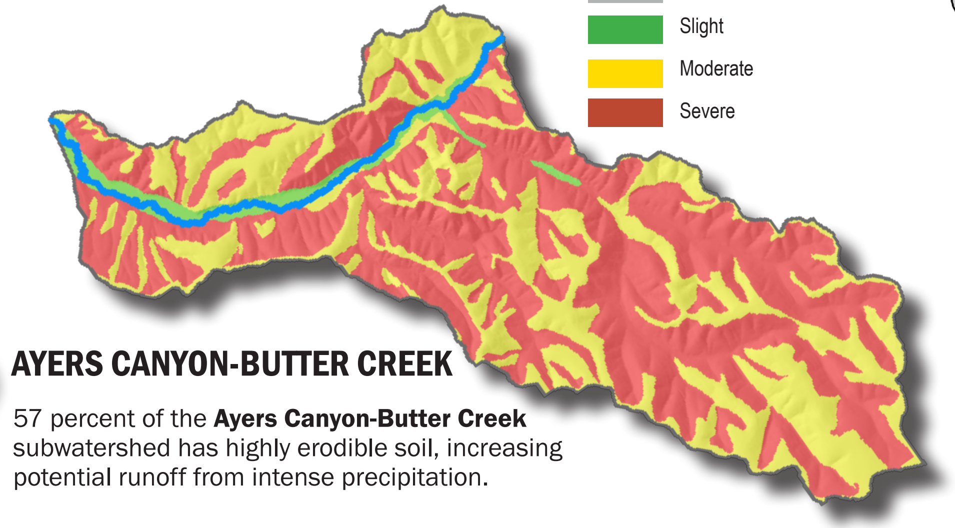
33 percent of vegetation in the subbasin is early seral, 66 percent is mid seral, and only 1 percent is late seral (LANDFIRE 2016)

17 percent of the intact canopy cover in the subbasin is less than 10 meters tall, 20 percent is greater than 20 meters tall, and 63 percent is between 10 and 20 meters tall (LANDFIRE 2016)



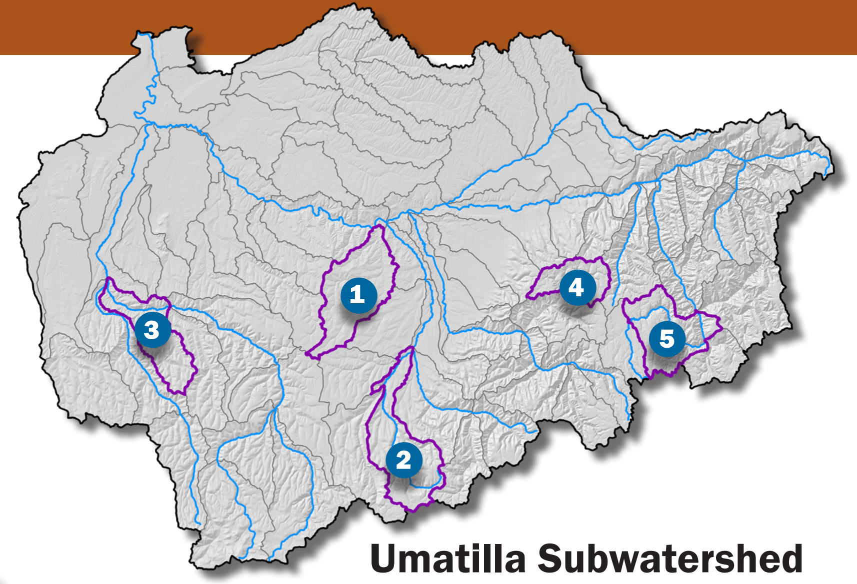
1 COOMBS CANYON

93 percent of the **Coombs Canyon** subwatershed area is highly departed from historic vegetation conditions.



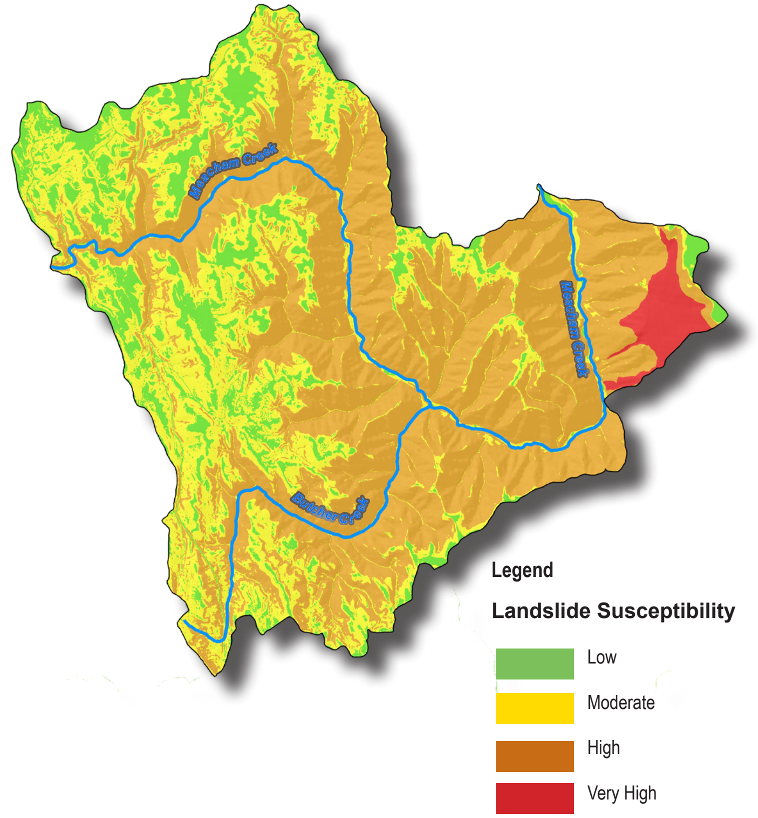
3 AYERS CANYON-BUTTER CREEK

57 percent of the **Ayers Canyon-Butter Creek** subwatershed has highly erodible soil, increasing potential runoff from intense precipitation.



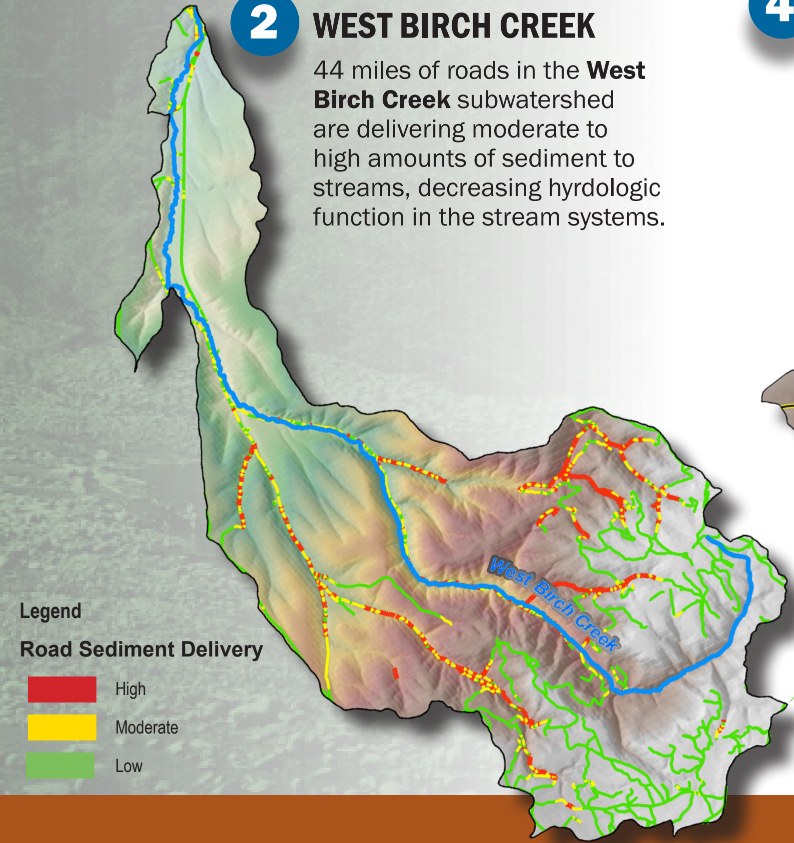
5 BUTCHER CREEK-MEACHAM CREEK

59 percent of the **Butcher Creek-Meacham Creek** subwatershed is highly or very highly susceptible to landslides, increasing potential impacts to hydrologic function following intense precipitation.



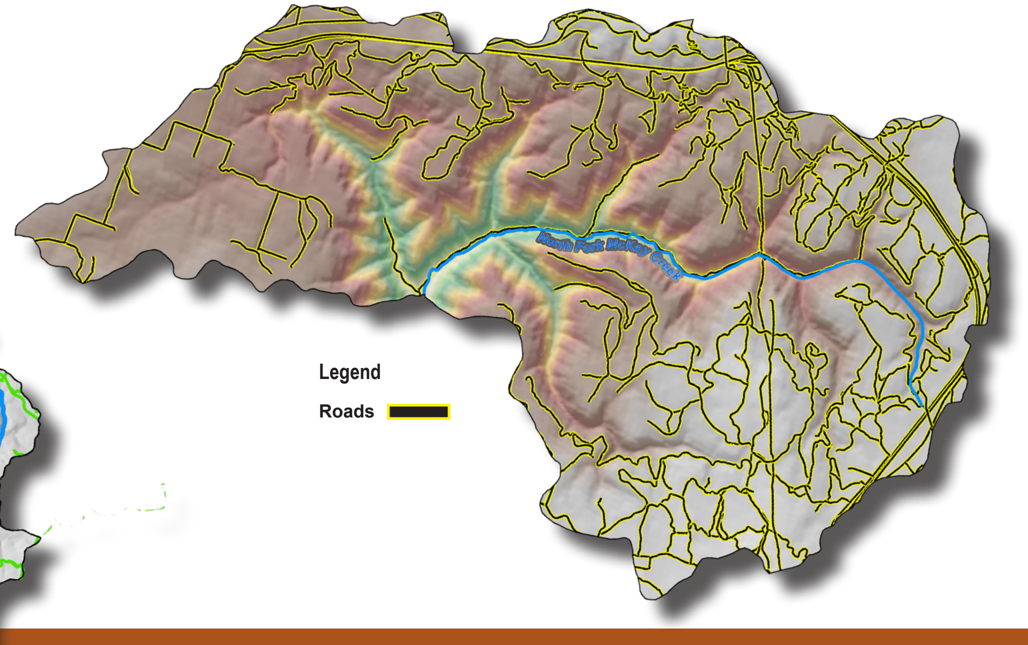
2 WEST BIRCH CREEK

44 miles of roads in the **West Birch Creek** subwatershed are delivering moderate to high amounts of sediment to streams, decreasing hydrologic function in the stream systems.



4 UPPER NORTH FORK McKAY CREEK

The **Upper North Fork McKay Creek** subwatershed has 6.9 miles of road per square mile of watershed area, well above the acceptable threshold of 1.0. These roads impact all Upland Vision Touchstones.



Subwatershed Prioritization

The more departed the subwatershed from historic conditions, the higher the prioritization for the subwatershed for restoration actions. Subwatersheds are prioritized based on departure from historic conditions as described in this document, including potential smolt production in the streams in the subwatershed as well as by Traditional Ecological Knowledge (TEK).

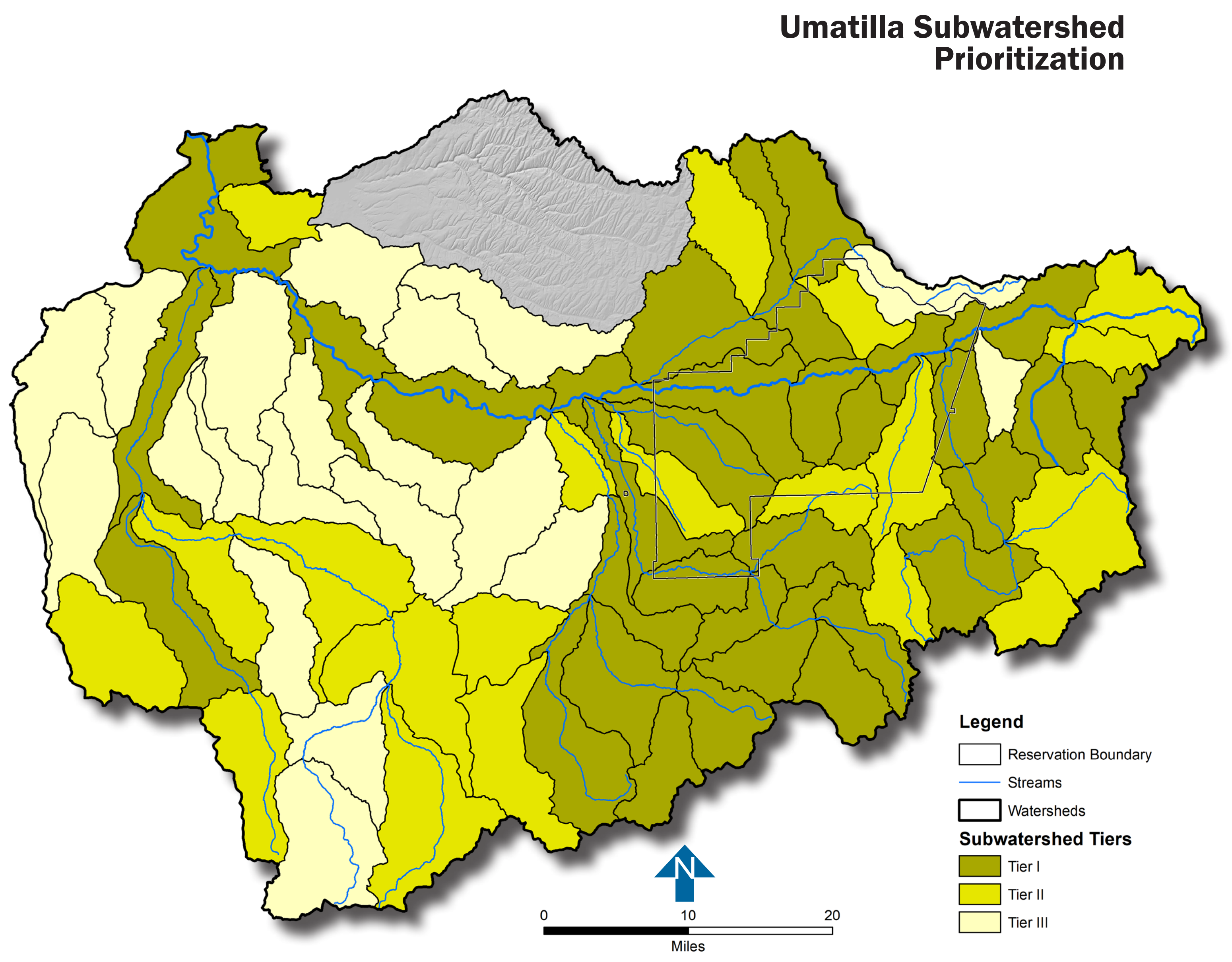
TIER I - High Priority
(Furthest Departed from Historic Uplands Conditions)

TIER II - Medium Priority
(Moderately Departed from Historic Uplands Conditions)

TIER III - Low Priority
(Least Departed from Historic Uplands Conditions)

	HUC12 Subwatershed	TIER
Headwaters Umatilla River	Thomas Creek	Tier I
	South Fork Umatilla River	Tier I
	Buck Creek-South Fork Umatilla River	Tier II
	North Fork Umatilla River	Tier II
	Ryan Creek	Tier III
	Bear Creek-Umatilla River	Tier I
Meacham Creek	Beaver Creek-Meacham Creek	Tier II
	East Meacham Creek	Tier II
	Butcher Creek-Meacham Creek	Tier I
	North Fork Meacham Creek	Tier II
	Camp Creek-Meacham Creek	Tier I
	Boston Canyon-Meacham Creek	Tier I
	Eagle Creek-Wildhorse Creek	Tier III
	Spring Hollow	Tier II
	Gerking Creek-Wildhorse Creek	Tier I
	Sand Hollow-Wildhorse Creek	Tier I
	Greasewood Creek	Tier II
	Spring Creek-Wildhorse Creek	Tier I
McKay Creek	Johnson Creek	Tier I
	Snipe Creek-McKay Creek	Tier I
	Wood Hollow-McKay Creek	Tier I
	Upper North Fork McKay Creek	Tier II
	Lower North Fork McKay Creek	Tier I
	Sevenmile Creek-McKay Creek	Tier I
	Little McKay Creek-McKay Creek	Tier I
	McKay Reservoir-McKay Creek	Tier I
Mission Creek-Umatilla River	Isqúulktpe Creek	Tier II
	Thorn Hollow-Umatilla River	Tier I
	Buckaroo Creek	Tier I
	Moonshine Creek-Umatilla River	Tier I
	Tutuilla Creek	Tier II
	Patawa Creek	Tier I
	Cottonwood Creek-Umatilla River	Tier I
Stage Gulch	Rew Ridge	Tier III
	Upper Stage Gulch	Tier III
	Lower Stage Gulch	Tier III

	HUC12 Subwatershed	TIER
Birch Creek	Pearson Creek	Tier I
	Upper East Birch Creek	Tier I
	Lower East Birch Creek	Tier I
	Bear Creek-West Birch Creek	Tier II
	Jack Canyon	Tier II
	West Birch Creek	Tier I
	George Canyon	Tier III
	Stewart Creek-Birch Creek	Tier I
	Coombs Peak-Birch Creek	Tier II
Alkali Canyon-Umatilla River	Coombs Canyon	Tier III
	Speare Creek	Tier III
	Mud Spring Canyon-Umatilla River	Tier I
	Upper Alkali Canyon	Tier III
	Lower Alkali Canyon	Tier III
	Furnish Ditch-Umatilla River	Tier I
Upper Butter Creek	Johnson Creek-Butter Creek	Tier III
	East Fork Butter Creek	Tier II
	Spring Hollow-Butter Creek	Tier III
	Hog Hollow-Butter Creek	Tier II
	Matlock Canyon	Tier III
	Slusher Canyon-Butter Creek	Tier II
	Ayers Canyon-Butter Creek	Tier II
Lower Butter Creek	Upper Little Butter Creek	Tier II
	Middle Little Butter Creek	Tier I
	Lower Little Butter Creek	Tier I
Sand Hollow	Upper Sand Hollow	Tier II
	Middle Sand Hollow	Tier III
	Lower Sand Hollow	Tier III
	Fourmile Creek-Sand Hollow	Tier III
Hunt Ditch-Umatilla River	Upper Spikes Gulch	Tier III
	Service Canyon	Tier III
	170701031303	Tier III
	Lower Spikes Gulch	Tier III
	Hermiston Ditch-Umatilla River	Tier II
	Umatilla River	Tier I



River Vision Function Key Findings

Based on analyses presented in Chapter 3 of this document and further described in the Technical Appendices, departure from historic river vision conditions have been identified for each reach of the Umatilla River. The more departed the reach from historic conditions, the higher the prioritization for the reach for restoration actions.

CONNECTIVITY

Reach with a more functional floodplain

48 miles of the mainstem Umatilla River are constrained by lateral control structures (i.e., levees, dikes, railroads, roads, cities, etc.)

44 percent of the total length of the river is laterally constrained

The current 100-year flow inundation extents only occupy about 40 percent of the historic floodplain

GEOMORPHOLOGY

Reach with a higher channel complexity

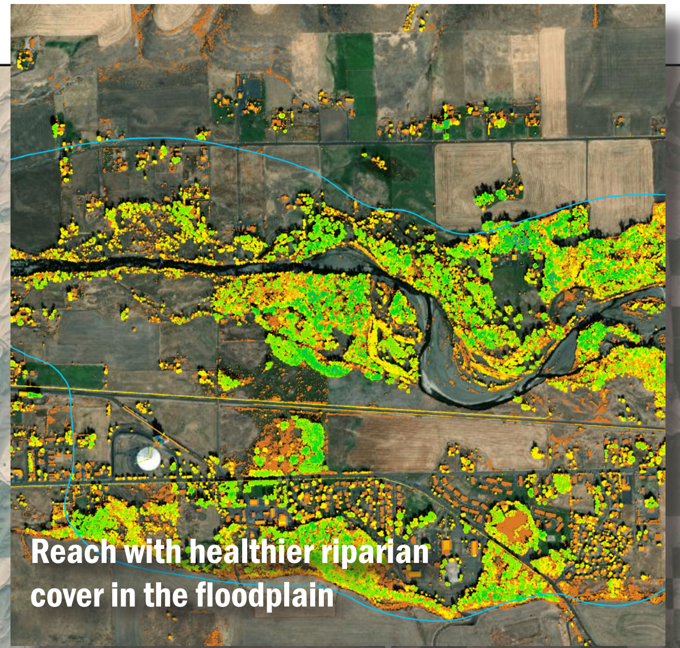
Based on historic aerial imagery from 1952, the mainstem Umatilla River channel complexity has decreased by 55 percent

Current conditions on the mainstem Umatilla River includes a total of 33 miles of off-channel habitat.

Historic conditions in 1952 would have included 52 miles of off-channel habitat

Based on the expected sinuosity analysis, the mainstem Umatilla River should have a total channel length of 110 miles, a 20 percent decrease from historic condition.

RIPARIAN VEGETATION



Reach with healthier riparian cover in the floodplain

The mainstem Umatilla River features 14 key pieces of wood per mile and 21 cubic yards of large wood per mile*

*Minimum needs = 6 key pieces and 147 cubic yards
*Optimal needs = 32 key pieces and 316 cubic yards

Over 80 percent of the mainstem Umatilla River average existing canopy cover height is below 15 feet tall in the historic floodplain

63 percent of the reaches in the mainstem Umatilla River feature average existing canopy cover height below 10 feet tall in the historic floodplain*

*12 percent of the reaches feature average canopy cover height under 5 feet tall

Reach with an abundance of large wood in the channel

AQUATIC BIOTA

Chinook salmon departure from historic conditions
- -Spawning habitat -38 percent
- -Summer rearing habitat -41 percent
- -Winter rearing habitat -37 percent
- -75 percent decrease in smolt production potential

Steelhead departure from historic conditions
- -Spawning habitat -41 percent
- -Summer rearing habitat -41 percent
- -Winter rearing habitat -37 percent
- -79 percent decrease in smolt production potential

HYDROLOGY

Surface water consumption in the Umatilla Subbasin is diverted for irrigation 69 percent of the time (Umatilla Subbasin 2050 Water Management Plan)
Water Quality

By 2099:
No sections of the mainstem Umatilla River will be optimal (below 64 degrees F)

Only 4 miles of the river will be considered sub-lethal (between 64- and 74-degrees F)

Nearly 83 miles of the river will be considered lethal (greater than 74 degrees F) for salmonids at mean summer stream temperatures (Isaak et al. 2017)

Umatilla River Assessment Summary

Reach Prioritization

The more departed the reach from historic conditions, the higher the prioritization for the reach for restoration actions. Reaches are prioritized based on departure from historic conditions as described in this document, including potential smolt production in the streams in the Umatilla River as well as by Traditional Ecological Knowledge (TEK).

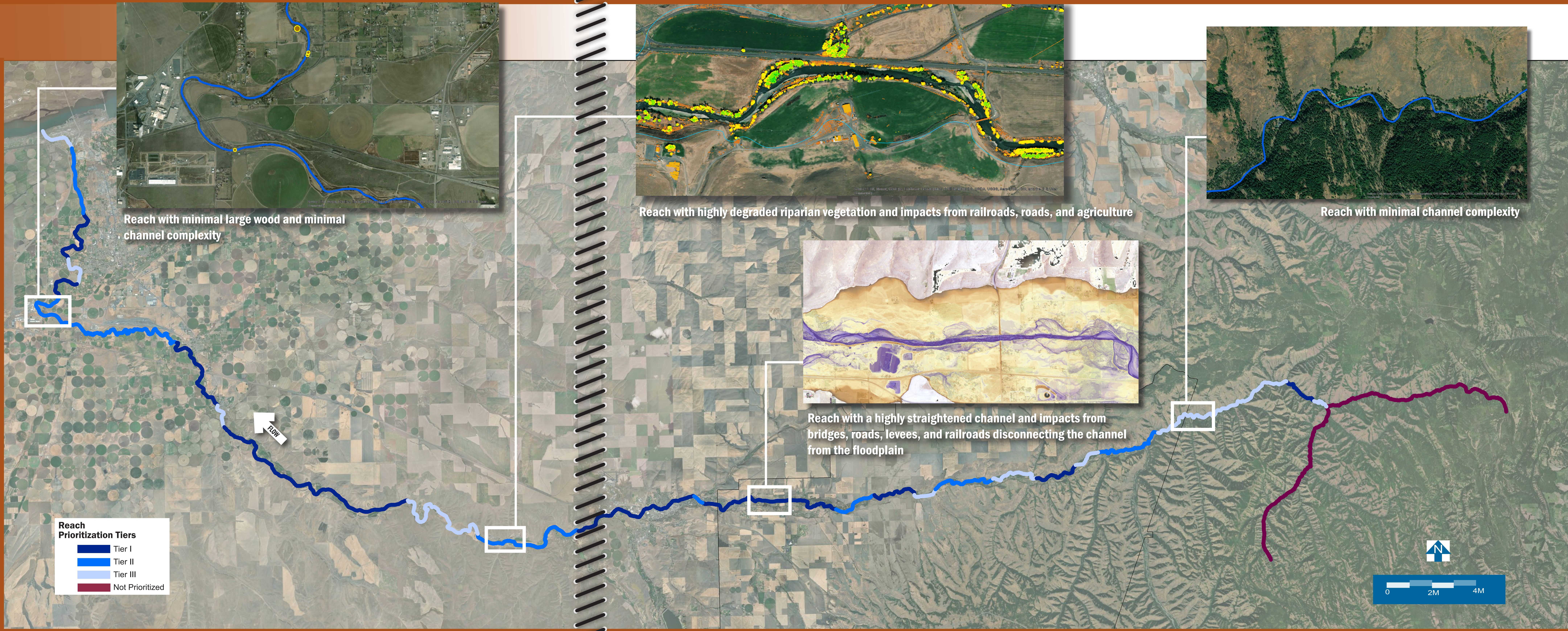
TIER I - High Priority
(Furthest Departed from Historic River Vision Conditions)

TIER II - Medium Priority
(Moderately Departed from Historic River Vision Conditions)

TIER III - Low Priority
(Least Departed from Historic River Vision Conditions)

NOTE:
North Fork and South Fork Umatilla River was prioritized as "Conservation" or "Restoration" rather than Tiers because of the lack of data analyzed in these reaches.

River	Reach	Tier
Umatilla River	UM1	Tier III
	UM2	Tier II
	UM3	Tier II
	UM4	Tier I
	UM5	Tier III
	UM6	Tier I
	UM7	Tier II
	UM8	Tier II
	UM9	Tier II
	UM10	Tier I
	UM11	Tier I
	UM12	Tier III
	UM13	Tier I
	UM14	Tier I
	UM15	Tier I
	UM16	Tier III
	UM17	Tier III
	UM18	Tier II
	UM19	Tier II
	UM20	Tier I
	UM21	Tier I
	UM22	Tier I
	UM23	Tier II
	UM24	Tier I
	UM25	Tier I
	UM26	Tier I
	UM27	Tier II
	UM28	Tier I
	UM29	Tier III
	UM30	Tier II
	UM31	Tier II
	UM32	Tier III
	UM33	Tier I
	UM34	Tier III
	UM35	Tier II
	UM36	Tier II
	UM37	Tier III
	UM38	Tier III
	UM39	Tier III
	UM40	Tier III
	UM41	Tier III
	UM42	Tier I
	UM43	Tier III
North Fork Umatilla River	NF1	Restoration
	NF2	Conservation
	NF3	Restoration
	NF4	Conservation
	NF5	Restoration
	NF6	Conservation
South Fork Umatilla River	SF1	Restoration
	SF2	Conservation
	SF3	Restoration
	SF4	Conservation



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