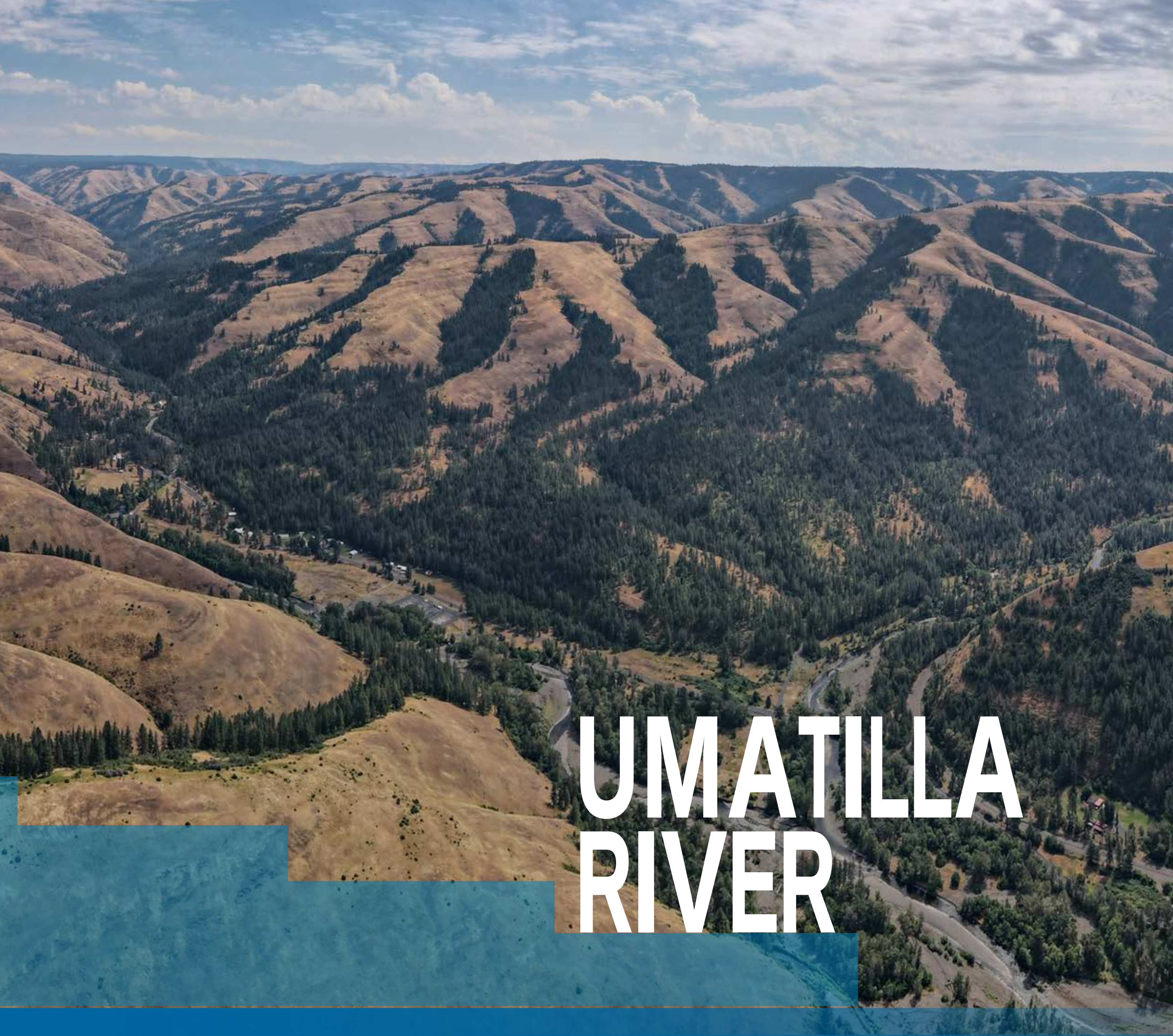


UMATILLA RIVER

Action Plan

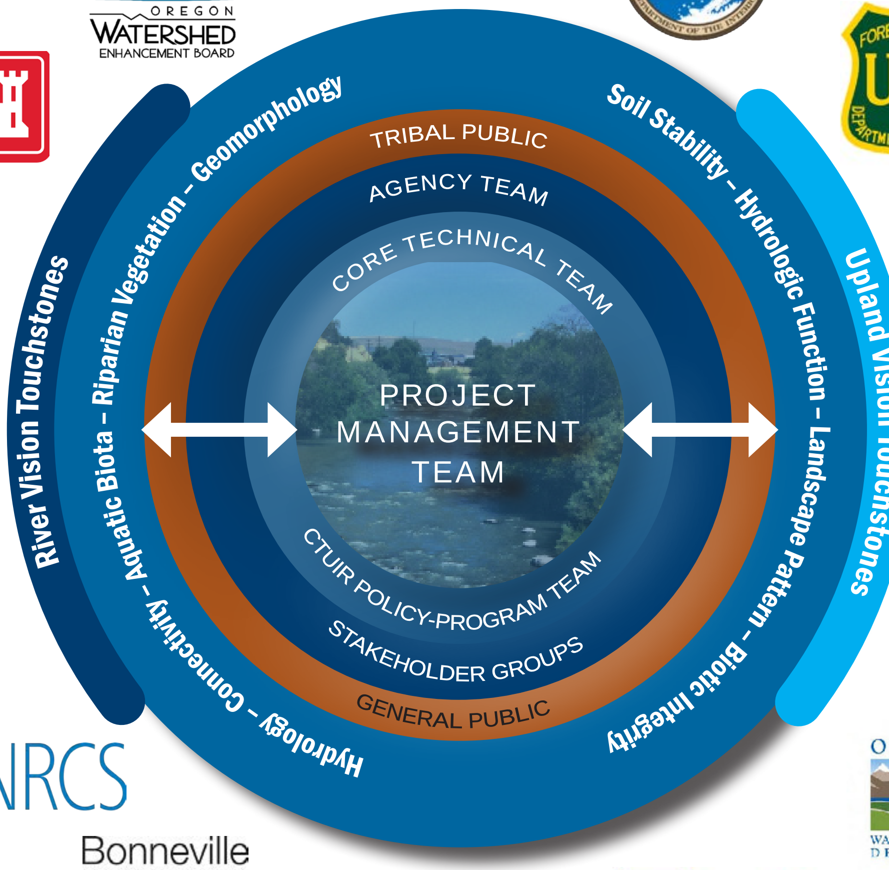
Volume 1

March 2025

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

Acknowledgements

This project represents a collaborative process involving the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), state and federal agencies, local non-governmental organizations, private landowners, and the Tribal and general publics. The project vision is to ensure an ecologically functional Umatilla River in which natural riverine processes are sustained per River Vision and Upland Vision Touchstones. This vision can be achieved by developing a scientific foundation to promote land management activities that provide a sustainable balance with healthy ecosystems and cultural practices. This will ultimately lead to self-sustaining populations of all native First Foods species available for Tribal and non-Tribal use.



VOLUME 1

List of Exhibits

List of Appendices (Volume 2)

Acronyms and Abbreviations

Action Plan	Umatilla River Action Plan (this document)
Assessment	Umatilla River Assessment
BPA	Bonneville Power Administration
BRAT	Beaver Restoration Assessment Tool
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
cfs	cubic feet per second
DOGAMI	Oregon Department of Geology and Mineral Industries
DNR	Department of Natural Resources
ESA	Endangered Species Act
F	Fahrenheit
FpMP	Floodplain Monitoring Plan
FshMP	Fisheries Monitoring Plan
HUC	Hydrologic Unit Code
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWEB	Oregon Watershed Enhancement Board
PIT	passive integrated transponder
RCP	Representative Concentration Pathway
SPP	Smolt Production Potential
Subbasin	Umatilla Subbasin (USGS HUC8)
Subwatershed	USGS HUC12
TMDL	Total Maximum Daily Load
TEK	Traditional Ecological Knowledge
UM	Mainstem Umatilla River
USGS	U.S. Geological Survey
USFS	U.S. Forest Service
URRP	Umatilla River Restoration Plan
USURP	Umatilla Subbasin Uplands Restoration Plan
VSP	Viable Salmonid Population
WQMP	Water Quality Management Plan
Watershed	USGS HUC10

1.0 Introduction

1.0 Introduction

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Natural Resources (DNR) Fisheries Program has collated existing data, reports and input from state co-managers, federal and local agencies, and other stakeholders into a watershed-scale assessment of historic, current, and desired conditions in the Umatilla Subbasin (Subbasin). The information from the watershed-scale assessment is documented in the Umatilla River Assessment (Assessment; CTUIR 2023). Building off the Assessment is this document, the Umatilla River Action Plan (Action Plan). The Action Plan is foundational to 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. Focal aquatic species include Endangered Species Act (ESA)-listed Threatened Middle Columbia River summer steelhead (*Oncorhynchus mykiss*), Columbia River bull trout (*Salvelinus confluentus*) (ESA-listed Threatened), spring Chinook salmon (*O. tshawytscha*), Pacific lamprey (*Entosphenus tridentatus*), Western Pearlshell Mussel (*Margaritifera falcata*), Western Ridge Mussel (*Gonidea angulata*), California Floater Mussel (*Anodonta californiensis*), Oregon Floater Mussel (*Anodonta oregonensis*), and other native fish. The goal is to lead to self-sustaining populations of all native First Foods species that will be available for Tribal and non-Tribal use.

1.1 Purpose and Need

Guiding the Fisheries Habitat Program is the "First Foods" DNR Mission and Tribal community driven management approach (Quaempts et al. 2018). This 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 support aquatic First Foods integral for the Tribal way of life. The Assessment (CTUIR 2023) 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), illustrated in Exhibit 1-1.

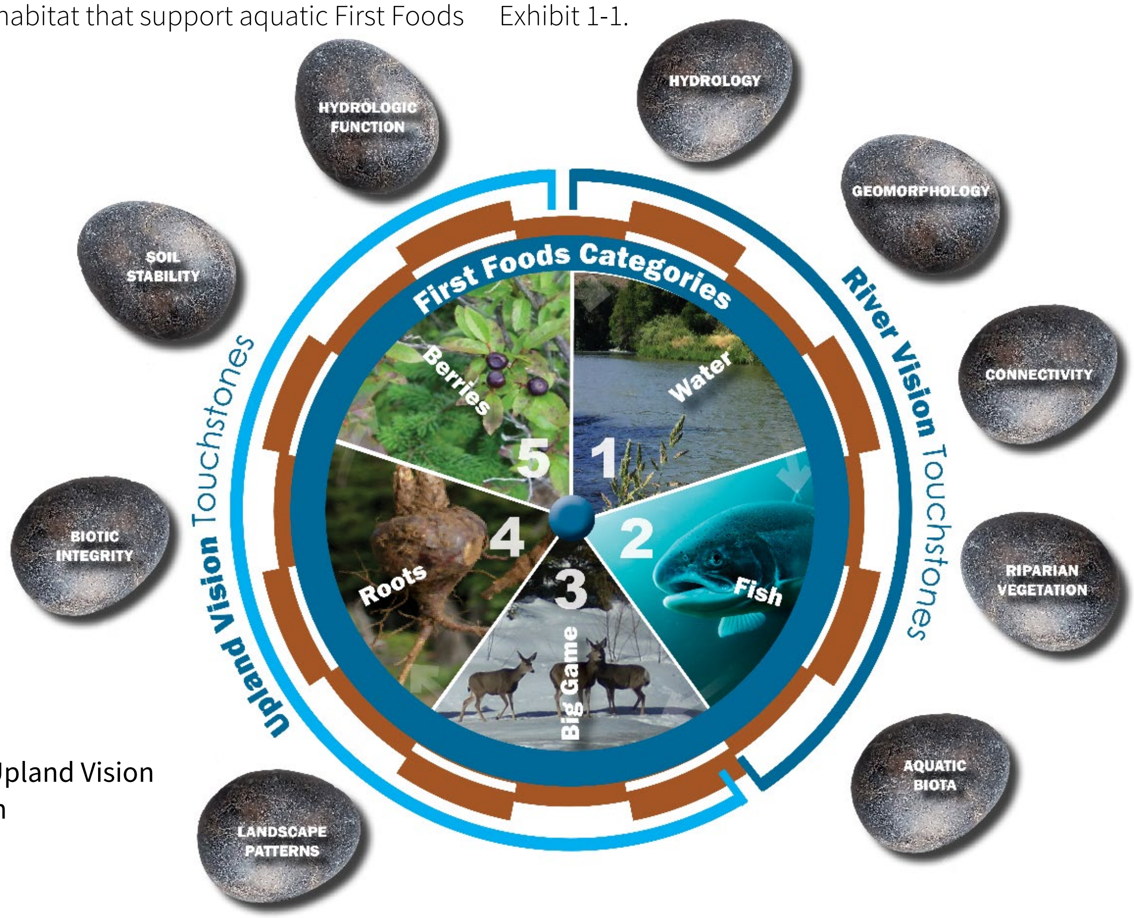


Exhibit 1-1. Upland Vision and River Vision Touchstones

The Assessment also evaluates the effect of current land use on the function of those natural processes and their influence on the historic, current, and potential production of focal species. Building off the Assessment (CTUIR 2023), the Action Plan supports 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. These plans may be applied to each geographic area to aid in restoring watershed processes and achieving enhancement and sustainability of habitats for native aquatic species.

The Action Plan supplies 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. The Action Plan is primarily focused on the alluvial channel and floodplain of the Umatilla River from the confluence with the Columbia River near the city of Umatilla, Oregon, to the headwaters of the North and South Forks of the Umatilla River in northeast Oregon (focal study area). The focal study area includes 108 miles of stream and the associated floodplain and tributary confluences of those stream segments. The Subbasin study area used in the Assessment includes the focal study area and a reconnaissance-level assessment of the upland conditions and tributary processes across the Subbasin that influence the focal study area (Subbasin study area).

1.2 Vision, Goal, and Objectives

The Action Plan vision is to restore an ecologically functioning Umatilla River Subbasin. An ecologically functional Subbasin is one in which upland, river, and floodplain processes sustain water quantity and quality, harvestable fish populations, and other First Foods central for Tribal and public use. The pathway to achieving that vision is the development of a spatially explicit strategic action plan, founded on a scientifically robust watershed assessment to effectively and efficiently direct restoration actions that increase sustainable function of upland, river, and floodplain processes and habitats that support and enhance aquatic focal species, while supporting Tribal community economic viability and reducing flood risk. The image below provides a summary of the Action Plan objectives.

1.3 Study Area

As previously noted, the Assessment and the Action Plan are divided into a subbasin and focal study area. The following subsections provide a brief overview of the regional context and further detail about the study areas. Additional information on Aboriginal use in the area and details about the study area can be found in the Assessment (CTUIR 2023).

1.3.1 Regional Setting

As a tributary to the Columbia River, the Umatilla River flows from the Blue Mountains of northeastern Oregon to its confluence with the Columbia River near the city of Umatilla, Oregon (Exhibit 1-2). The Subbasin is one of 62 subbasins that make up the Columbia River basin. The Umatilla River is one of thirteen identified cold-water refuges for the mainstem Columbia River (Palmer 2021), highlighting the importance of implementation of restoration actions on the Umatilla River to help reduce river temperatures and maintain cold-water refuges. The Subbasin is 2,290 square miles in area and features the Blue Mountain Uplands (meadows and forested lands above the 3,000-foot elevation), Blue Mountain Slopes (steep walled canyons between 2,000- and 3,000-foot elevation), Pendleton Plains (gently rolling slopes between 1,200- and 2,000-foot elevation), and the Stream Bottomlands (flat floodplains edged by moderate to steep slopes).

Exhibit 1-2. Umatilla Subbasin and Aboriginal Use Area Boundary

1.3.2 Subbasin Study Area (Umatilla Subbasin)

The Subbasin, which consists of the Umatilla River and all 77 subwatersheds, comprises the Subbasin study area for the Action Plan. The Subbasin study area includes a reconnaissance-level assessment of the upland conditions and tributary processes across the Subbasin that influence the focal study area. The Subbasin is 2,290 square miles in area and includes the 271 square miles which comprise the CTUIR. The Umatilla River drainage is a part of the U.S. Geological Survey's (USGS) Umatilla Subbasin (8-digit Hydrologic Unit Code [HUC-8] 17070103). The Subbasin includes 13 10-digit HUC10 watersheds (Exhibit 1-3) and 77 12-digit HUC12 subwatersheds.

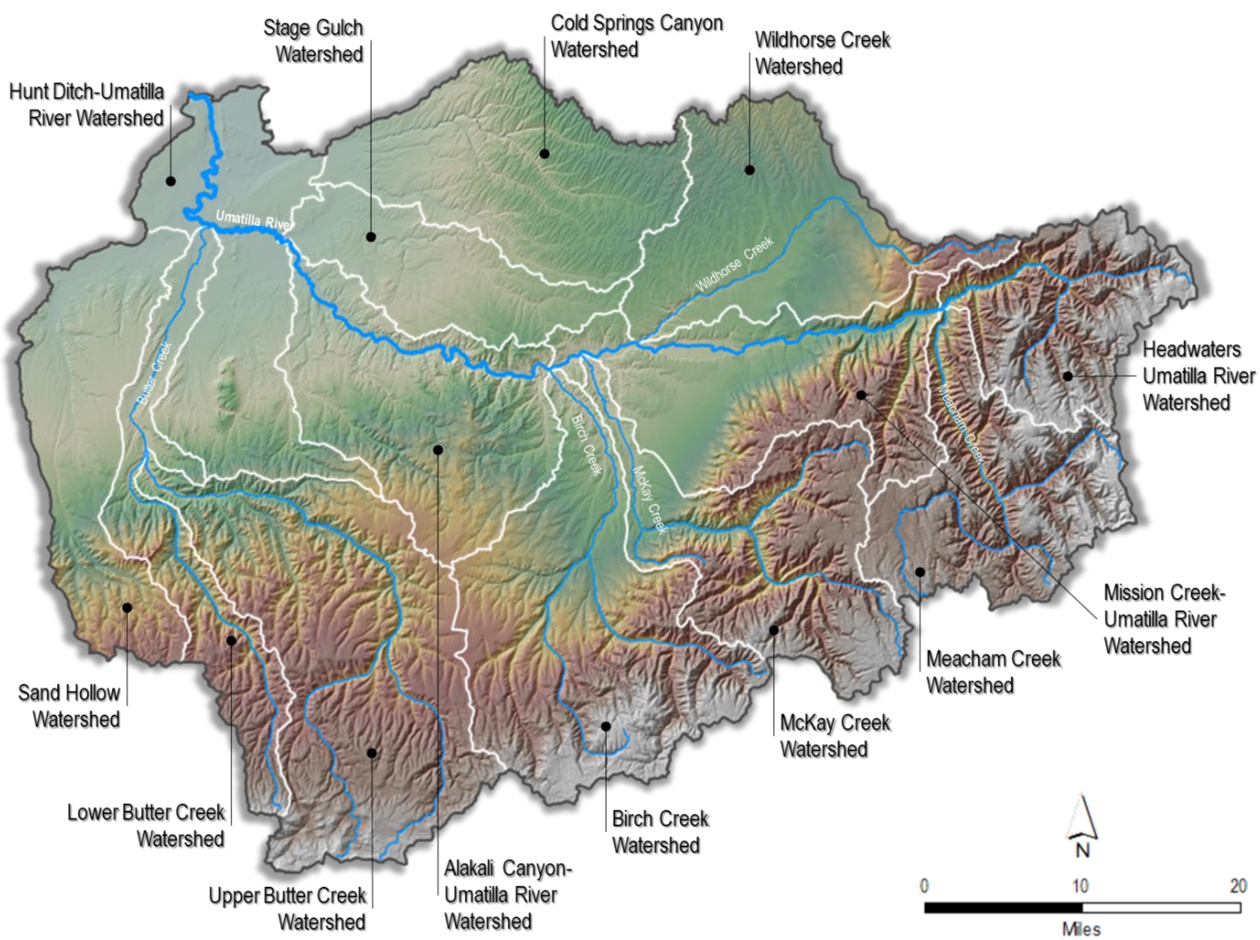


Exhibit 1-3. Watersheds within the Umatilla Subbasin

1.3.3 Focal Study Area (Umatilla River)

The mainstem Umatilla River is 89 miles and also includes the North Fork Umatilla River and South Fork Umatilla River in the Umatilla National Forest for a total of 108 miles of river (Exhibit 1-4). In addition to the 108-mile-long mainstem and forks, there are 7 major tributaries (among others) that flow into the Umatilla River, including Meacham Creek, Isqúulktpe Creek, Wildhorse Creek, Mission Creek, McKay Creek, Birch Creek, and Butter Creek. The focal study area, shown below, includes the 108 miles of the Umatilla River and the associated floodplain and tributary confluences of those stream segments. The surrounding floodplain and land along the Umatilla River has several towns and communities, including Umatilla, Hermiston, Echo, Stanfield, Pendleton, Mission, and Gibbon. The focal study area is further broken down into reaches that have similar and consistent physical properties, using a combination of physical characteristics and metrics. Analyses to evaluate each reach have been based on the data compiled and metrics established for the Action Plan. More detail for the reach breaks is included in the Assessment (CTUIR 2023).

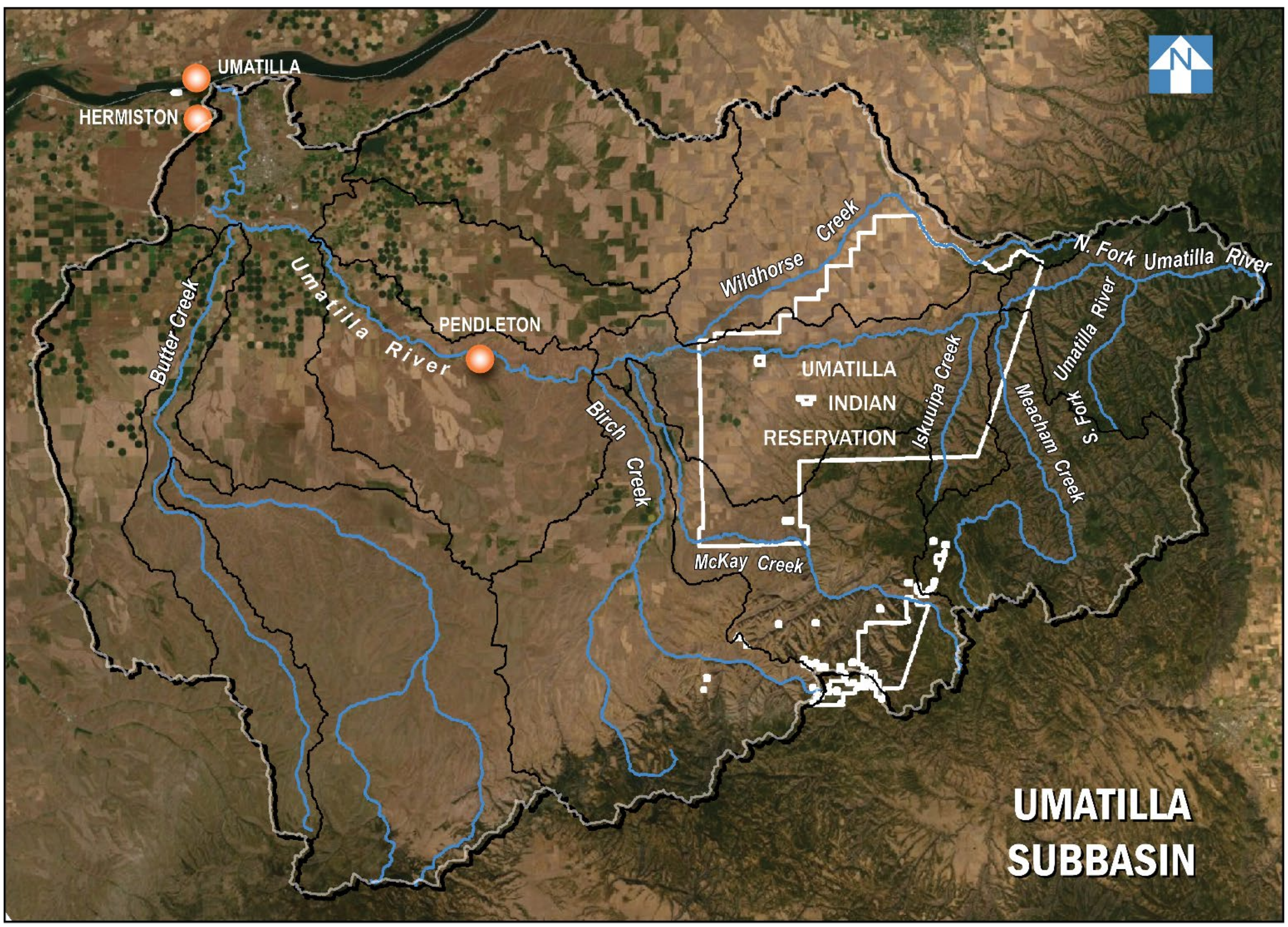


Exhibit 1-4. Umatilla River and Major Tributaries

1.4 Process

The CTUIR has collaborated with universities, non-profit groups, and various governmental agencies to conduct extensive research in the Subbasin. This research has yielded comprehensive information on landscape patterns, hydrologic function, geomorphology, connectivity, riparian vegetation, and aquatic biota. Additionally, numerous restoration projects have been implemented, offering evidence on the effectiveness of different restoration approaches in the Subbasin. This collective body of work serves as the foundation for the Assessment, drawing heavily on the information and lessons learned from past efforts to develop a robust and data-driven strategic action plan for the Subbasin.

The purpose of the Action Plan is to identify 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. To accomplish these objectives, the process leading to development of the Action Plan has included three main steps, described below and shown in Exhibit 1-5.

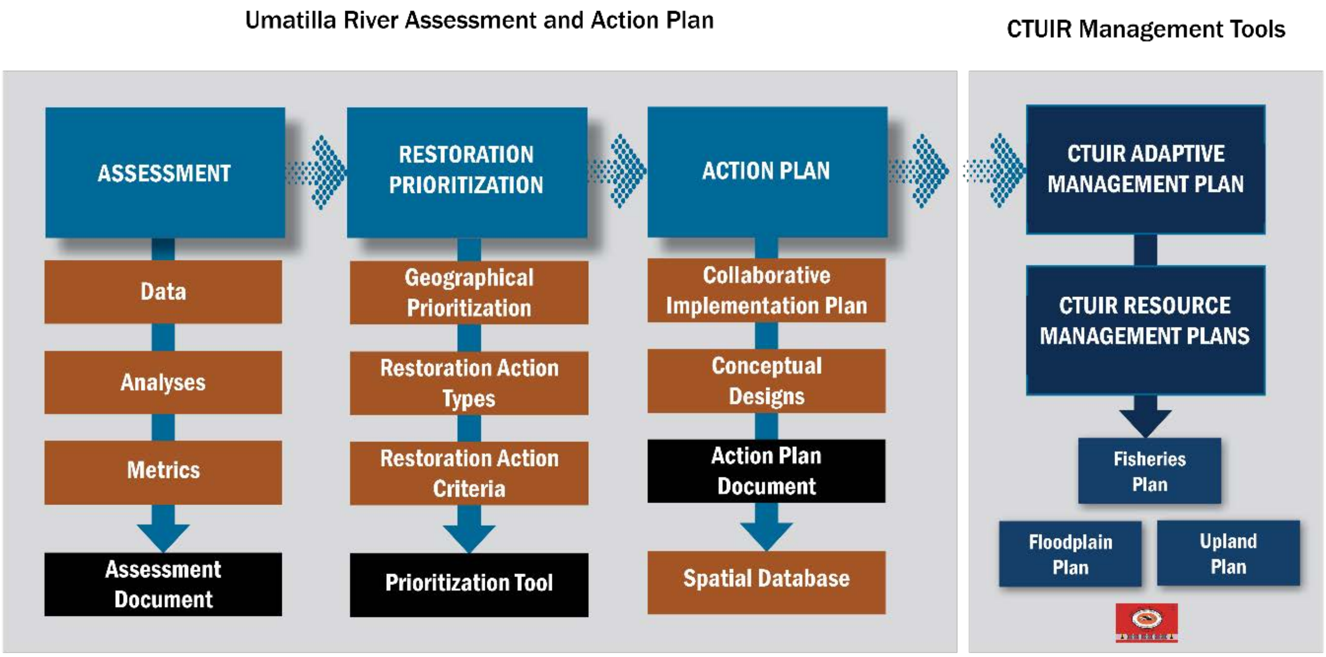


Exhibit 1-5. Outline of the Action Plan Process

- **Assessment:** Existing data sources were collated by Subbasin agency partners and the CTUIR and collected to identify and define data adequacy (i.e., sufficient data quantity and quality) as well as data needs (i.e., data gaps [see Section 1.5 Data Gaps]). All sources of data received were input into a spreadsheet to support the review of data in the development of the Assessment. The existing data sources—including existing and available Subbasin documents and data—were reviewed, analyzed, and organized based on the metrics identified to characterize historic and current conditions in reference to the Umatilla River Vision and Uplands Vision Touchstones. The final Assessment (CTUIR 2023) provides illustrations and documentation of the findings of the data review and analyses based on the Touchstones.

- **Restoration Prioritization:** The information presented in the Assessment was analyzed to identify the reaches and subwatersheds most departed from historic conditions, quantified based on existing data and professional judgement, and organized by Touchstones to geographically prioritize these areas for restoration. A prioritization spreadsheet was developed that can be updated in the future as new data are collected or as projects are implemented. Next, a tool was developed that outlines the restoration actions that can be used in the reaches and subwatersheds to restore Uplands Vision and River Vision Touchstone functions. Restoration action criteria include potential benefits as well as the feasibility of restoration actions in the project areas. The criteria include both physical and social constraints.
- **Action Plan:** This Action Plan is intended to provide the CTUIR and partners with a strategic approach for prioritizing and implementing restoration actions throughout the Subbasin, mainstem Umatilla River, and South and North forks of the Umatilla River. The Action Plan includes restoration plans for uplands in the Umatilla Subbasin, the river channel and associated floodplains of the Umatilla River, and the aquatic species of the Subbasin (Exhibit 1-6). The Action Plan also includes actions that can be undertaken in the Subbasin and in the Umatilla River, a reach-by-reach map book of actions for the Umatilla River, and conceptual designs for six high priority locations on the Umatilla River.

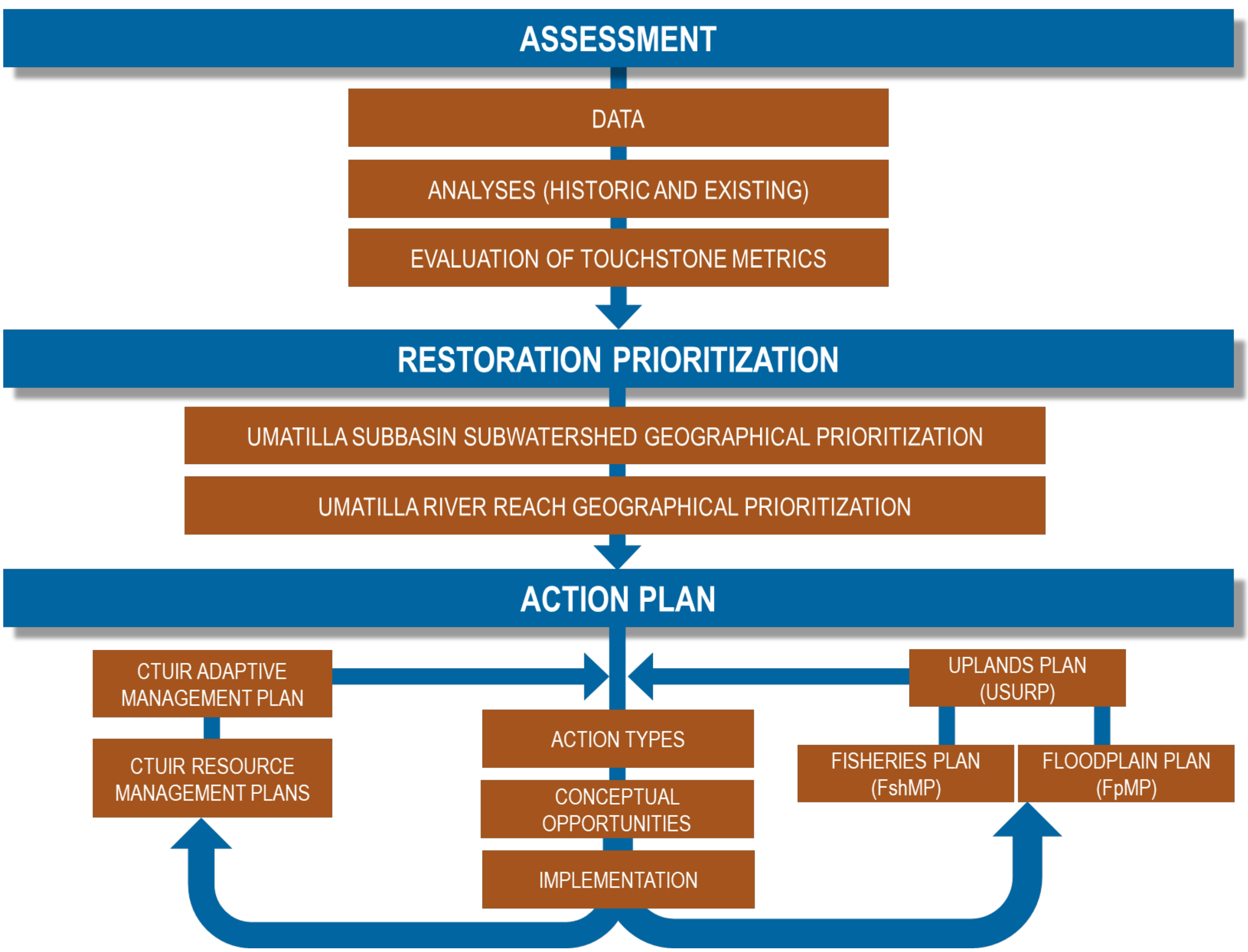


Exhibit 1-6. Outline of the Elements of the Assessment and Action Plan

1.5 Data Gaps

The Assessment (CTUIR 2023) includes an annotated bibliography providing a list of important research and past work, complete with descriptions and links to resulting reports and datasets. In reviewing the existing data in the Subbasin, data gaps and needs for future analyses have been identified. Should these data gaps and analyses be obtained, they would play a critical role in the prioritization of restoration actions in the Subbasin and Umatilla River. Exhibit 1-7 provides the identified data gaps for the Subbasin. The updated prioritization could guide the CTUIR in decision-making regarding the focus for restoration actions (Exhibit 1-8 highlights, in yellow, the steps that might be revisited). Similarly, following implementation, monitoring of project areas could provide information that could also update the prioritization and potential future restoration activities (Exhibit 1-8).

Data Gaps
Invasive plant species data in the Subbasin (outside of the CTUIR)
Bathymetric data in the mainstem Umatilla River
Existing extent of beavers and beaver activity
Beaver Restoration Assessment Tool (BRAT) Report
Big game historic and current habitat availability
Umatilla River Water Rights Assessment (Freshwater Trust 2010)
Extent of existing freshwater mussel species

Exhibit 1-7. Umatilla Subbasin Data Gaps

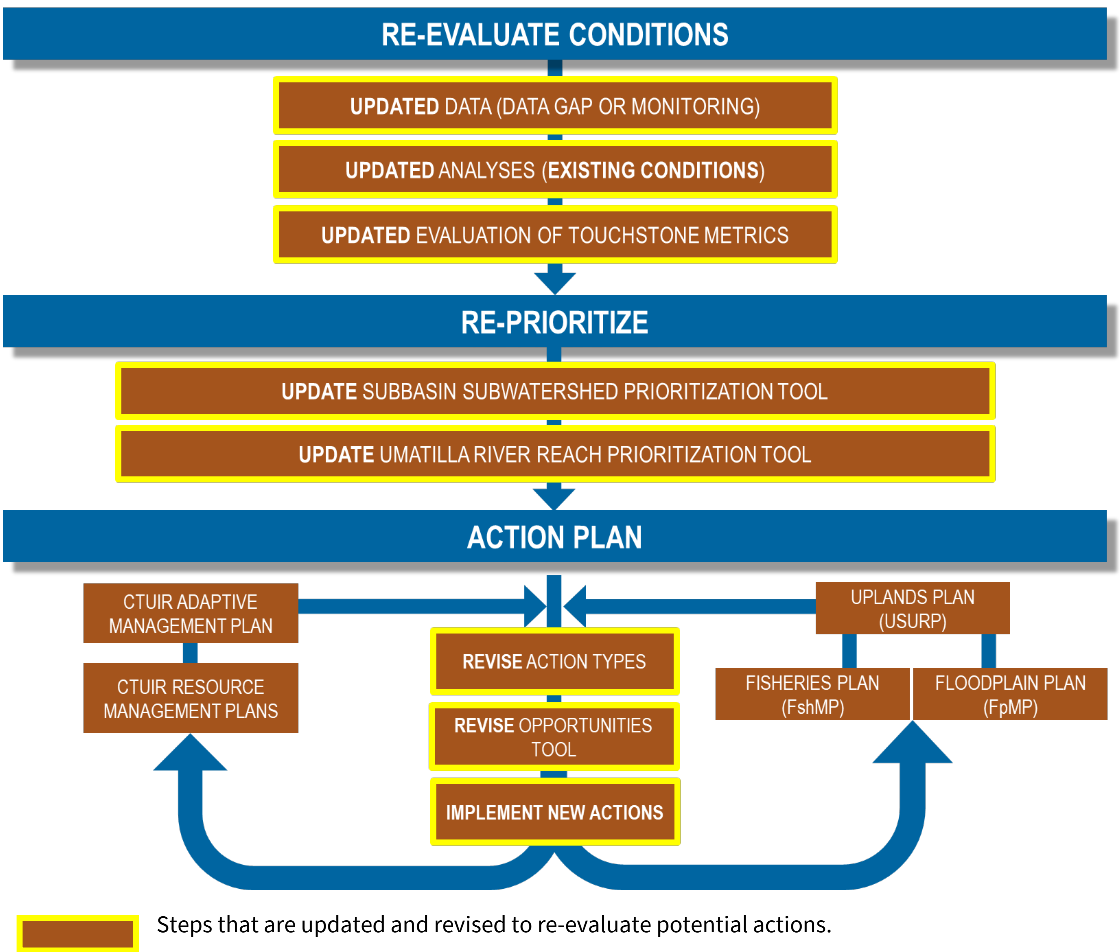


Exhibit 1-8. Elements of the Action Plan and Assessment including Obtained Data Gaps or Monitoring Data Updates

2.0 Assessment Key Findings

Analyses of the existing datasets provided by the CTUIR and other stakeholders were used to identify how departed existing conditions are from historic conditions throughout the Subbasin and in the Umatilla River. Conditions were analyzed based on metrics identified in the Umatilla River Vision (Jones et al. 2008) and the Uplands Vision (Endress et al. 2019). Conditions were analyzed for each of the Umatilla River Vision Touchstones (Hydrology, Geomorphology, Connectivity, Riparian Vegetation, and Aquatic Biota) as well as the Uplands Vision Touchstones (Hydrologic Function, Soil Stability, Landscape Pattern, and Biotic Integrity). Traditional Ecological Knowledge (TEK) was also used to further characterize the historic functionality of the Subbasin and the Umatilla River. Areas known to have been utilized for traditional uses (Exhibit 2-1) were identified geographically but not provided publicly due to the sensitivity of the locations of the traditional uses. The following sections summarize the findings of the Assessment of the Subbasin study area (Section 2.1) and the focal study area (Section 2.2).

Exhibit 2-1. TEK Use Types (adapted from Hunn et al. 2015)

2.1 Subbasin Study Area Key Findings (Umatilla Subbasin)

This section summarizes the historic and existing conditions key findings by Uplands Vision Touchstone for the Subbasin (Hydrologic Function, Soil Stability, Landscape Pattern, and Biotic Integrity).

2.1.1 Hydrologic Function Touchstone

By 2080, according to representative concentration pathway (RCP) 8.5, mean summer streamflows in the mainstem Umatilla River are expected to decrease 20 to 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). Climate change will also impact timing and duration of peak and low flows. The Subbasin will shift from a mix of snow-and-rain dominant hydrology to that of a rain-dominant hydrology (Exhibit 2-2) 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). Both winter and summer flows are expected to increase in variability from 2040 to 2080 (Hamlet et al. 2013). Using different modeling techniques, researchers at the University of Washington and the CTUIR found similar patterns in the predicted hydrology for the Umatilla Subbasin (Pytlak et al. 2018; O'Daniel 2023). As discussed in the following sections, altered landscapes in the Subbasin further impacts run-off characteristics and water storage, resulting in increased changes in the hydrologic graph.

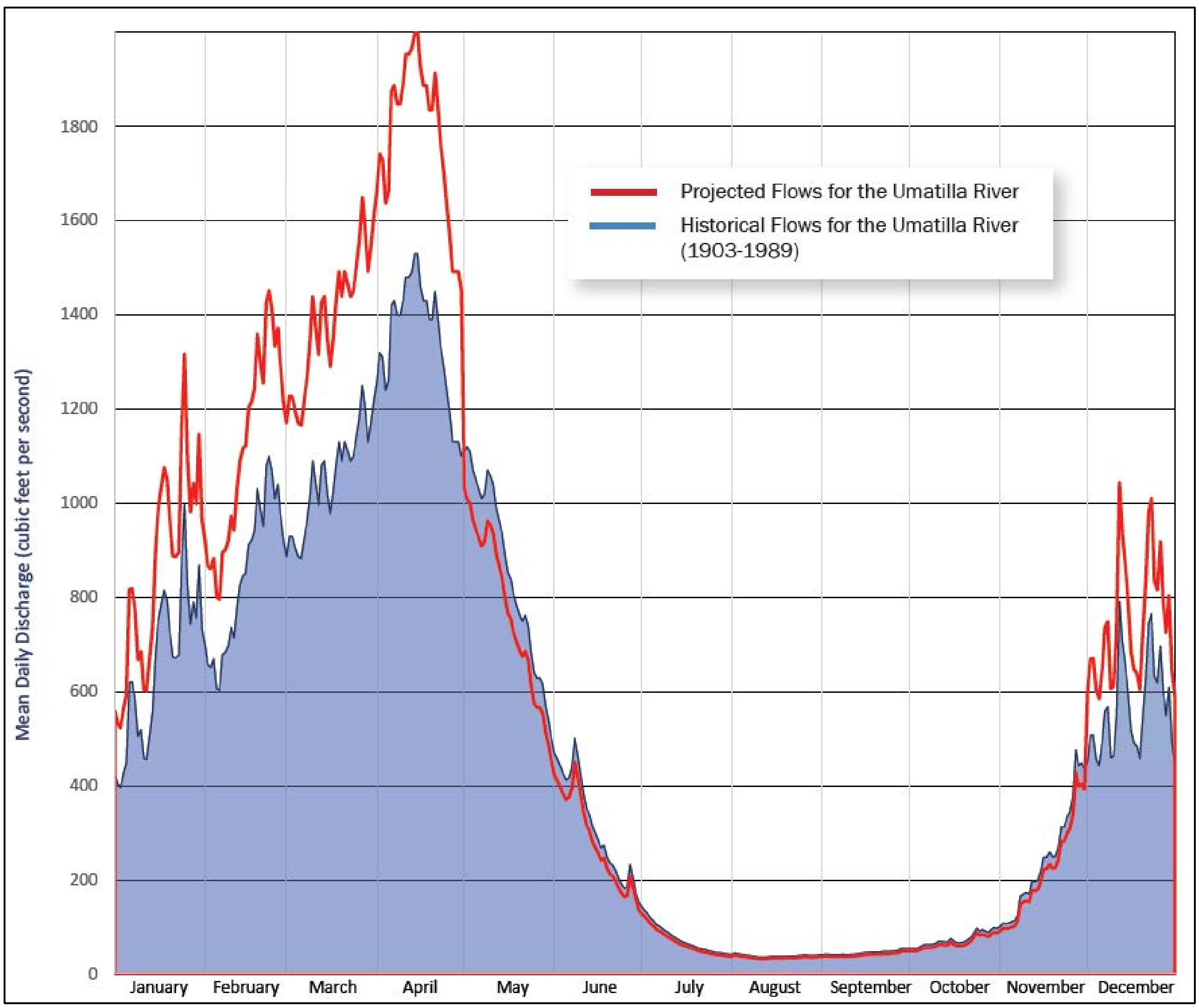


Exhibit 2-2. Predicted Subbasin Hydrology at Umatilla River at Pendleton, OR Gage

2.1.2 Soil Stability Touchstone

In the Subbasin, 54 percent of the soils are highly erodible (Exhibit 2-3) (NRCS 2021) and 29 percent of the Subbasin is high or very highly susceptible to landslides (DOGAMI 2016). Conversion of land from areas of First Foods to agriculture production has reduced availability of traditional foods, reduced range for wildlife, and reduced soil stability. Historic over-grazing by livestock prior to 1950 introduced non-native plants and historic timber extraction has depleted forest stands, further reducing soil stability and increasing sediment routing to streams. This decrease in soil stability under post-Euro-American settlement is a particular concern given the erodible nature of the soils in the Subbasin

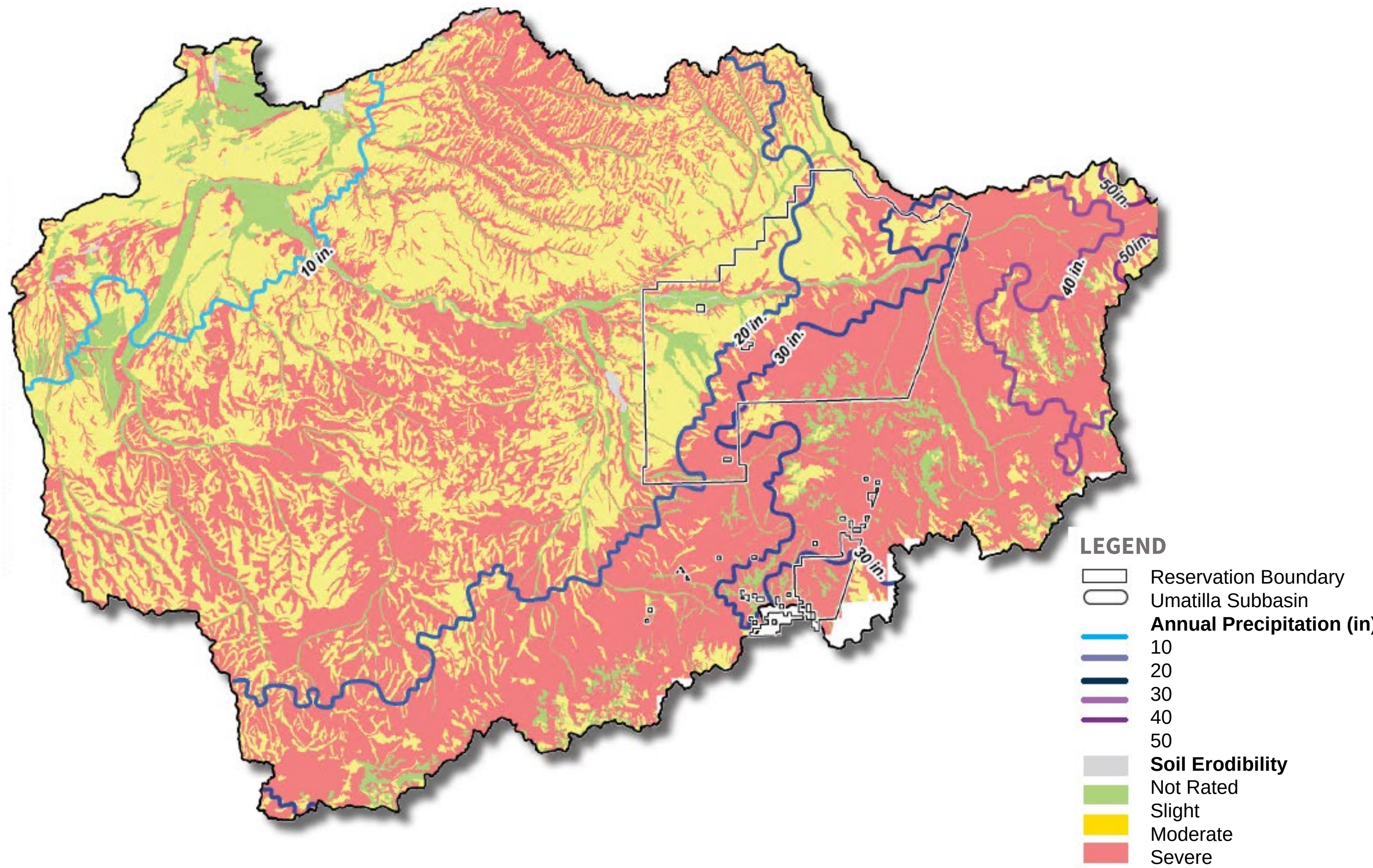


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Exhibit 2-3. Soil Erodibility and Annual Precipitation in the Umatilla Subbasin

Throughout the Subbasin, thousands of miles of roads have been constructed for use in critical transportation, recreation, agriculture, and timber harvesting. Analysis of the impacts of these roads shows that roads are contributing 343 tons of sediment per year to streams in the Subbasin (Exhibit 2-4). A total of 85 miles of streams in the Subbasin are receiving more than 60 tons of sediment per year from roads.

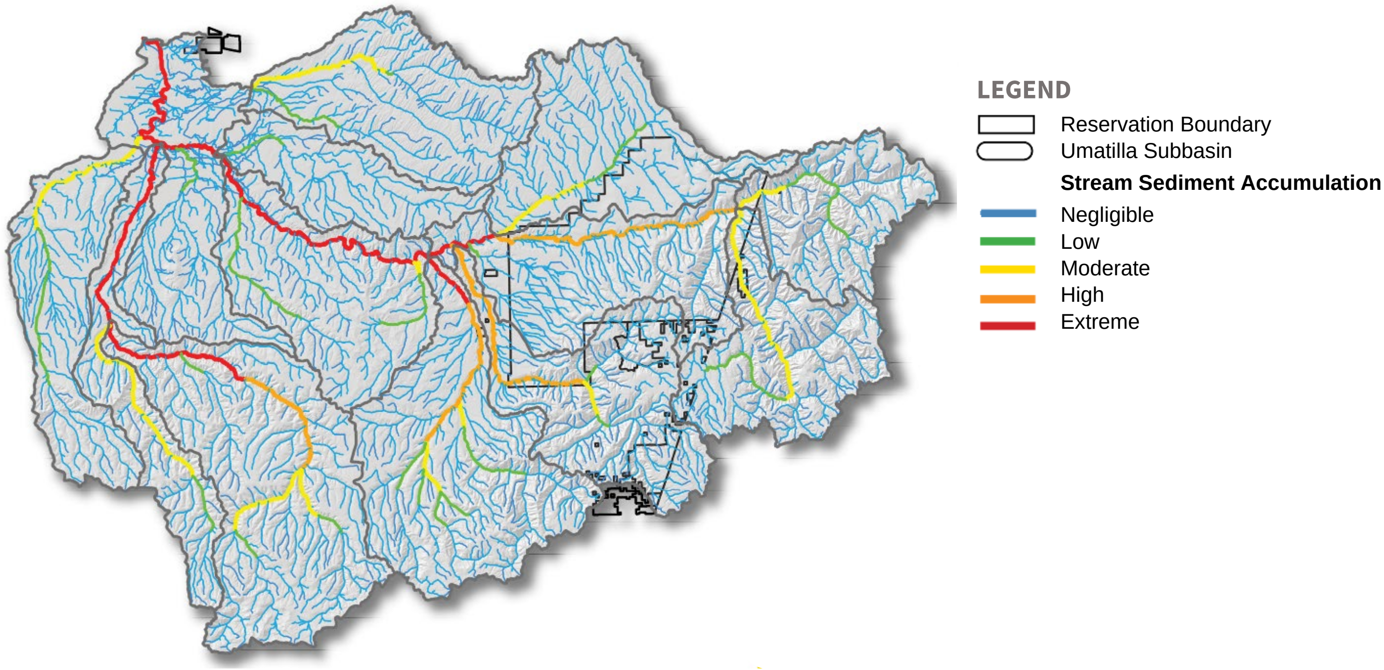


Exhibit 2-4. Stream Sediment Accumulation from Roads in the Umatilla Subbasin

2.1.3 Landscape Pattern Touchstone

In the Subbasin, 34 percent of the land has been converted to agriculture (NLCD 2011). While only 3 percent of the Subbasin has been developed (i.e., open space, low intensity, medium intensity, high intensity), 62 percent of the Subbasin remains (Exhibit 2-5) as either herbaceous land, wetlands, or scrub/shrub (NLCD 2011). 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.

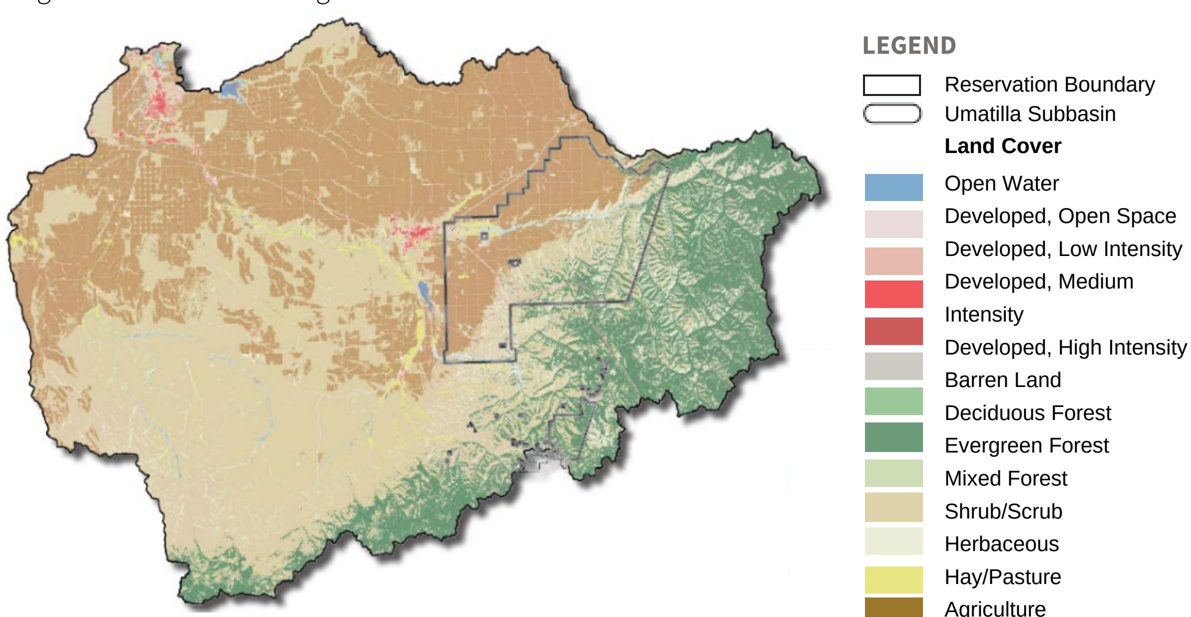


Exhibit 2-5. Land Cover in the Umatilla Subbasin

Catastrophic fires, mechanical disturbance, and insects/disease have further decimated areas that remain intact (Exhibit 2-6). Approximately 23,000 acres of the Subbasin were impacted by high intensity fires between 2004 and 2014 (LANDFIRE 2016). Over 70,000 acres of the Subbasin have been impacted by mechanical disturbances (i.e., logging) and 700 acres of the Subbasin have been impacted by insects/disease (LANDFIRE 2016), further impacting the intact land areas in the Subbasin.

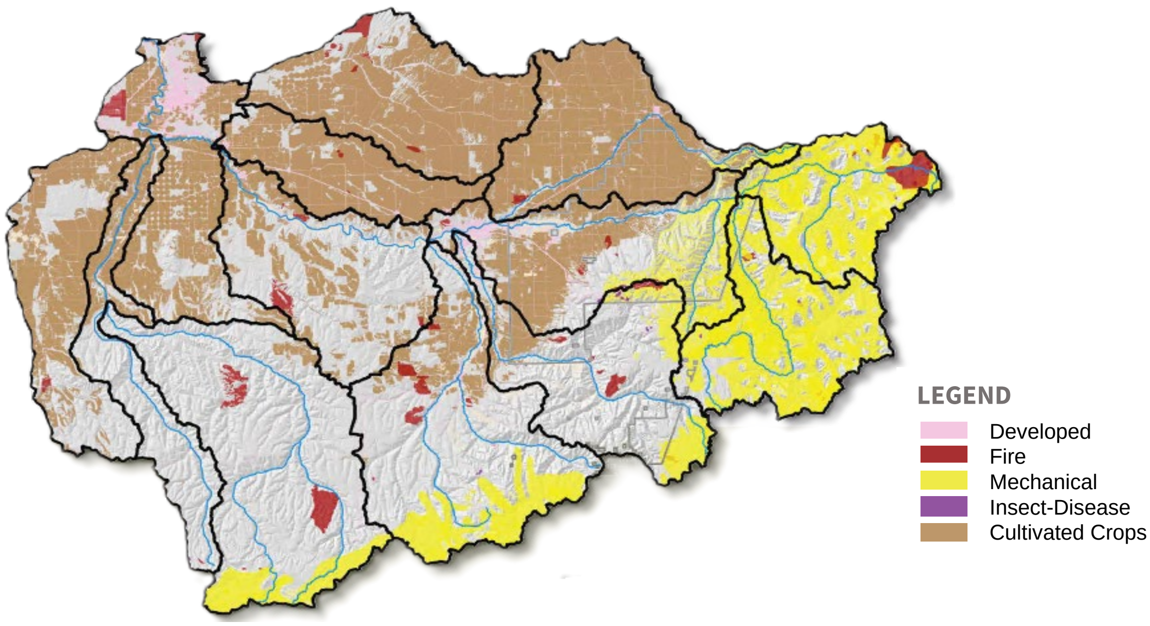


Exhibit 2-6. Disturbances in the Umatilla Subbasin

2.1.4 Biotic Integrity Touchstone

Vegetation has been impacted throughout the Subbasin by the introduction of timber harvest, fire suppression, conversion to croplands, and grazing. The Subbasin has been heavily impacted by the introduction and spread of non-native species, further reducing biotic integrity (Exhibit 2-7). Over 57 percent of the vegetation in the Subbasin is highly departed from historic conditions (LANDFIRE 2016).

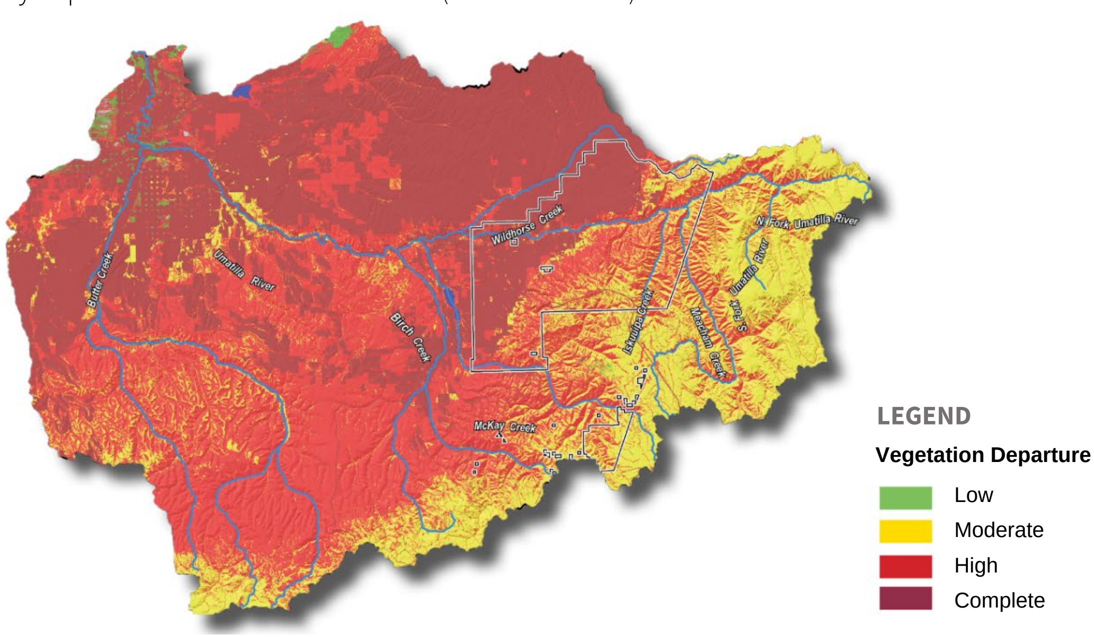


Exhibit 2-7. Vegetation Departure in the Umatilla Subbasin

Historic over-grazing and timber harvest has also reduced the variability in the landscape that is key to resilience to climate change and other impacts such as insects or disease. An analysis of the vegetation in the Subbasin shows 33 percent of vegetation is early seral, 66 percent is mid seral, and only 1 percent is late seral (Exhibit 2-8) (LANDFIRE 2016). Breaking down the composition of the intact canopy cover in the Subbasin, 17 percent is less than 10 meters tall, 20 percent is greater than 20 meters tall, and 63 percent is between 10 and 20 meters tall (Exhibit 2-8) (LANDFIRE 2016). The reduced variability in successional stages and canopy heights in the vegetation is an indicator of poor uplands conditions throughout the Subbasin.

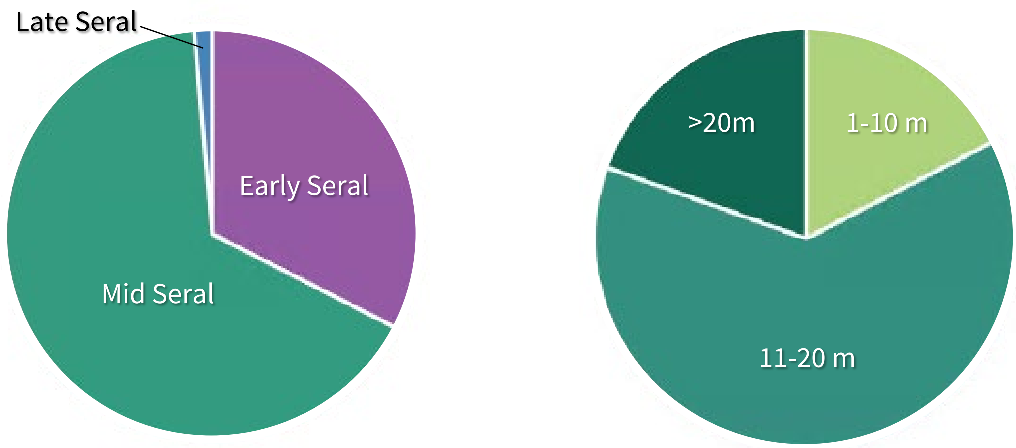


Exhibit 2-8. Seral Stage Distribution in the Umatilla Subbasin (left) and Current Tree Height Distribution (right)

2.2 Focal Area Key Findings (Umatilla River)

This section summarizes the historic and existing conditions key findings by River Vision Touchstone (Hydrology, Geomorphology, Connectivity, Riparian Vegetation, and Aquatic Biota) for the Umatilla River.

2.2.1 Hydrology Touchstone

The Umatilla River Vision Hydrology Touchstone includes Water Quantity and Water Quality. Water rights and competing demands for water can impact the flow of the Umatilla River. Water quality, particularly water temperatures, can impact survival of salmonids in the river.

2.2.1.1 Water Quantity

Irrigation dam construction and dewatering of streams because of development of the Umatilla River floodplain and surrounding uplands is generally accepted as the reason for the extirpation of Chinook salmon in the Subbasin. Of the total surface water consumption in the Umatilla River, 69 percent is diverted for irrigation (Exhibit 2-9) (Umatilla Subbasin 2050 Water Management Plan [Umatilla County Critical Groundwater Task Force 2008]). Improvements have occurred with the introduction of the Umatilla Basin Water Exchange project, resulting in increased flows in the mainstem Umatilla River during critical periods.

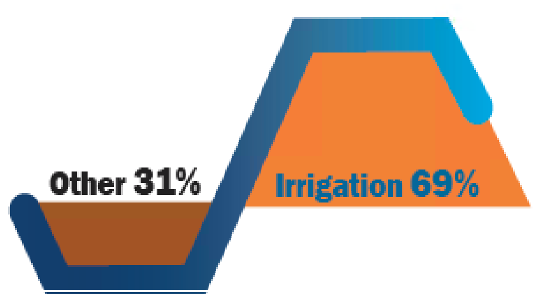


Exhibit 2-9. Surface Water Consumption in the Umatilla River

2.2.1.2 Water Quality

As described in the Umatilla Subbasin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) (ODEQ 2001), salmonids are highly sensitive to temperatures in the streams they inhabit. Temperatures between 64- and 74-degrees Fahrenheit (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.

According to Isaak et al. (2017), 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), and nearly 83 miles of the river will be considered lethal (greater than 74 degrees F) for salmonids at mean summer stream temperatures (Exhibit 2-10). The Umatilla River is considered a cold-water refuge to the mainstem Columbia River (Palmer 2021) during winter months, increasing the need for restoration actions in the river. As described in the CTUIR TMDL WQMP (2004), sediment also plays a major role in water quality in the Umatilla River. The Umatilla River from Wildhorse Creek upstream to the confluence of the North and South Fork Umatilla River has been listed for sedimentation issues. The Umatilla River from the mouth upstream to Mission Creek has also been listed for turbidity issues.

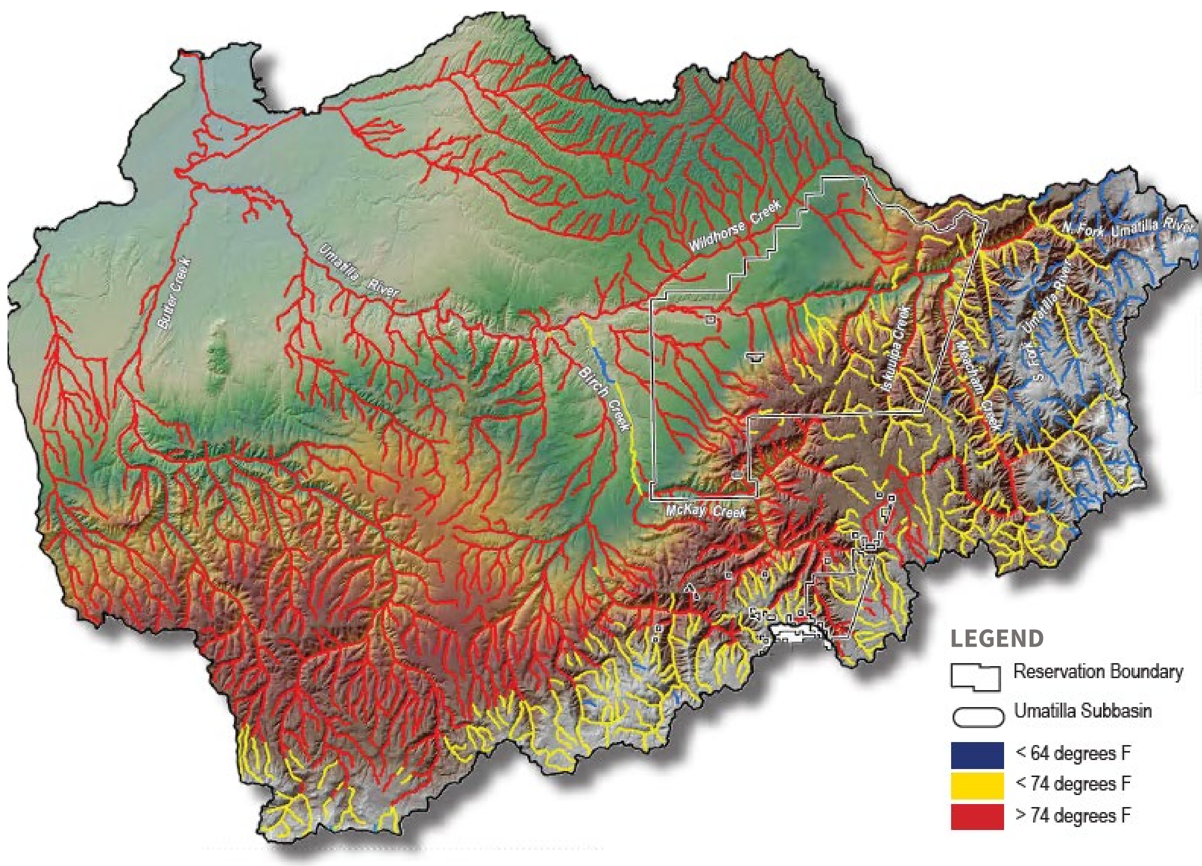


Exhibit 2-10. Mean Summer Stream Temperatures in 2099

2.2.2 Geomorphology Touchstone

Based on historic aerial imagery from 1952, the mainstem Umatilla River channel complexity has decreased by 55 percent. The mainstem Umatilla River currently includes a total of 33 miles of off-channel habitat. Historic conditions in 1952 included 52 miles of off-channel habitat. Because Euro-American settlement on the Umatilla River impacted the channel for over 100 years before 1952, it is likely that the off-channel habitat was much more abundant (Exhibit 2-11).

Expected sinuosity is calculated based on the roughness of the floodplain and the channel, the slope of the floodplain, and the bankfull flow depth (Lazarus and Constantine 2013). The current channel length of the mainstem Umatilla River is 87 miles. Based on the expected sinuosity analysis, the mainstem Umatilla River should have a total channel length of 108 miles, a 20-percent decrease from historic conditions (Exhibit 2-12).

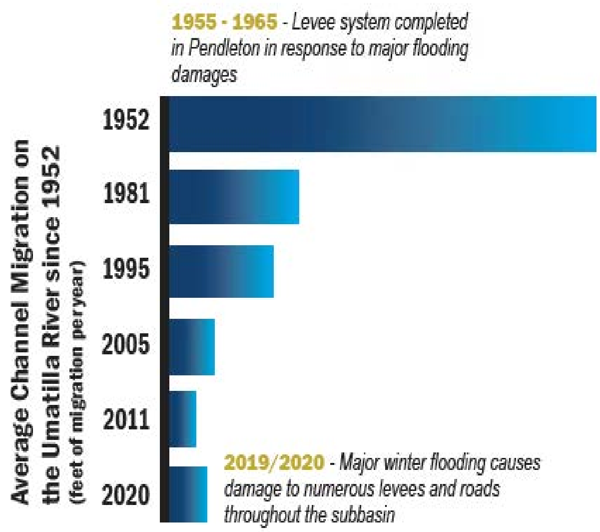


Exhibit 2-11. Average Channel Migration in the Umatilla River since 1952

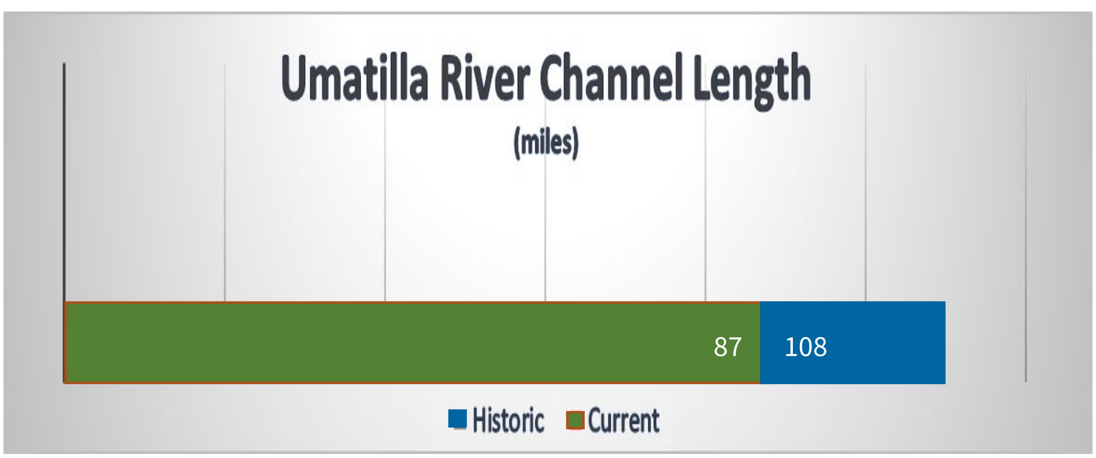


Exhibit 2-12. Umatilla River Channel Length

2.2.3 Connectivity Touchstone

Prior to Euro-American settlement, the Umatilla River would have fully occupied the floodplain from valley wall to valley wall. On the mainstem Umatilla River (including the North Fork and South Fork), 48 miles of the river are constrained by lateral control structures (i.e., levees, dikes, railroads, roads, cities, etc.), which is more than 44 percent of the total length of the river (Exhibit 2-13). Similarly, the current 100-year flow inundation extents only occupy about 40 percent of the historic floodplain (Exhibit 2-14).

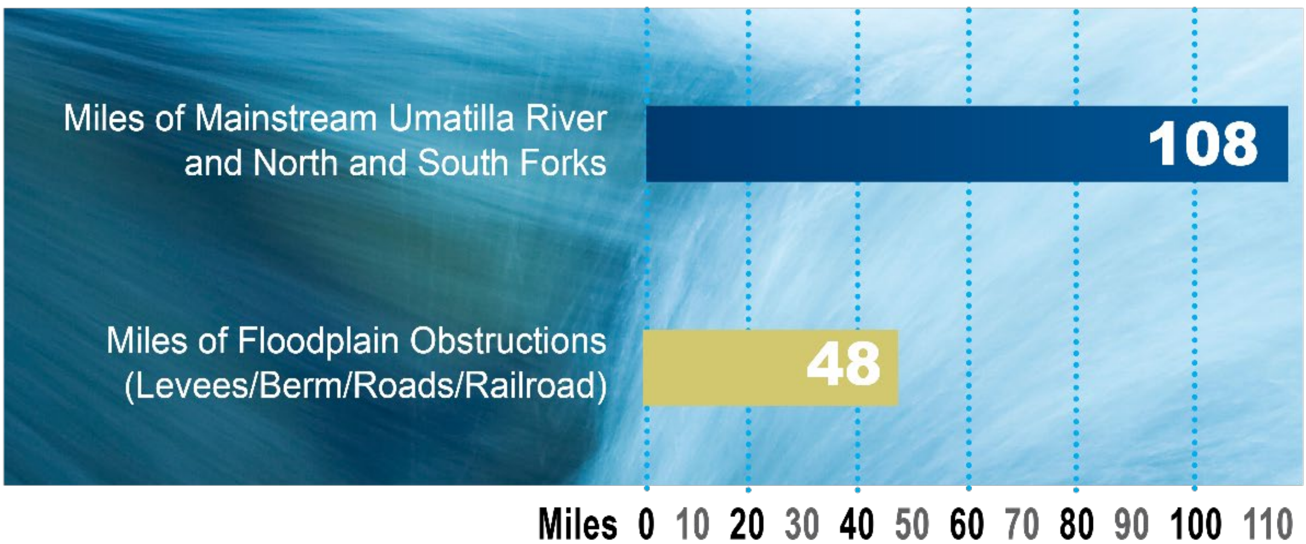
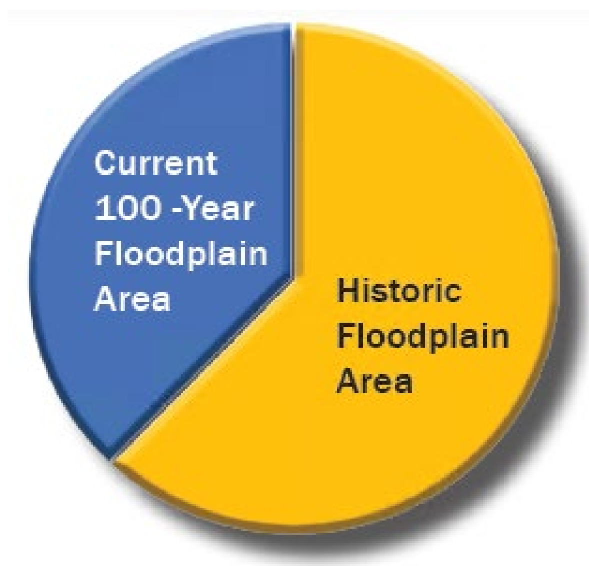


Exhibit 2-13. Lateral Obstructions on the Mainstem Umatilla River

Exhibit 2-14. Floodplain Connectivity on the Mainstem Umatilla River



Historical unimpeded longitudinal passage in the Umatilla River would have provided aquatic species access to cold-water habitat for spawning and rearing which is important for climate resiliency. Several factors have diminished connectivity, including the construction of flow control structures, road and railroad development, culverts, dewatering from irrigation withdrawals, and thermal barriers caused by high water temperatures. This impedes aquatic species from migrating 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 CTUIR has led efforts to improve fish passage at a number of locations by removing or rectifying barriers (Exhibit 2-15). 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.

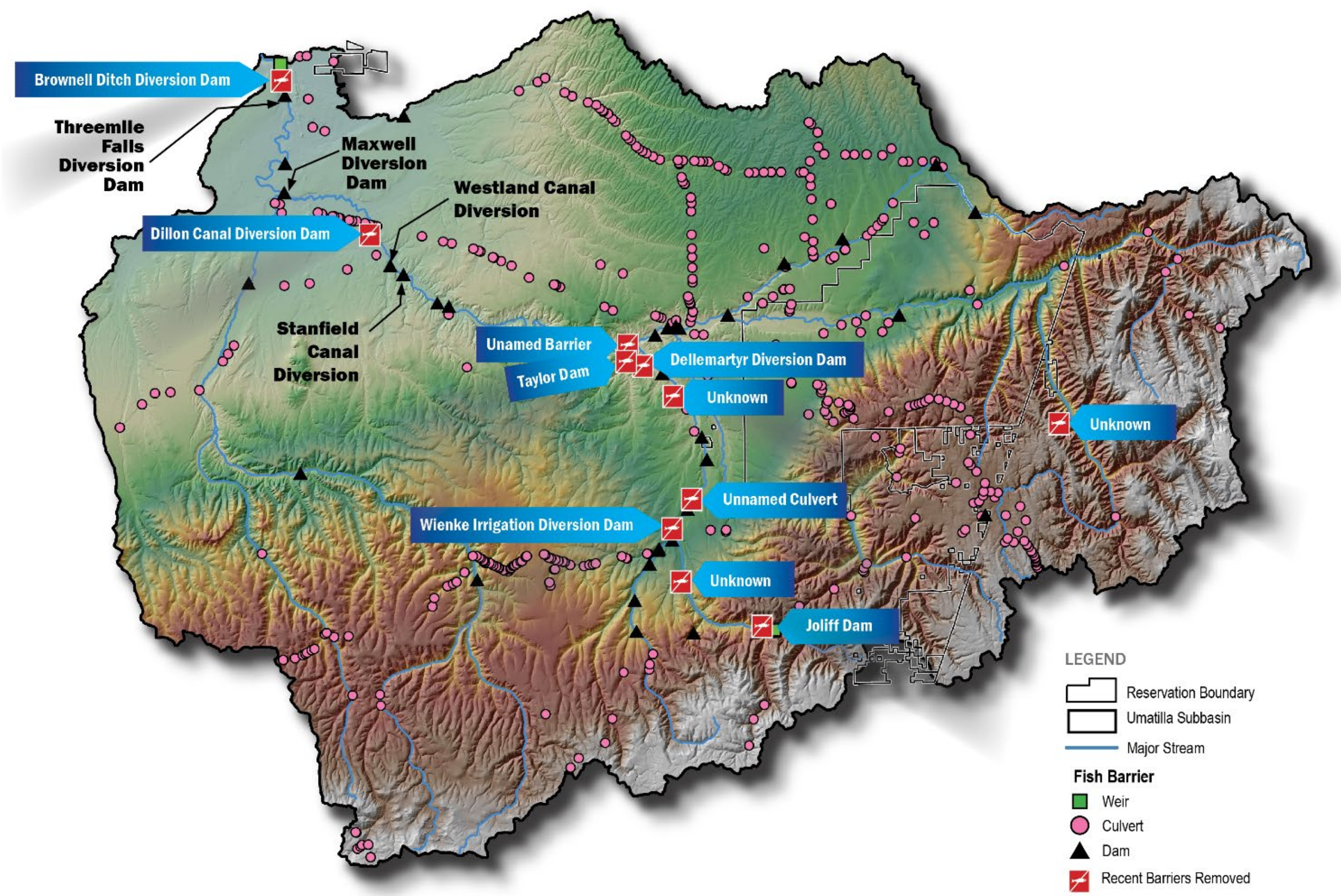


Exhibit 2-15. Fish Passage Barriers in the Umatilla Subbasin

2.2.4 Riparian Vegetation Touchstone

The removal of large wood from the mainstem channel, removal of healthy riparian forests in the floodplain to make room for agriculture and development, and the disconnection of the mainstem channel from the floodplain has reduced the availability of large wood for recruitment to the channel. The Umatilla River mainstem is below target values for large wood volume, due to a greater proportion of small wood, and smaller key pieces, compared to historical conditions. Large wood key pieces are meeting targets (Exhibit 2-16), but are smaller than the key pieces[1/] that would have been in the river historically, resulting in large wood volume being unsatisfactory (Exhibit 2-17).

Exhibit 2-16. Representative Historic Log Structure

Log structure more similar to what existed historically, showing large and numerous key pieces.

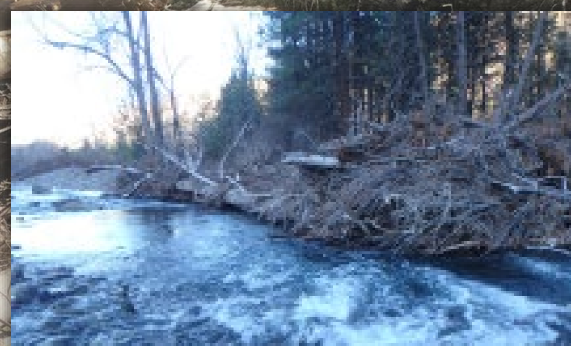
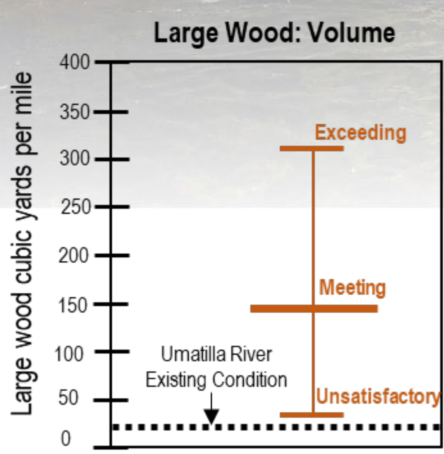
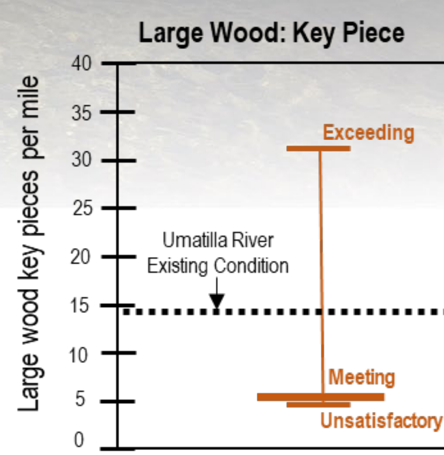


Exhibit 2-17. Representative Current Log Structure

Log structure typical of those that are present today, showing high proportion of small wood and fewer and smaller key pieces.





1/ Key pieces are defined as a log and/or rootwad that is 1) independently stable in the stream bankfull width (not functionally held by another factor, i.e., pinned by another log, buried, trapped against a rock or bed form) and 2) retaining (or having the potential to retain) other pieces of organic debris (Fox and Bolton 2007).

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 development, resulting in decreased riparian canopy height along the Umatilla River with most of the floodplain featuring canopy less than 10 feet tall (Exhibit 2-18). The decreased canopy height further exacerbates water quality issues in the Subbasin, with increased stream temperatures due to lack of shade and cover. Channel incision along most of the Umatilla River has exacerbated connectivity issues between the river and floodplain, disconnecting the groundwater from the adjacent riparian vegetation, reducing the ability of the riparian species to reestablish and flourish, since it is harder for their roots to find water.

Current conditions in the lower Umatilla River

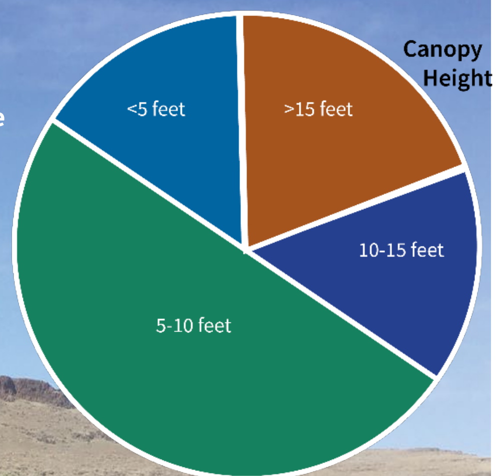


Exhibit 2-18. Distribution of Canopy Height within the Subbasin

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

2.2.5 Aquatic Biota Touchstone

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 aquatic and riparian habitat conditions that stem from the long-term conversion of land uses (Exhibit 2-19). For example, extensive irrigation withdrawals lead to low river flows, and grazing and agriculture lead to loss of riparian vegetation; both conditions exacerbate high summertime water temperatures. Dikes and levees built to straighten and consolidate the river channel have led to sedimentation downstream and have greatly reduced in-channel habitat complexity and flood dissipation.

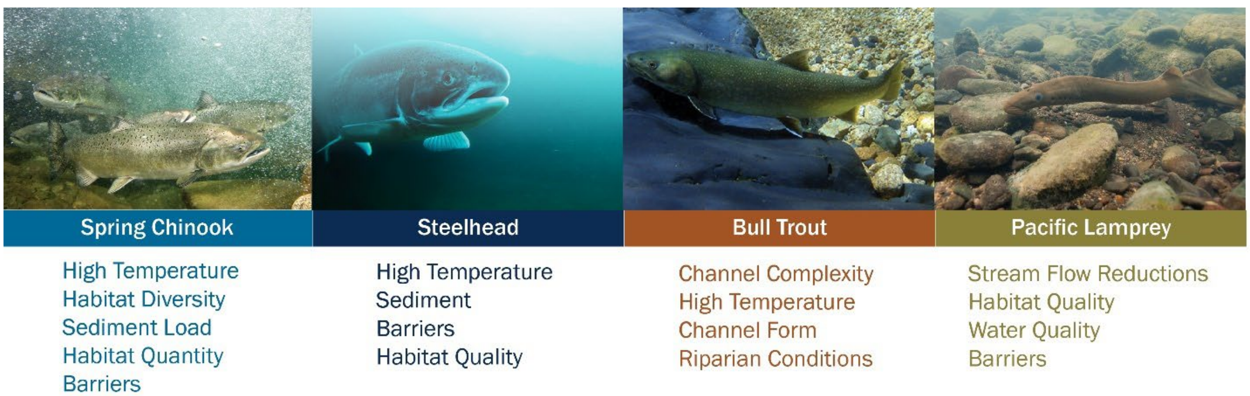


Exhibit 2-19. Most Significant Limiting Factors Identified Within the Umatilla Subbasin for Each Focal Species (NPCC 2005)

Limiting factors listed here are focused mostly on focal aquatic species (i.e., salmonids) (Exhibit 2-20). However, as discussed in Brim Box et al. (2006), a significant overlap exists between the limiting factors for salmonids and 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.

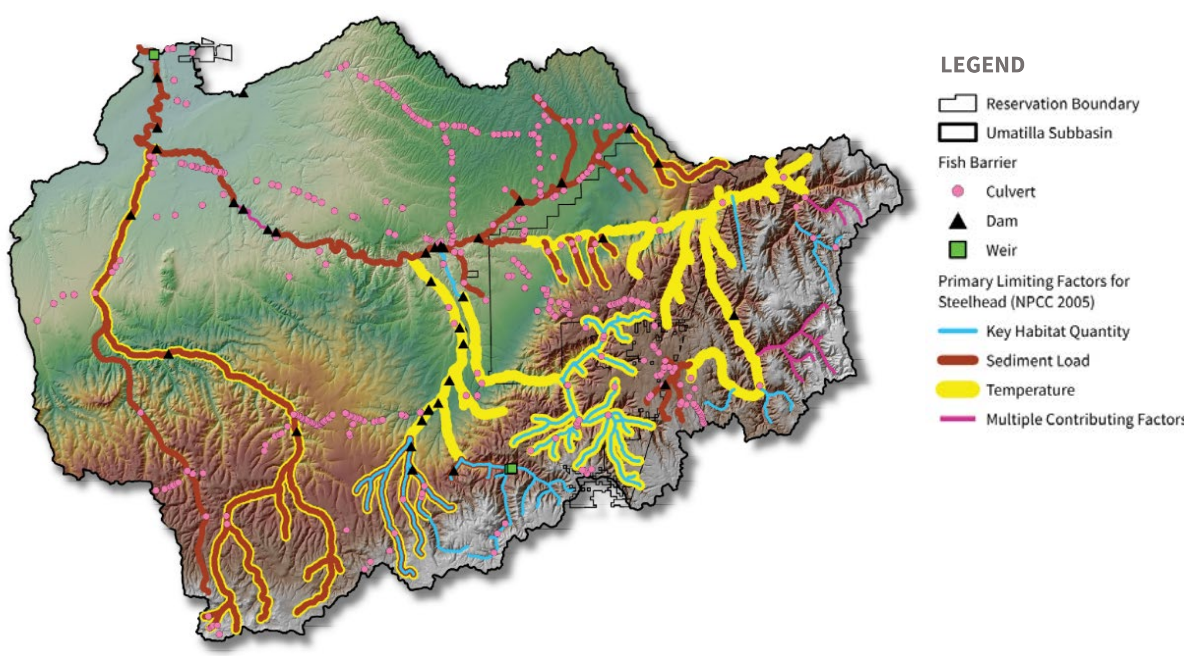


Exhibit 2-20. Primary Limiting Factors for Steelhead in the Umatilla Subbasin (NPCC 2005)

Spring Chinook salmon, coho salmon, and Pacific lamprey were all extirpated from the Subbasin. The summer steelhead and bull trout populations in the Subbasin have significantly declined. Spring Chinook salmon were reintroduced to the Subbasin in 1986 with Carson stock and in 1998 with local Umatilla River adult returns through fishery enhancement efforts by the CTUIR. Pacific lamprey have also been reintroduced beginning with CTUIR reintroduction of the species in 2000. The current population of Pacific lamprey is believed to be extremely low and remains a focus of restoration initiatives by the CTUIR.

The current habitat availability in the mainstem Umatilla River for the four focal species (spring Chinook, steelhead, bull trout, and lamprey) is a fraction of what was historically available (Exhibit 2-21). Smolt production potential modeling for the four focal species (spring Chinook, steelhead, bull trout, and lamprey [ammocoetes]) indicates that summer conditions most significantly limit populations. The decline in available habitat within the mainstem Umatilla River has led to an overall decline in smolt production from historic levels (Exhibit 2-22).

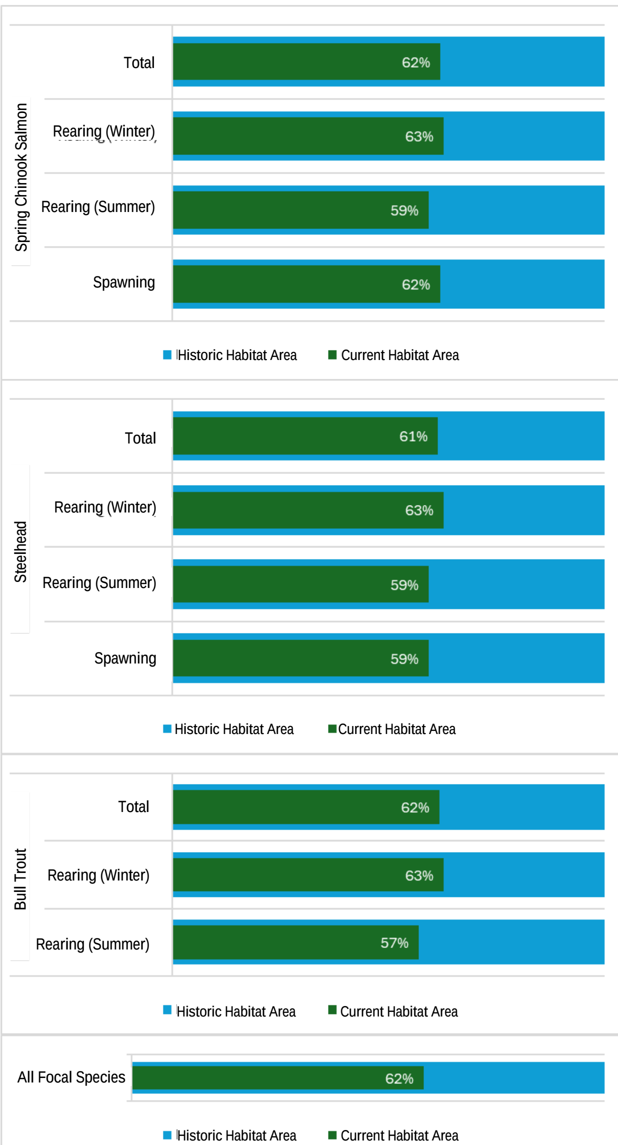


Exhibit 2-21. Potential Habitat in the Mainstem Umatilla River for Spring Chinook Salmon, Steelhead, and Bull Trout

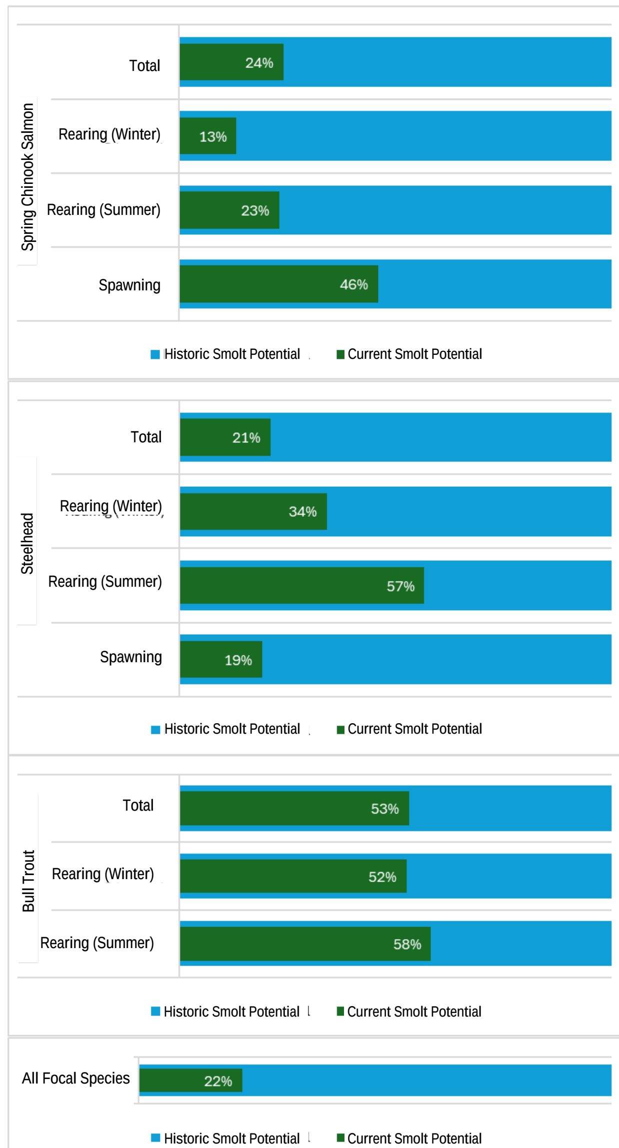


Exhibit 2-22. Smolt Potential for the Mainstem Umatilla River for Spring Chinook, Steelhead, and Bull Trout

3.0 Prioritization

Reaches and subwatersheds where existing conditions are most departed from historic conditions were identified through analysis of existing data sources presented in the Assessment. The further departed from historic conditions, the higher priority the reach or the subwatershed for action. The following section presents the prioritization process (Section 3.1), prioritization results for Subbasin subwatersheds (Section 3.2), and prioritization results for Umatilla River reaches (Section 3.3). While the furthest departure from historic conditions was used for this prioritization effort, reaches and subwatersheds that are closer to historic conditions are also identified. The prioritization tools can be used to identify areas for protection as well as areas for restoration. For example, a subwatershed or reach that is prioritized as least departed from historic conditions could be identified for protection of the functional habitat, while subwatersheds or reaches prioritized as most departed from historic conditions could be identified for restoration.

3.1 Prioritization Process

The prioritization process identified subwatersheds within the Subbasin and reaches on the Umatilla River that are 1) most departed from historic conditions, 2) have the highest potential impact on focal aquatic species, and 3) are the highest priority for targeted restoration and conservation efforts. Upland function in the subwatersheds of the Subbasin was characterized by departure from historic conditions for roads, vegetation, soils, beaver restoration assessment tools (BRAT), wetlands, and springs (Exhibit 3-1).

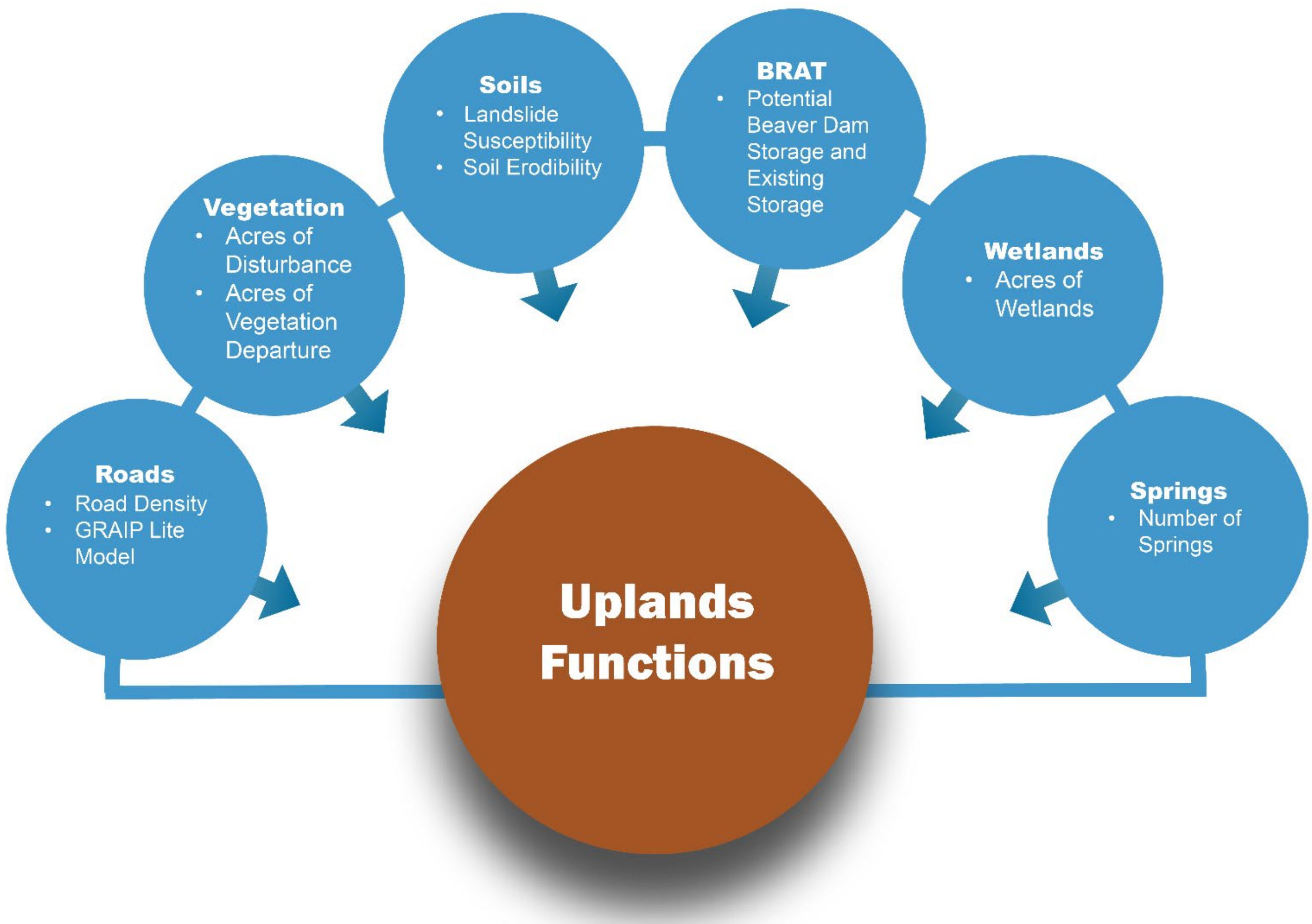


Exhibit 3-1. Prioritization Factors

TEK was characterized for each subwatershed, identifying which subwatersheds were traditionally of greatest value to the CTUIR. (Exhibit 3-2). Historic, current, and potential smolt production in the tributaries in the subwatersheds was also used to identify those subwatersheds with the greatest potential impact on focal aquatic species (Exhibit 3-3). All these factors went into identifying the subwatersheds with the greatest potential for restoration and conservation in the Subbasin (Exhibit 3-4).

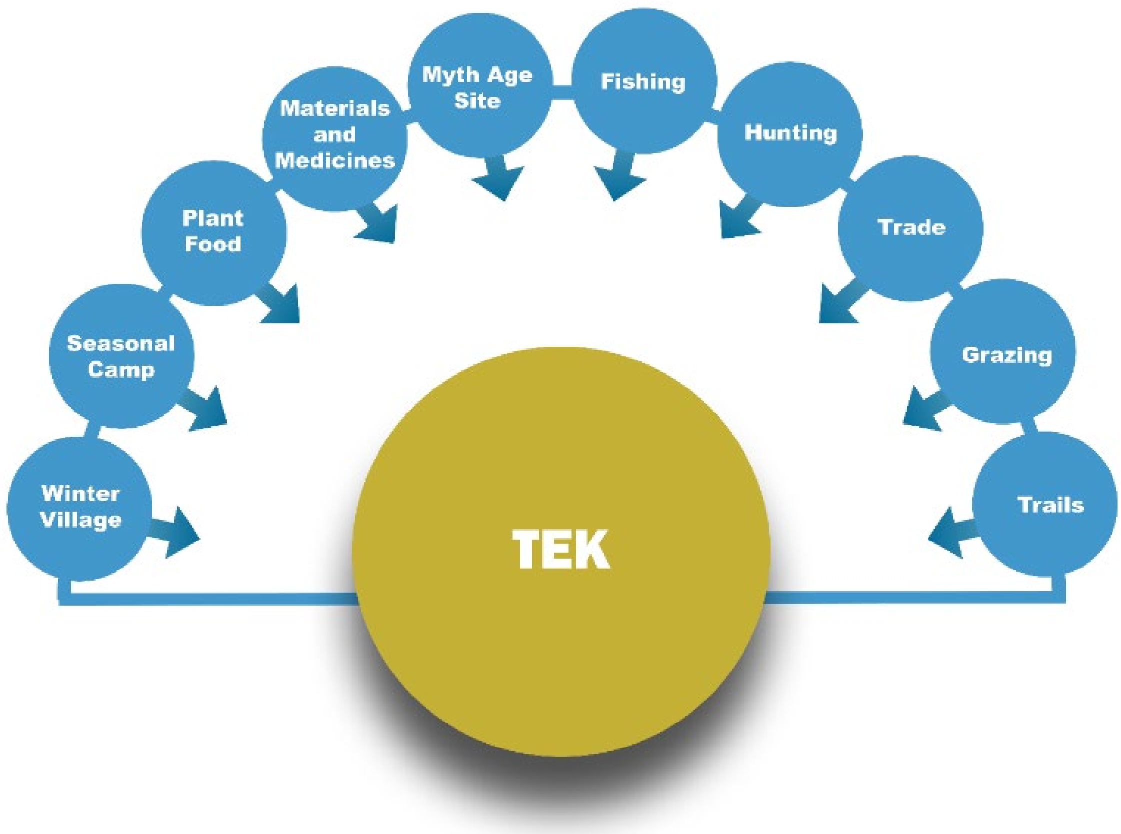


Exhibit 3-2. Traditional Ecological Knowledge Prioritization Factors

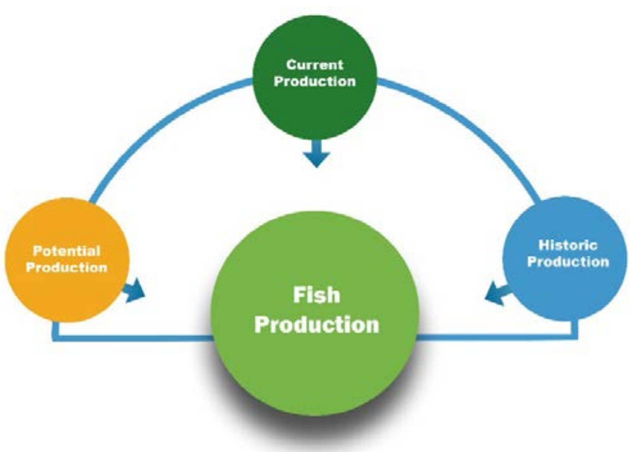


Exhibit 3-3. Fish Production Prioritization Factors

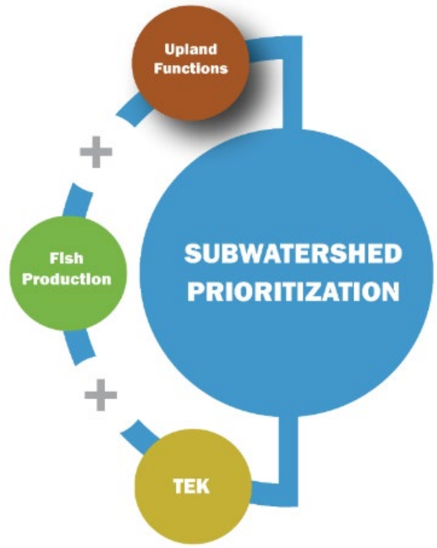


Exhibit 3-4. Subwatershed Prioritization Factors

The prioritization tool (Exhibit 3-5) uses data from the Assessment to provide a score for subwatersheds, based on departure from historic uplands conditions and potential smolt production. The subwatershed prioritization tool is adaptive, which allows the CTUIR to update the tool as data are compiled. The tool includes the following components:

- Overview of the watersheds and subwatersheds in the Subbasin;
- Overview of the subwatershed scoring and prioritization rankings;
- Tab for overriding scores for each Uplands Vision Touchstone;
- Chart displaying the prioritization scores for each subwatershed;
- Scores for each metric calculated for the Uplands Vision Touchstones;
- Summary of subwatershed prioritization scores and tiers for use in GIS;
- Raw data used in the Assessment for scoring and prioritization of each subwatershed;
- Tab for overriding or updating data inputs for each Uplands Vision Touchstone; and
- Summary of the smolt production potential (SPP) model data completed for the Assessment for each subwatershed and each focal species.

	UMATILLA SUBBASIN WATERSHEDS AND SUBWATERSHEDS												
	FISH PRODUCTION POTENTIAL			UPLANDS FUNCTION SCORING						TEK	RESULTS		
	HISTORIC SCORE	CURRENT SCORE	POTENTIAL SCORE	ROADS SCORE	VEGETATION SCORE	SOILS SCORE	BRAT SCORE	WETLANDS SCORE	SPRINGS SCORE	TEK SCORE	CUMULATIVE SCORE	RANKING	
Most Departed	5	5	5	5	5	5	5	5	5	10	55	Tier I	Highest Priority
↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	↕	Tier II	↕
Least Departed	1	1	1	1	1	1	1	1	1	0	9	Tier III	Lowest Priority

Exhibit 3-5. Subwatershed Prioritization Tool

River Vision function in the reaches of the Umatilla River was characterized by departure from historic conditions for each of the Touchstones: Hydrology, Geomorphology, Connectivity, Riparian Vegetation, and Aquatic Biota (Exhibit 3-6). Historic, current, and potential smolt production in the reaches of the Umatilla River was also utilized to identify which reaches have the greatest potential impact on focal aquatic species (refer to Exhibit 3-3). TEK was also characterized for each reach of the Umatilla River, identifying which reaches were traditionally of greatest value to the CTUIR. All of these factors went into identifying the reaches of the Umatilla River with the greatest potential for restoration and conservation (Exhibit 3-7).

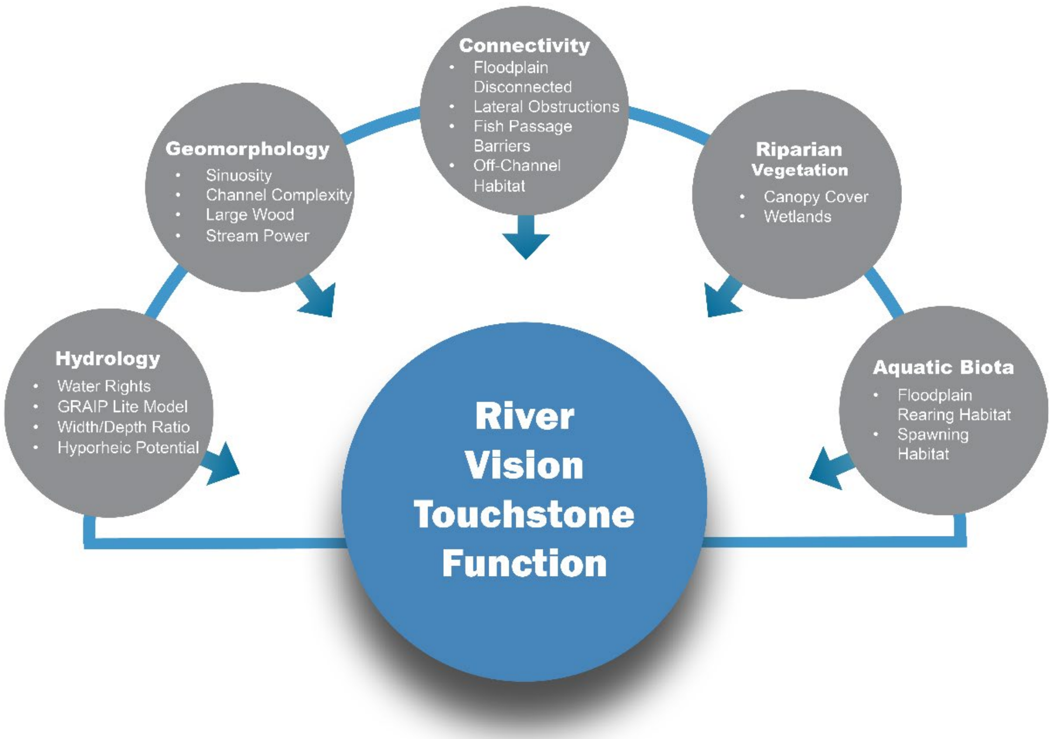
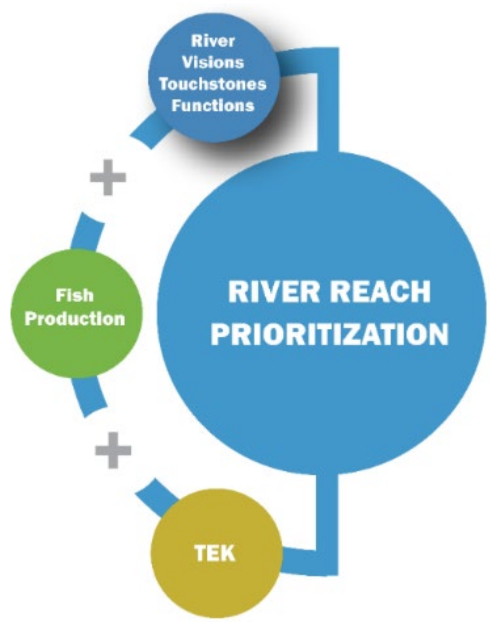


Exhibit 3-6. River Vision Function Prioritization Factors

Exhibit 3-7. Umatilla River Reach Prioritization Factors



The prioritization tool (Exhibit 3-8) uses data from the Assessment to provide a score for subwatersheds, based on departure from historic uplands conditions and potential smolt production. The reach prioritization tool is adaptive, which allows the CTUIR to update the tool as data are compiled. The tool includes the following components:

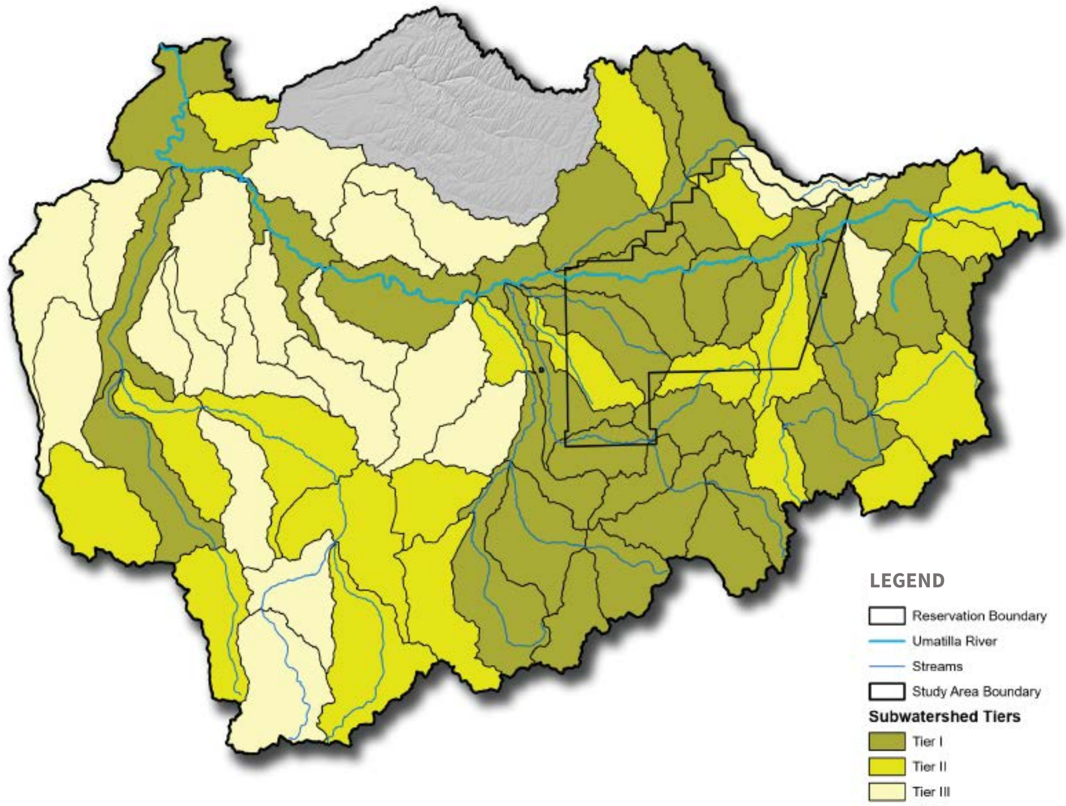
- Overview of the reach delineation for the Assessment;
- Overview of the reach scoring and prioritization rankings;
- Tab for overriding scores for each River Vision Touchstone;
- Chart displaying the prioritization scores for each reach;
- Scores for each metric calculated for the River Vision Touchstones;
- Summary of reach prioritization scores and tiers for use in GIS;
- Raw data used in the Assessment for scoring and prioritization of each reach;
- Tab for overriding or updating data inputs for each River Vision Touchstone; and
- Summary of the smolt production potential (SPP) model data completed for the Assessment for each reach and focal species.

	FISH PRODUCTION POTENTIAL			RIVER VISION FUNCTION SCORING																TEK	RESULTS		
				HYDROLOGY				GEOMORPHOLOGY				CONNECTIVITY				RIPARIAN		AQUATIC BIOTA					
	HISTORIC SCORE	CURRENT SCORE	POTENTIAL SCORE	WATER RIGHTS SCORE	GRAIP LITE SCORE	BANKFULL SCORE	HYPORHEIC POTENTIAL SCORE	SINUOSITY SCORE	CHANNEL COMPLEXITY SCORE	LARGE WOOD SCORE	SEDIMENT TRANSPORT SCORE	PERCENT DISCONNECTED SCORE	LATERAL OBSTRUCTION SCORE	LONGITUDINAL OBSTRUCTION SCORE	OFF-CHANNEL HABITAT SCORE	CANOPY COVER SCORE	WETLANDS SCORE	REARING HABITAT SCORE	SPAWNING HABITAT SCORE	TEK SCORE	CUMULATIVE SCORE	RANKING	
Most Departed	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	10	**105**	Tier I	Highest Priority
																						Tier II	
Least Departed	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	**19**	Tier III	Lowest Priority

Exhibit 3-8. River Vision Function Prioritization Tool

3.2 Umatilla Subbasin Subwatershed Prioritization Results

Subwatersheds were prioritized based on departure from historic conditions for the Uplands Vision Touchstones, smolt production, and TEK data for the subwatersheds of the Subbasin. The more departed the subwatershed from historic conditions, the higher the prioritization for restoration actions. The highest priority subwatersheds were those most departed from historic conditions and were identified as Tier I, subwatersheds moderately departed from historic conditions were identified as Tier II, and subwatersheds least departed from historic conditions were identified as Tier III (Exhibit 3-9).[2]



2/ The Cold Springs Canyon Watershed (gray area) is listed by the USGS as a part of the 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 historically had no influence on the lower Umatilla River.

Exhibit 3-9. Umatilla Subbasin Subwatershed Prioritization Results

3.3 Umatilla River Reach Prioritization Results

Umatilla River reaches were prioritized based on departure from historic River Vision Touchstone conditions, smolt production, and TEK data for the reaches of the Umatilla River. The more departed the reach from historic conditions, the higher the prioritization for restoration actions. The highest priority reaches were those most departed from historic conditions and were identified as Tier I, reaches moderately departed from historic conditions were identified as Tier II, and reaches least departed from historic conditions were identified as Tier III (Exhibit 3-10). The North Fork and South Fork of the Umatilla River were prioritized as "Conservation" or "Restoration" rather than Tiers because of the lack of data available and analyzed in these reaches.

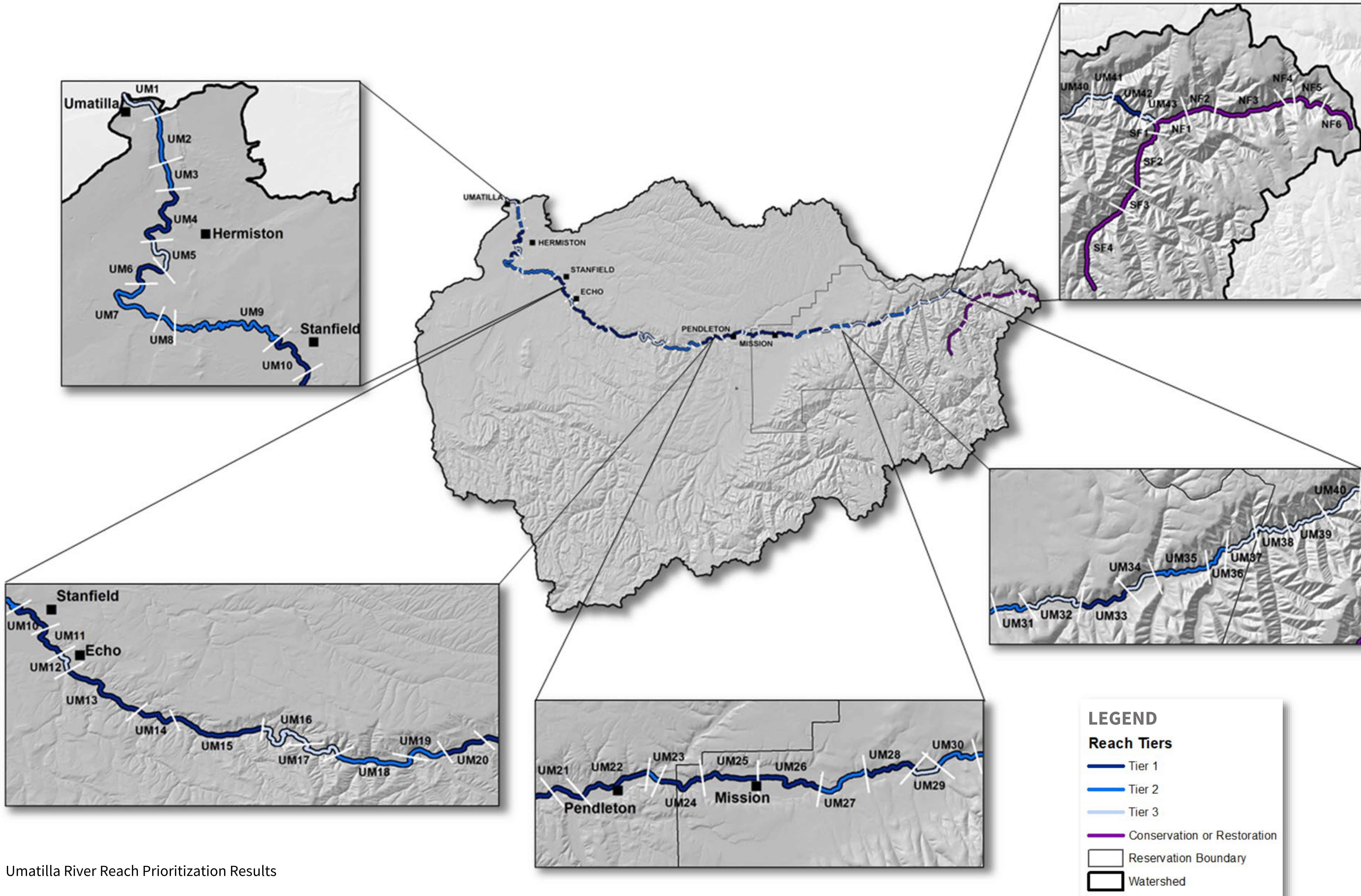
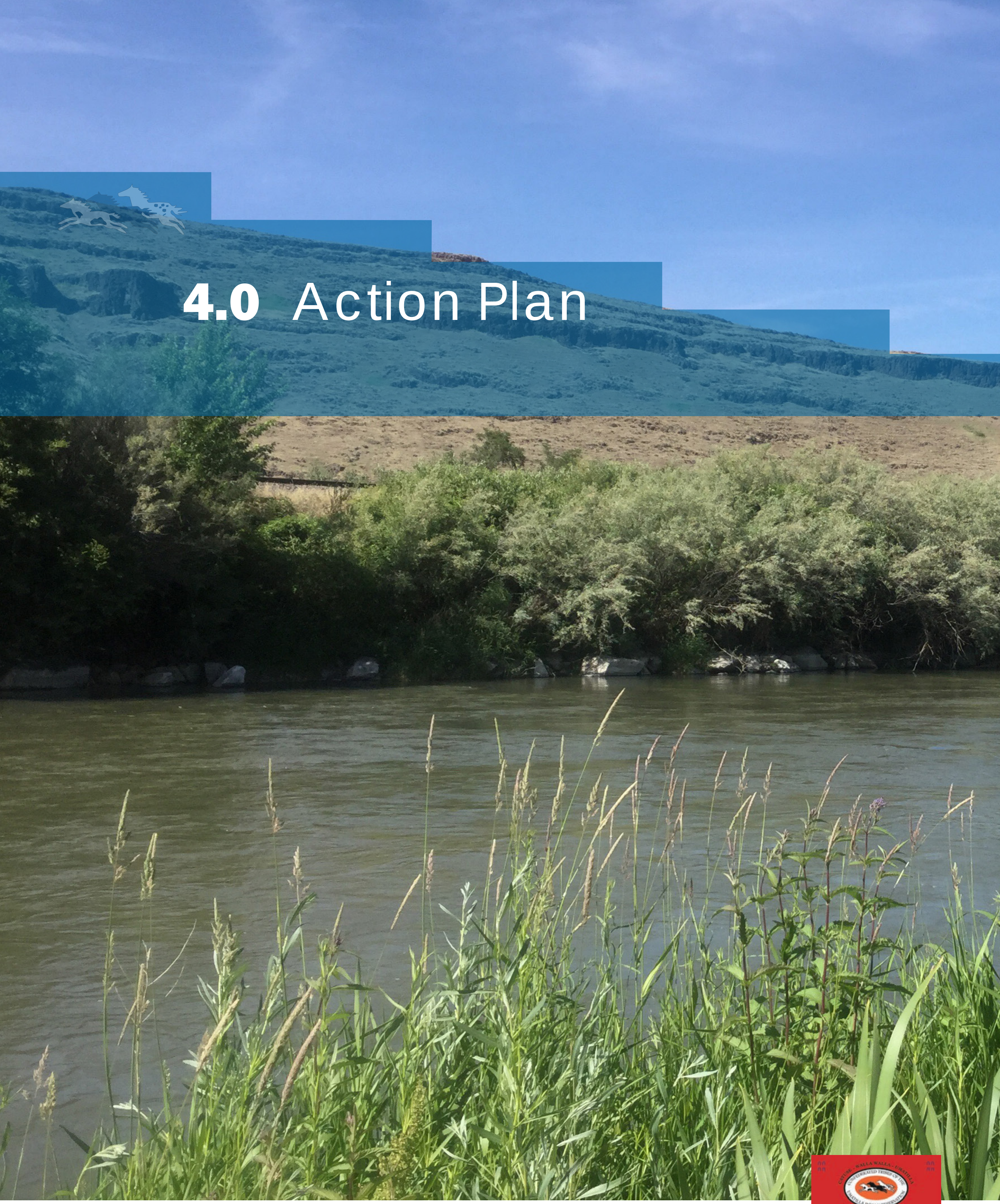


Exhibit 3-10. Umatilla River Reach Prioritization Results

4.0 Action Plan



This section presents the Action Plan, an approach for incorporating an adaptive strategy to guide, re-evaluate, and inform process-based restoration priorities for meeting aquatic focal species recovery goals and objectives during the 30-year life of the Action Plan. The Action Plan includes:

- **Section 4.1:** Umatilla Subbasin Uplands Restoration Plan
- **Section 4.2:** Umatilla River Restoration Plan
- **Section 4.3:** Conceptual Designs
- **Section 4.4:** Strategic Planning Process
- **Section 4.5:** Implementation Pathways and Timeline

Numerous management plans have been compiled by the CTUIR in the Subbasin, including the Forest Management Plan (CTUIR 2010), Agricultural Resource Management Plan (CTUIR 2015), Integrated Weed Management Plan (CTUIR 2018), and Rangeland Resource Inventory (Synergy Resource Solutions, Inc. 2009). This Action Plan was developed to prioritize strategies that highlight riparian protection and vegetation enhancement identified to address priority process impacts, contribute towards achievement of healthy watersheds per the CTUIR DNR's River Vision, increase traditional First Foods abundance and use opportunities, contribute to the achievement of subbasin plan and ESA recovery plan goals, assist in recovery of ESA subject species, and address water quality limiting factors per Clean Water Act 303d listing (i.e., temperature, turbidity, sedimentation, and habitat complexity).

4.1 Umatilla Subbasin Uplands Restoration Plan

The Umatilla Subbasin Uplands Restoration Plan (USURP) utilizes the Assessment and prioritization tool to identify the highest priority subwatersheds where opportunities can be identified and actions can be evaluated and planned for implementation. To aid in evaluating and planning, an opportunities tool (see description below) was developed. Combined, the USURP utilizes the Assessment, prioritization tool, and opportunities tool—along with on-the-ground action and monitoring—to implement protection, restoration, and enhancement efforts in support of the CTUIR Uplands Vision. The USURP provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring (Exhibit 4-1).

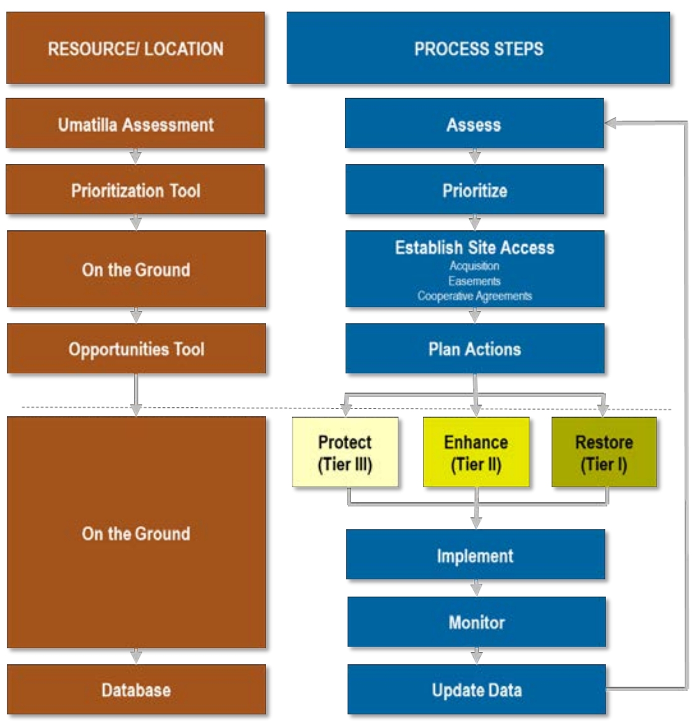


Exhibit 4-1. Uplands Restoration Plan Process

The first step in developing the USURP is assessment. Data needed to inform this stage are provided in the Assessment and are meant to be updated as new information is obtained or as specific actions are implemented. Prioritization of subwatersheds in the Subbasin is the second step and is carried out using the prioritization tool (see Section 3.0). Assessment and prioritization can also be undertaken at different scales. For example, a particular watershed can be assessed and subwatersheds within can be prioritized for actions.

Establishing site access to carry out protection, enhancement, or restoration actions is the third step. Establishing site control can be accomplished through direct land acquisition, establishing easements, or cooperative agreements as described below. To effectively advance to the fourth step, aggressive, large-scale action planning is needed in the Subbasin. Examples of large-scale planning efforts include:

- **Subbasin Wide Cooperative Data Management** – As described in Section 1.5, data gaps exist throughout the Subbasin for critical uplands metrics. Subbasin-wide cooperative data management would include all relevant partners such as the CTUIR, U.S. Forest Service (USFS), Oregon Department of Transportation (ODOT), Umatilla County, Oregon Watershed Enhancement Board (OWEB), City of Pendleton, and Oregon Department of Fish and Wildlife (ODFW), among others. Cooperative data management would include building digital data repositories that would house updated information and that could be freely accessed by agreed upon partners. Examples of potential uplands data gaps to fill in the Subbasin include the geographic extent of invasive plant species, native plant inventories, the extent and function of wetlands, extent of existing beaver activity, big game historic and current habitat availability, and updated roads layers to improve understanding of fine sediment input from roads.
- **Land Acquisition or Agreements** – Large-scale land acquisition or landowner agreements with Subbasin stakeholder or private landowners should be pursued to provide comprehensive uplands implementation opportunities. Patchwork implementation of uplands planning provides some progress, but to restore the health of the Subbasin and the sustainable production of First Foods, large-scale, comprehensive actions must be taken to improve uplands function.
- **Uplands Development Policies** – Policies designating uplands function in the Subbasin as the highest priority must be developed and implemented. Many of these policies exist in the previously described management plans. However, these policies must be coalesced and become the governing principles for responsible use of uplands resources.

Alongside the large-scale planning efforts listed above, Subbasin managers can identify specific planning actions as the fourth step in the USURP process. Specific action-type categories include protection, enhancement, and/or restoration (Section 4.1.1). These specific action types provide a blueprint for planning throughout the Subbasin at the subwatershed scale to improve uplands function following the Uplands Vision Touchstones.

Following action planning, implementation of the identified action types is the fifth step. Follow-up monitoring and data management will aid in tracking restoration performance and future needs over time. The monitoring and data management will be used to update the prioritization tool and continue the USURP process.

The following sections provide a list of specific, but not comprehensive, action types that can be taken to improve uplands function. These action types were used and included in the opportunities spreadsheet tool and used to evaluate potential conditions that could result in the subwatershed. The opportunities tool shows the potential benefit to uplands function based on the selected action types and is described in further detail in Section 4.1.2.

4.1.1 Action Types

Uplands restoration project action types were identified by selecting groups of restoration and habitat enhancement actions that would have the greatest impact on improving Uplands Vision function (Exhibit 4-2) from the Bonneville Power Administration (BPA) Atlas Restoration Prioritization Framework (BPA 2017). Project actions will promote the development of healthy riparian and uplands areas to improve sustainable growth of First Foods and overall subwatershed health. The list of project activities provides a wide selection of passive and active restoration approaches. However, the list is not all-inclusive as other potential approaches might be identified.

4.1.2 Umatilla Subbasin Subwatershed Actions

Project actions were identified for each subwatershed in the Subbasin from the list of 15 uplands treatment group and activities, arranged from passive to active (Exhibit 4-2). Each proposed action was identified with a specific purpose and expected uplands function benefits. Actions were identified to be the most effective and appropriate for each subwatershed. Some actions are designed to provide a restoration action plan for the uplands in the Subbasin such as land management, while others are designed to provide on-the-ground benefits, such as introducing beavers to subwatersheds to promote healthy ecosystems throughout the Subbasin.

	Uplands Treatment Group and Activities	Uplands Functions Benefits					
	Land and Water Preservation	Roads	Vegetation	Soils	BRAT	Wetlands	Springs
1	Protection: Acquisitions, Easements, Cooperative Agreements	–	++	+	+	+	++
2	Land Management: Grazing Plans, Fire Management, Etc.	–	++	+	+	+	++
	Water Quality Improvements	Roads	Vegetation	Soils	BRAT	Wetlands	Springs
3	Reduce – Mitigate Point or Non-Point Source Impacts	–	–	++	–	–	+
4	Nutrients Additions (Carcasses)	–	+	++	–	–	–
5	Upland Vegetation Treatment – Management	–	+++	+	+	–	–
	Sediment Reduction	Roads	Vegetation	Soils	BRAT	Wetlands	Springs
6	Road Grading – Drainage Improvements	++	–	+	–	–	–
7	Road Decommissioning or Abandonment	+++	–	++	–	–	–
	Water Quantity	Roads	Vegetation	Soils	BRAT	Wetlands	Springs
8	Water Management – Improve Irrigation Efficiency	–	–	–	–	++	+++
9	Acquire or Increase Instream Flow (Lease or Purchase; Groundwater Storage)	–	–	–	–	++	+++
	Riparian Restoration and Management	Roads	Vegetation	Soils	BRAT	Wetlands	Springs
10	Remove Non-Native Plants	–	+++	+	–	+	–
11	Off-Site Water Development	–	++	–	–	++	+++
12	Riparian Buffer Strip, Planting	–	++	+	+	+	–
13	Selective Thinning	–	++	–	–	–	–
14	Beaver Re-Introduction or Management	–	++	–	+++	+++	+
15	Riparian Fencing	–	+++	++	++	++	+

+++ High Benefit; ++ Moderate Benefit; + Low Benefit; – Little or No Benefit

Exhibit 4-2. Uplands Action Types

The selected actions have been incorporated into the opportunities tool, which identifies potential impact in the subwatershed based on the Uplands Vision Touchstones function factors described in Section 2.1 (i.e., hydrologic function, soil stability, landscape pattern, and biotic integrity). In addition to evaluating actions based on uplands function benefits, a feasibility factor has also been identified for each action. The feasibility factor is the potential impact of implementing each action and is weighted based on costs, intensity, and feasibility of implementation in each specific subwatershed. The opportunities tool compares the uplands function benefits and feasibility of certain actions in a subwatershed to the current function in the subwatershed to inform practitioners of the potential benefits of implementing actions in the subwatershed (Exhibit 4-3). The action types identified for each subwatershed have also been compiled in a geodatabase and map book (Appendix A – Volume 2).

Treatment Group & Activities		Uplands Functions						Activities Factors		
		ROADS	VEGETATION	SOILS	BRAT	WETLANDS	SPRINGS	COSTS	INTENSITY	FEASIBILITY
Land and Water Preservation:										
1	Protection: (Acquisitions, Easements, Coop. Agreements)	No Impact	Moderate Impact	Low Impact	Low Impact	Low Impact	Moderate Impact	Moderate	Extremely Low	High
2	Land Management: (Grazing Plans, Fire management, etc.)	No Impact	Moderate Impact	Low Impact	Low Impact	Low Impact	Moderate Impact	Low	Low	High
Water Quality Improvements:										
3	Reduce - Mitigate Point or Non-Point Source Impacts	No Impact	No Impact	Moderate Impact	No Impact	No Impact	Low Impact	Low	Low	High
4	Nutrients Additions (carcasses)	No Impact	Low Impact	Moderate Impact	No Impact	No Impact	No Impact	Moderate	Low	Extremely High
5	Upland Vegetation Treatment - Management	No Impact	High Impact	Low Impact	Low Impact	No Impact	No Impact	Moderate	Low	High
Sediment Reduction:										
6	Road Grading - Drainage Improvements	Moderate Impact	No Impact	Low Impact	No Impact	No Impact	No Impact	High	Moderate	High
7	Road Decommissioning or Abandonment	High Impact	No Impact	Moderate Impact	No Impact	No Impact	No Impact	Moderate	Low	Moderate
Water Quantity:										
8	Water Management-Improve Irrigation Efficiency	No Impact	No Impact	No Impact	No Impact	Moderate Impact	High Impact	Moderate	Moderate	High
9	Acquire or Increase Instream Flow (Lease/Purchase; GW Storage)	No Impact	No Impact	No Impact	No Impact	Moderate Impact	High Impact	Moderate	Low	Low
Riparian Restoration and Management:										
10	Remove Non-native Plants	No Impact	High Impact	Low Impact	No Impact	Low Impact	No Impact	Low	High	Moderate
11	Off--Site Water Developments	No Impact	Moderate Impact	No Impact	No Impact	Moderate Impact	High Impact	Low	Low	Low
12	Riparian Buffer Strip, Planting	No Impact	Moderate Impact	Low Impact	Low Impact	Low Impact	No Impact	Moderate	High	High
13	Selective Thinning	No Impact	Moderate Impact	No Impact	No Impact	No Impact	No Impact	Low	Moderate	High
14	Beaver Re-introduction or Management	No Impact	Moderate Impact	No Impact	High Impact	High Impact	Low Impact	Moderate	Moderate	Low
15	Riparian Fencing	No Impact	High Impact	Moderate Impact	Moderate Impact	Moderate Impact	Low Impact	Moderate	Moderate	High

1 Potential benefit to uplands function chosen by CTUIR for each uplands restoration action.

2 Feasibility for each uplands restoration action chosen by CTUIR.

POTENTIAL SUBWATERSHED ACTIONS			ACTIVITY SCORES BY UPLANDS FUNCTION					
ACTIVITY NO.	ACTIVITY	ACTIVITY FEASIBILITY	ROADS	VEGETATION	SOILS	BRAT	WETLANDS	SPRINGS
1	Protection: (Acquisitions, Easements, Coop. Agreements)	Moderate	0.0	0.1	0.1	0.1	0.0	0.1
2	Land Management: (Grazing Plans, Fire management, etc.)	Moderate	0.0	0.1	0.1	0.1	0.0	0.1
4	Nutrients Additions (carcasses)	High	0.0	0.1	0.3	0.0	0.0	0.0
7	Road Decommissioning or Abandonment	Low	1.8	0.0	0.3	0.0	0.0	0.0
		ACTIONS SCORE	1.8	0.4	0.8	0.1	0.1	0.2
		EXISTING SCORE	3.5	2.1	3.9	1.0	1.0	1.0
		POTENTIAL SCORE	1.8	1.8	3.1	0.9	0.9	0.8

EXISTING CUMULATIVE SCORE	22.5
EXISTING TIER	Tier I
POTENTIAL IMPACT	3.2
POTENTIAL SCORE	19.3
COST FACTOR	0.5
INTENSITY FACTOR	0.3
FEASIBILITY FACTOR	1.0
FEASIBLE SCORE	19.0
POTENTIAL TIER	Tier II

3 Subwatershed uplands restoration actions chosen by CTUIR. Feasibility chosen by CTUIR for each action within a particular subwatershed.

4 Cumulative benefits of uplands restoration actions on the subwatershed are calculated.

Exhibit 4-3. Subwatershed Opportunities Tool Components

4.2 Umatilla River Restoration Plan

The Umatilla River Restoration Plan (URRP) uses the Assessment, prioritization tool, and opportunities tool—along with on-the-ground action and monitoring—to implement protection, restoration, and enhancement efforts in support of the CTUIR River Vision. The URRP provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring. The URRP includes two monitoring plans: the Floodplain Monitoring Plan (FpMP) (Section 4.2.1) and the Fisheries Monitoring Plan (FshMP) (Section 4.2.2). Similar to the USURP, aggressive, large-scale action planning is needed in the Umatilla River to meet fisheries co-managers' comprehensive goals and objectives in the Subbasin as they relate to First Foods, ESA, and recovery plans, relative Viable Salmonid Population (VSP) targets, and the Columbia Basin Biological Opinion.

Examples of large-scale planning efforts include:

- **Cooperative Data Management** – As described in Section 1.5, data gaps exist throughout the Subbasin for critical River Vision metrics. Cooperative data management, similar to that described in Section 4.0, would include building digital data repositories to store updated information that can be freely accessed by the agreed upon partners. Examples of potential River Vision data gaps to fill include bathymetric data for the entire Umatilla River, the extent and function of wetlands in the Umatilla River floodplain, and extent of existing beaver activity in the Umatilla River.
- **Floodplain Acquisition or Agreements** – Active pursuit of high priority, large-scale floodplain acquisition or landowner agreements should be pursued to provide comprehensive floodplain strategic action opportunities. Patchwork implementation of river restoration planning provides some progress, but to restore the full floodplain and fisheries functions of the Umatilla River and the sustainable production of First Foods, large-scale, comprehensive actions must be taken to improve River Vision Touchstone functions. Aggressive acquisition of floodplains sets the CTUIR up for success in implementing the types of floodplain development policies that will ultimately provide the maximum benefit to the health of the Umatilla River.
- **Floodplain Development Policies** – Policies designating floodplain function in the Umatilla River as the highest priority must be developed and implemented. Floodplain development should be discouraged and managed with greater understanding of flood risk management and impacts to resources, whether that is agricultural, residential, or otherwise. Stricter floodplain policies are necessary to 1) reduce flooding risk and impact issues (i.e., impacts to infrastructure), 2) restore floodplain functionality and connectivity that is vital to the function of the Umatilla River, and 3) uplift fisheries production throughout the Umatilla River to promote sustainable First Foods for Tribal and non-Tribal use.
- **Lateral and Longitudinal Restoration Approach** – Alongside establishment of floodplain policies described above, aggressive restoration approaches should be implemented at the reach-scale and beyond. Aggressive approaches for restoration should include both lateral (i.e., levee removal or setback, floodplain excavation, wetland enhancement) and longitudinal (i.e., large wood structures installation, side channel and off-channel habitat connection, and removal of dams and culverts) actions. This approach will promote self-sustaining wood recruitment over time, maximize loading of wood volumes throughout all reaches of the Umatilla River, decrease stream power and promote hyporheic exchange, and create riparian habitats capable of sustaining cultural and native plants that provide buffers to expected climate impacts.

4.2.1 Floodplain Monitoring Plan (FpMP) Process

The FpMP uses the Assessment, prioritization tool, and opportunities tool—along with on-the-ground action and monitoring—to implement protection, restoration, and enhancement efforts in support of the CTUIR River Vision. To protect is to maintain the ability of habitat and related natural systems to sustainably function. To restore is to bring habitat back to a desired conservation condition. To enhance is to increase the ability of habitat and related natural systems to sustainably function. If conditions remain stagnant or seem to be degrading, further enhancement and/or restoration plan actions will need to be implemented. If enhanced floodplain conditions are observed, protection of these natural systems will continue.

The FpMP provides a process to implement and monitor the aggressive, large-scale approaches described above (Exhibit 4-4). The first step in developing the FpMP is assessment. Data needed to inform this stage are already provided in the Assessment and is meant to be updated as new information is obtained, or as specific actions are implemented. Prioritization of reaches of the Umatilla River is the second step and is done in the prioritization tool that is detailed in Section 3.1. Assessment and prioritization can also be undertaken at different scales. For example, a particular set of reaches can be assessed and prioritized for actions. The collection of River Vision Touchstones metrics is associated with information provided in the Assessment.

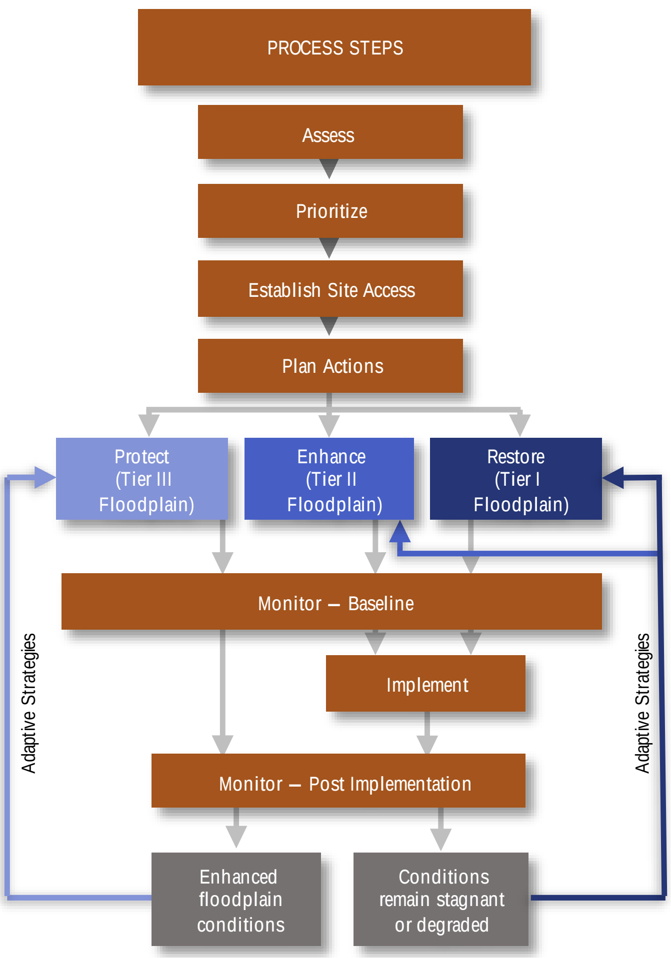


Exhibit 4-4. Floodplain Monitoring Plan (FpMP)

Establishing site access of large swaths of the floodplain of the Umatilla River to carry out protection, enhancement, or restoration actions is the third step. Establishing site control can be accomplished through direct land acquisition, establishing easements, or cooperative agreements as described in Section 4.2.

How functional the floodplain is should be identified using the prioritization as described in Section 3.3. Floodplains that are identified as Tier III are likely to be slated for "Protection." Tier II sites are likely to need "Enhancement," and Tier I sites are likely to need full "Restoration." These general categories are arranged from most passive to most intensive. Enhancement and restoration activities require an implementation stage that would include designing project elements to maximize benefit to the floodplain, followed by construction of the design. All categories would then be monitored to characterize the floodplain metrics and assess whether improvements have been made. If monitoring shows that improvements have been made, the site should be put in the "Protection" category and monitoring should be continued to ensure benefits are sustainable. If monitoring shows that improvements have not been made or have not improved enough, then adaptive strategies will be necessary for the site and should be considered for more aggressive "Enhancement" or "Restoration" strategies.

4.2.2 Fisheries Monitoring Plan (FshMP) Process

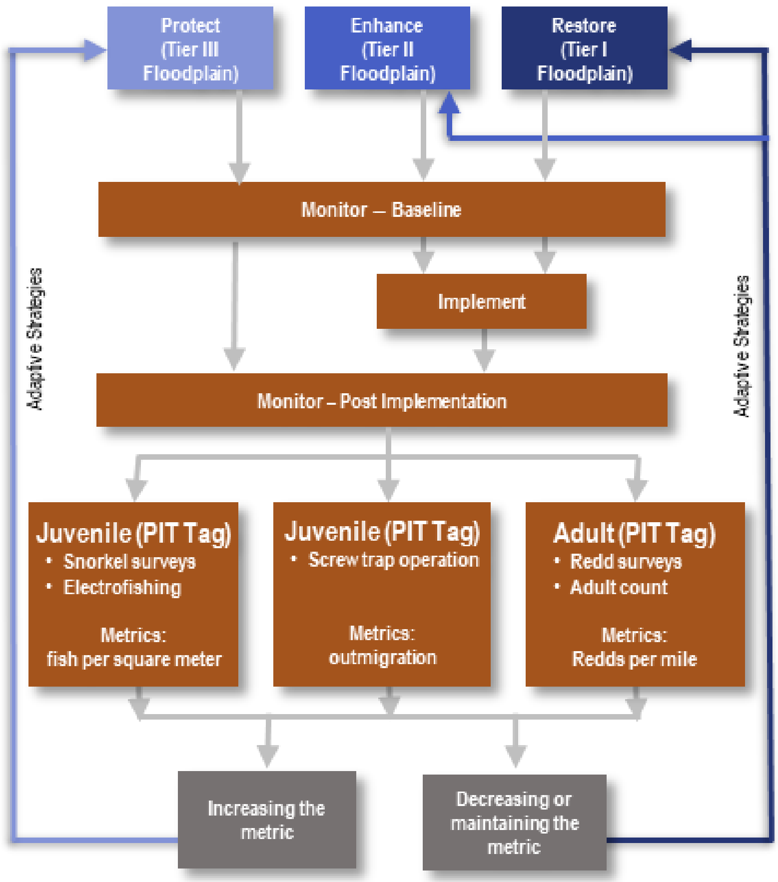


Exhibit 4-5. Fisheries Monitoring Plan (FshMP)

While the FpMP provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring in the floodplain, the FshMP provides a pathway to maximize productivity and survival of focal aquatic species via habitat improvements across the floodplain at multiple flows. The plan is tied to the FpMP in that the FpMP informs the decisions made for restoration actions on the Umatilla River, which ultimately benefit the aquatic species that reside in the river. Following implementation of the FpMP actions, the FshMP provides a process by which fisheries managers can monitor and assess aquatic species in the Umatilla River (Exhibit 4-5).

As described in the FpMP, floodplain actions include protection, enhancement, or restoration. Following implementation of enhancement or restoration actions, monitoring of the project is conducted for both floodplain metrics (Section 4.2.1) as well as fisheries metrics. The collection of fisheries metrics is associated with focal fish species and includes both juvenile and adult categories. For juveniles, monitoring methods include snorkel surveys, passive integrated transponder (PIT) tags, electrofishing, and, where appropriate, screw trap operations. Methods for monitoring adults include PIT tags, redd surveys, and, where appropriate, dam or weir counts. Calculated metrics from snorkel surveys or electrofishing include juvenile density estimates of the number of fish per square meter, while screw trap operations provide an estimate of annual outmigration abundance. The primary calculated metric for adults is the number of redds per mile, or secondarily, annual passage counts at dams or weirs.

Following project actions, if increases in these metrics are documented, then site protection may be warranted. Conversely, if increases are not documented, then further enhancement or restoration may be justified. For example, if a project is implemented with only enhancement measures and post-implementation monitoring shows that juvenile fish per square meter is not improving in the project area, then the site may need to be more intensely restored. Using these metrics at a scale that includes the entirety of the Umatilla River would provide adequate data to inform fisheries managers what kind of impact these projects are having on fish production. Increased juvenile densities and redd abundance throughout the Umatilla River would indicate an improvement in production. The insight gained from the monitoring of fisheries improves the ability of practitioners to utilize the prioritization tool for adaptive strategies and prioritization.

4.2.3 Action Types

Restoration project actions were identified by selecting groups of restoration and habitat enhancement actions that would have the greatest impact on River Vision Touchstone function for each reach in the Umatilla River. The list includes 40 floodplain treatment group and activities, arranged from passive to active, selected from the Restoration Prioritization Framework: User's Manual (BPA 2017). Project actions will promote development of healthy riparian areas and functional floodplains to promote sustainable growth of First Foods and to promote overall ecological health.

4.2.4 Umatilla River Actions

Each proposed action was identified with a specific purpose and expected river function benefits. Actions were identified to be the most effective and appropriate actions for each reach. Some actions were designed to encourage aggradation and reconnection of the floodplain, while others are designed to increase channel complexity, provide cover, and catch mobile debris or provide infrastructure protection where needed.

The selected actions have been incorporated in the opportunities tool, which identifies potential impact in the reach based on the River Vision Touchstone function factors described in Section 2.2. In addition to evaluating actions based on river function benefits, a feasibility factor also has been identified for each action. The feasibility factor is the potential impact of implementing each action and is weighted based on costs, intensity, and feasibility of implementation in each specific reach. The opportunities tool compares the river function benefits and feasibility of certain actions in a reach to the current function in the reach to inform practitioners of the potential benefits of implementing actions (Exhibit 4-6). The action types identified for each reach have been compiled in a geodatabase and a reach-by-reach map book (Appendix B).

Treatment Group & Actions		Hydrology	Geomorphology	Connectivity	Riparian Vegetation	Aquatic Biota	Costs	Intensity	Feasibility
		Touchstones							
Land and Water Preservation:									
1	Protection: (Acquisitions, Easements, Coop. Agreements)	Moderate Impact	Moderate Impact	Low Impact	Low Impact	Low Impact	Moderate	Extremely Low	High
2	Land Management: (Grazing Plans, Fire management, etc.)	Moderate Impact	Moderate Impact	Low Impact	Moderate Impact	Low Impact	Low	Low	High
Water Quality Improvements:									
3	Reduce - Mitigate Point or Non-Point Source Impacts	Low Impact	Lowest Impact	Lowest Impact	Lowest Impact	Low Impact	Low	Low	High
4	Nutrients Additions (carcasses)	Lowest Impact	Lowest Impact	Lowest Impact	Moderate Impact	Low Impact	Moderate	Low	Extremely High
5	Upland Vegetation Treatment - Management	Moderate Impact	Lowest Impact	Lowest Impact	Moderate Impact	Low Impact	Moderate	Low	High
Sediment Reduction:									
6	Road Grading - Drainage Improvements	Moderate Impact	Lowest Impact	Lowest Impact	Lowest Impact	Low Impact	High	Moderate	High
7	Road Decommissioning or Abandonment	High Impact	High Impact	Moderate Impact	Low Impact	Low Impact	Moderate	Low	Moderate
Water Quantity:									
8	Water Management-Improve Irrigation Efficiency	Moderate Impact	Lowest Impact	Lowest Impact	Lowest Impact	Lowest Impact	Moderate	Moderate	High
9	Acquire or Increase Instream Flow (Lease/Purchase; GW Storage)	High Impact	Lowest Impact	Lowest Impact	Lowest Impact	Lowest Impact	Moderate	Low	Low
Riparian Restoration and Management:									
10	Remove Non-native Plants	Low Impact	Low Impact	Lowest Impact	High Impact	Low Impact	Low	High	Moderate
11	Off--Site Water Developments	Moderate Impact	Low Impact	Lowest Impact	Moderate Impact	Low Impact	Low	Low	Low
12	Riparian Buffer Strip, Planting	Low Impact	Moderate Impact	Low Impact	Highest Impact	Moderate Impact	Moderate	High	High
13	Selective Thinning	Low Impact	Low Impact	Lowest Impact	High Impact	Low Impact	Low	Moderate	High
14	Beaver Re-introduction or Management	High Impact	High Impact	Low Impact	Moderate Impact	High Impact	Moderate	Moderate	Low
15	Riparian Fencing	Lowest Impact	Moderate Impact	Lowest Impact	High Impact	Low Impact	Moderate	Moderate	High
Bank Restoration or Modification									
16	Bank Shaping and Stabilization	Lowest Impact	High Impact	High Impact	Moderate Impact	Low Impact	Moderate	Moderate	High
17	Removal of Bank Armoring	Lowest Impact	High Impact	High Impact	High Impact	Moderate Impact	Moderate	Moderate	High
18	Restore Banklines with LWD – Bioengineering	Lowest Impact	High Impact	Moderate Impact	Highest Impact	High Impact	Moderate	Moderate	High
Instream Structures and Habitat Complexity:									
19	Boulder Placements	Lowest Impact	Moderate Impact	Lowest Impact	Lowest Impact	Moderate Impact	Low	Moderate	High
20	LWD Placements - Individual Whole Trees, Logjams, etc.	Lowest Impact	Highest Impact	Low Impact	Low Impact	Highest Impact	Moderate	Moderate	High
21	Weirs for Grade Control	Lowest Impact	Low Impact	Lowest Impact	Lowest Impact	Low Impact	Low	Moderate	Moderate
Floodplain Reconnection:									
22	Levee Modifications: Removal, Setback, Breach	Low Impact	High Impact	Highest Impact	Low Impact	Moderate Impact	High	High	Extremely Low
23	Remove and/or Relocate Floodplain Infrastructure	Lowest Impact	Moderate Impact	High Impact	Low Impact	Lowest Impact	High	High	Extremely Low
24	Restoration of Floodplain Topography and Vegetation	Low Impact	High Impact	Highest Impact	High Impact	Moderate Impact	Moderate	High	Moderate
25	Floodplain Excavation: Benching	Low Impact	Moderate Impact	Moderate Impact	Moderate Impact	Low Impact	Moderate	Moderate	High
Side Channel / Off-Channel Habitat Restoration:									
26	Improve Thermal Refugia (reconnect cold springs, winter temps)	Highest Impact	Low Impact	Moderate Impact	Low Impact	High Impact	Moderate	Moderate	Moderate
27	Perennial Side Channel	High Impact	Moderate Impact	High Impact	Moderate Impact	High Impact	Moderate	Moderate	Moderate
28	Secondary Channel (non-perennial)	Moderate Impact	Moderate Impact	Moderate Impact	Low Impact	Moderate Impact	Moderate	Moderate	Moderate
29	Floodplain Pond	High Impact	Low Impact	High Impact	Moderate Impact	Low Impact	Moderate	Moderate	Moderate
30	Wetland	High Impact	Moderate Impact	Moderate Impact	High Impact	Moderate Impact	Moderate	Moderate	Moderate
31	Alcove	Low Impact	Low Impact	Low Impact	Moderate Impact	High Impact	Moderate	Moderate	High
32	Hyporheic Off-Channel Habitat (Groundwater)	Moderate Impact	Low Impact	Low Impact	Low Impact	High Impact	Moderate	Moderate	High
Stream Channel Modifications:									
33	Spawning Gravel Augmentation	Low Impact	High Impact	Lowest Impact	Lowest Impact	Highest Impact	Moderate	High	Moderate
34	Pool Construction	Low Impact	Moderate Impact	Lowest Impact	Low Impact	High Impact	Moderate	High	Moderate
35	Riffle Construction	Low Impact	High Impact	Lowest Impact	Lowest Impact	High Impact	Moderate	High	Moderate
36	Meander (Oxbow) Re-connect - Reconstruction	Low Impact	High Impact	Moderate Impact	Moderate Impact	High Impact	Moderate	High	Low
37	Channel Reconstruction	Low Impact	Highest Impact	Low Impact	Moderate Impact	High Impact	High	High	Low
Fish Passage Restoration:									
38	Structural Passage (Diversions, Screening)	Moderate Impact	High Impact	High Impact	Low Impact	Moderate Impact	High	High	Moderate
39	Barrier or Culvert Replacement or Removal	Low Impact	High Impact	High Impact	Low Impact	High Impact	High	High	Moderate
40	Dam Removal or Breaching	High Impact	Highest Impact	High Impact	Moderate Impact	Highest Impact	Extremely High	Extremely High	Extremely Low

1 Potential benefit to River Vision Touchstone function chosen by CTUIR for each river restoration action.

2 Feasibility for each river restoration action chosen by CTUIR.

ACTIVITY NO.	ACTIVITY	ACTIVITY FEASIBILITY	HYDROLOGY	GEOMORPHOLOGY	CONNECTIVITY	RIPARIAN VEGETATION	AQUATIC BIOTA
POTENTIAL REACH ACTIONS			ACTIVITY SCORES BY TOUCHSTONE				
	Protection: (Acquisitions, Easements, Coop. Agreements)	Low	0.7	0.8	0.3	0.4	0.4
2	Land Management: (Grazing Plans, Fire management, etc.)	Moderate	0.7	0.8	0.3	0.6	0.4
37	Channel Reconstruction	Extremely Low	0.4	1.6	0.3	0.6	1.1
16	Bank Shaping and Stabilization	Low	0.1	1.2	0.7	0.6	0.4
17	Removal of Bank Armoring	Extremely Low	0.1	1.2	0.7	0.9	0.7
18	Restore Banklines with LWD - Bioengineering	Low	0.1	1.2	0.4	1.2	1.1
9	Acquire or Increase Instream Flow (Lease/Purchase; GW Storage)	Extremely High	1.1	0.2	0.1	0.1	0.1
TOTAL ACTIONS		ACTIONS SCORE	3.3	6.9	2.6	4.5	4.5
7		EXISTING SCORE	8.0	9.0	5.0	7.0	8.5
		POTENTIAL SCORE	4.7	2.1	2.4	2.5	4.1

EXISTING SCORE	50.5
EXISTING TIER	Tier III
POTENTIAL IMPACT	21.7
POTENTIAL SCORE	28.8
COST FACTOR	3.6
INTENSITY FACTOR	3.0
FEASIBILITY FACTOR	-11.7
FEASIBLE SCORE	47.0
POTENTIAL TIER	Tier III

3 River reach restoration actions chosen by CTUIR. Feasibility chosen by CTUIR for each action within a particular reach of the Umatilla River.

4 Cumulative benefits of river restoration actions on the reach calculated and benefits to River Vision Touchstones calculated.

Exhibit 4-6. Reach Opportunities Tool Components

4.3 Conceptual Opportunities

For the URRP, conceptual opportunities were developed. The intent of developing conceptual designs for groups of typical instream, riparian, and floodplain restoration or habitat enhancements is to provide approaches that are scalable and can be efficiently and effectively replicated and adapted to meet the diverse needs of the Umatilla River based on the action types described in Section 4.2.3. Typical conceptual designs were developed that are intended to provide visual representations of existing conditions of stretches of the Umatilla River and to illustrate potential future conditions. Conceptual designs are intended to assist the CTUIR and other Subbasin managers in articulating restoration goals, objectives, and results to landowners and stakeholders.

Conceptual designs were developed for six high priority reaches of the Umatilla River. Designs were developed to represent a suite of project actions along representative portions of the Umatilla River and do not necessarily correspond to specific project areas, nor do they imply landowner access or permission has been granted to conduct restoration activities on private lands. The designs that were developed include portions of the river with varying degrees of degradation and restoration potential. The following section describes conceptual designs for each of the six locations in more detail.

Based on the proposed actions identified for each project area (Exhibit 4-7), Exhibit 4-8 illustrates future conditions. Exhibit 4-8 provides summary information and diagrams associated with the River Vision Touchstone function for the six typical sites and conceptual designs. The diagrams illustrate existing conditions as represented by a typical cross-section within a given project area. The diagrams under future conditions depict results as represented by change in the typical cross section. Stages of geomorphic process are not necessarily linear in progression and may not reflect what can be achieved immediately under various restoration scenarios. Therefore, Exhibit 4-8 represents anticipated outcomes in the short term if restoration actions are initiated.

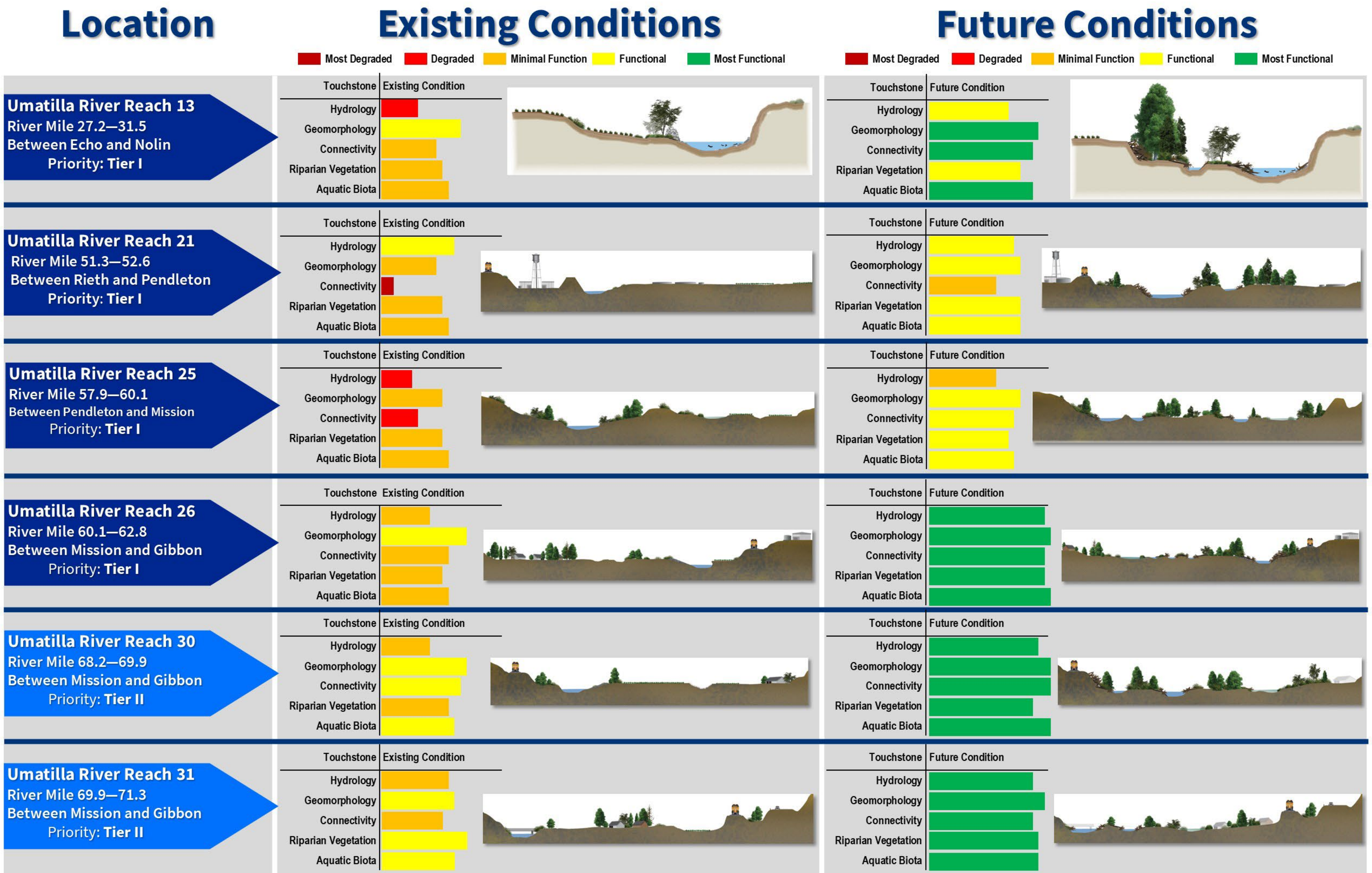
Floodplain Treatment Group and Activities		River Vision Function Benefits				
Land and Water Preservation		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
1	Protection: Acquisitions, Easements, Cooperative Agreements	+++	+++	++	++	++
2	Land Management: Grazing Plans, Fire Management, etc.	+++	+++	++	+++	++
Water Quality Improvements		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
3	Reduce – Mitigate Point or Non-Point Source Impacts	++	+	+	+	++
4	Nutrients Additions (Carcasses)	+	+	+	+++	++
5	Upland Vegetation Treatment – Management	+++	+	+	+++	++
Sediment Reduction		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
6	Road Grading – Drainage Improvements	+++	+	+	+	++
7	Road Decommissioning or Abandonment	++++	++++	+++	++	++
Water Quantity		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
8	Water Management – Improve Irrigation Efficiency	+++	+	+	+	+
9	Acquire or Increase Instream Flow (Lease or Purchase; Groundwater Storage)	++++	+	+	+	+
Riparian Restoration and Management		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
10	Remove Non-Native Plants	++	++	+	++++	++
11	Off-Site Water Development	+++	++	+	+++	++
12	Riparian Buffer Strip, Planting	++	+++	++	+++++	+++
13	Selective Thinning	++	++	+	++++	++
14	Beaver Re-introduction or Management	++++	++++	++	+++	++++
15	Riparian Fencing	+	+++	+	++++	++
Bank Restoration or Modification		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
16	Bank Shaping and Stabilization	+	++++	++++	+++	++
17	Removal of Bank Armoring	+	++++	++++	++++	+++
18	Restore Banklines with LWD - Bioengineering	+	++++	+++	+++++	++++
Instream Structures and Habitat Complexity		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
19	Boulder Placements	+	+++	+	+	+++
20	LWD Placements – Individual Whole Trees, Logjams, etc.	+	+++++	++	++	+++++
21	Weirs for Grade Control	+	++	+	+	++
Floodplain Reconnection:		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
22	Levee Modifications: Removal, Setback, Breach	++	++++	+++++	++	+++
23	Remove and/or Relocate Floodplain Infrastructure	+	+++	++++	++	+
24	Restoration of Floodplain Topography and Vegetation	++	++++	+++++	++++	+++
25	Floodplain Excavation: Benching	++	+++	+++	+++	++
Side Channel/ Off-Channel Habitat Restoration		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
26	Improve Thermal Refugia: Reconnect cold springs, winter temps	+++++	++	+++	++	++++
27	Perennial Side Channel	++++	+++	++++	+++	++++
28	Secondary Channel (non-perennial)	+++	+++	+++	++	+++
29	Floodplain Pond	++++	++	++++	+++	++
30	Wetland	++++	+++	+++	++++	+++
31	Alcove	++	++	++	+++	++++
32	Hyporheic Off-Channel Habitat (Groundwater)	+++	++	++	++	++++
Stream Channel Modifications		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
33	Spawning Gravel Augmentation	++	++++	+	+	+++++
34	Pool Construction	++	+++	+	++	++++
35	Riffle Construction	++	++++	+	+	++++
36	Meander (Oxbow) Re-connect - Reconstruction	++	++++	+++	+++	++++
37	Channel Reconstruction	++	+++++	++	+++	++++
Fish Passage Restoration		Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
38	Structural Passage (Diversions, Screening)	+++	++++	++++	++	+++
39	Barrier or Culvert Replacement or Removal	++	++++	++++	++	++++
40	Dam Removal or Breaching	++++	+++++	++++	+++	+++++

Project action types were identified by selecting groups of restoration and habitat enhancement actions that would have the greatest impact on improving River Vision function. Project actions will promote the development of natural channel processes including channel complexity, floodplain connectivity, and improvements to riparian health. Restoring these processes will aid in the formation of habitat features for aquatic species and will enhance geomorphic process. The list of project activities provides a wide selection of passive and active restoration approaches. However, the list is not all-inclusive as other potential approaches might be identified.

+++++	Highest Impact
++++	High Impact
+++	Moderate Impact
++	Low Impact
+	Lowest Impact

Exhibit 4-7. Proposed Actions for Each Project Area

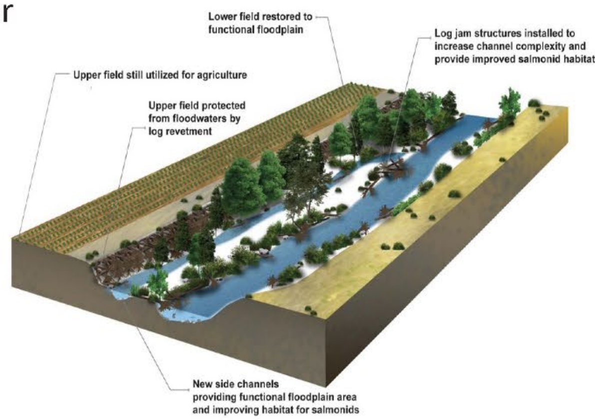
Exhibit 4-8. Summary Information and Conceptual Diagrams



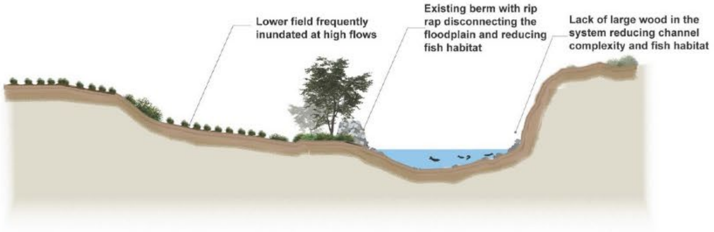
Conceptual Opportunities by Reach

The following information is provided for the **six** high priority sites:

1 Isometric views of both existing and potential future conditions

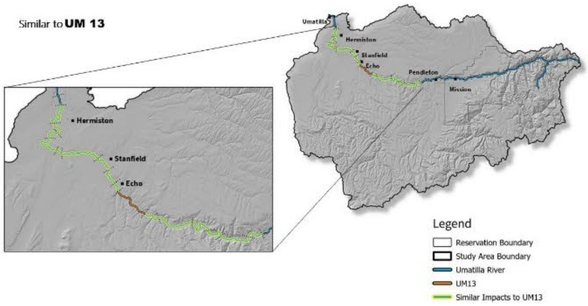


2 Cross-section views of existing and potential future conditions



3 Potential future benefits for habitat availability and smolt production in each reach, compared to historic and current conditions

4 Map of other reaches that could benefit from similar restoration actions



4.3.1 Umatilla River Reach UM 13

The Umatilla River Reach (UM) 13 conceptual design includes:

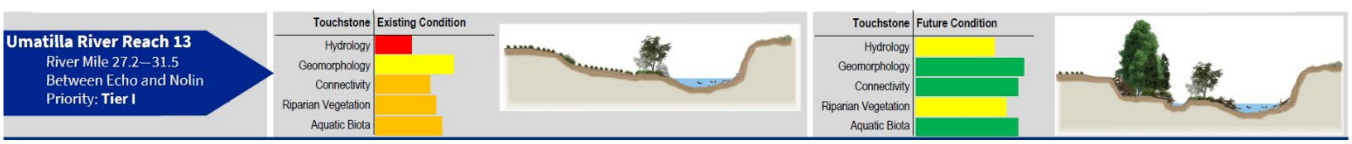
- **Floodplain restoration** – Agricultural development in the floodplain is removed and the floodplain is revegetated with riparian cover for large wood recruitment via channel migration;

- **Side channel activation** – New side channels are developed and existing side channels are reactivated in the newly reconnected floodplain;

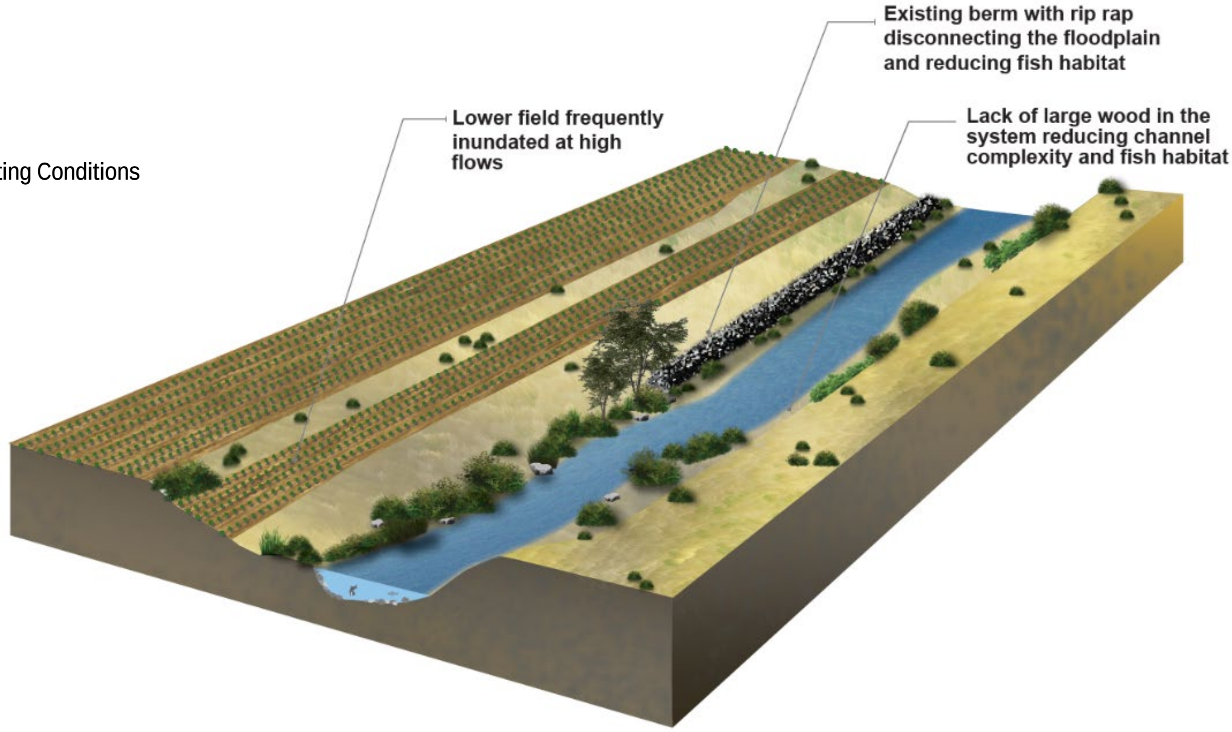
- **Berm removal** – Berms are removed from the floodplain to promote floodplain connectivity, reduce stream power, and reactivate existing side channels; and,

- **Large wood structures** – Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, and to provide protection for the remaining agricultural development adjacent to the floodplain to continue functional landowner operations.

Refer to Exhibit 4-9 and Exhibit 4-10 for a comparison of existing conditions and potential future conditions for UM 13.



Existing Conditions



Potential Future Conditions

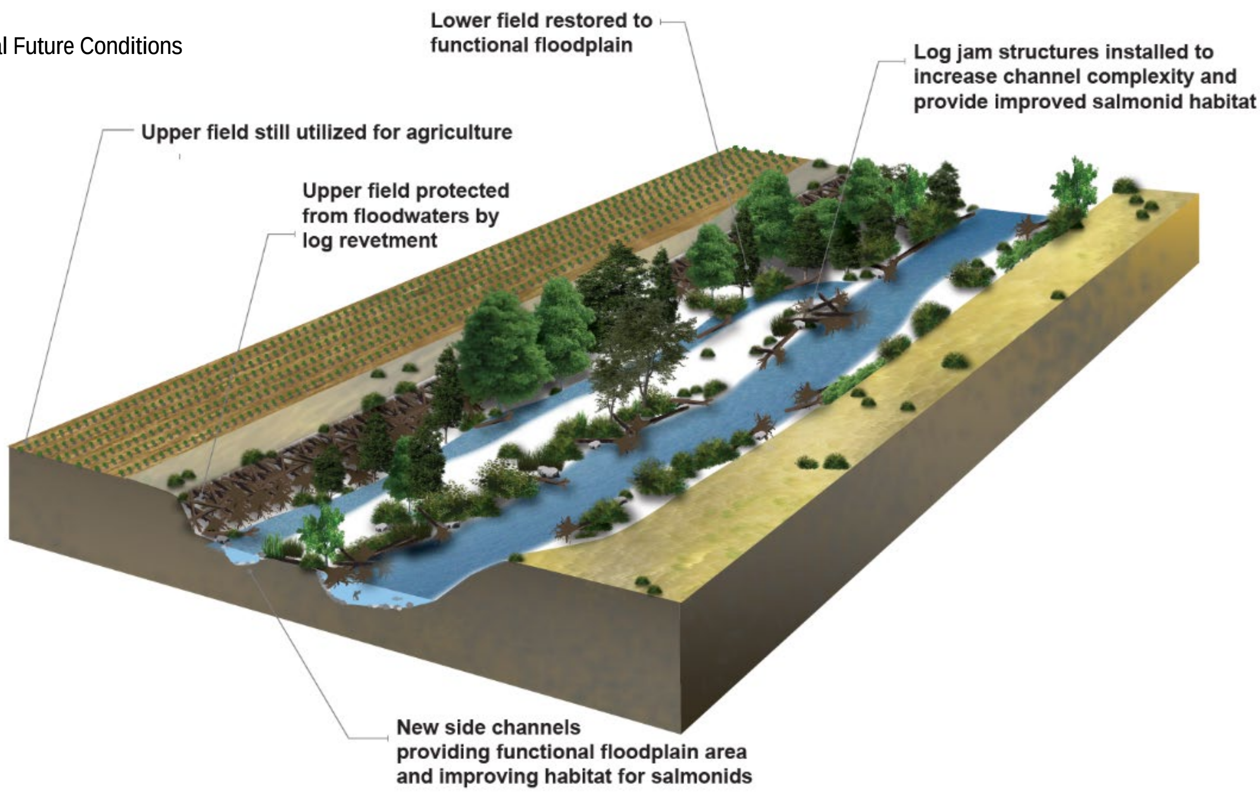
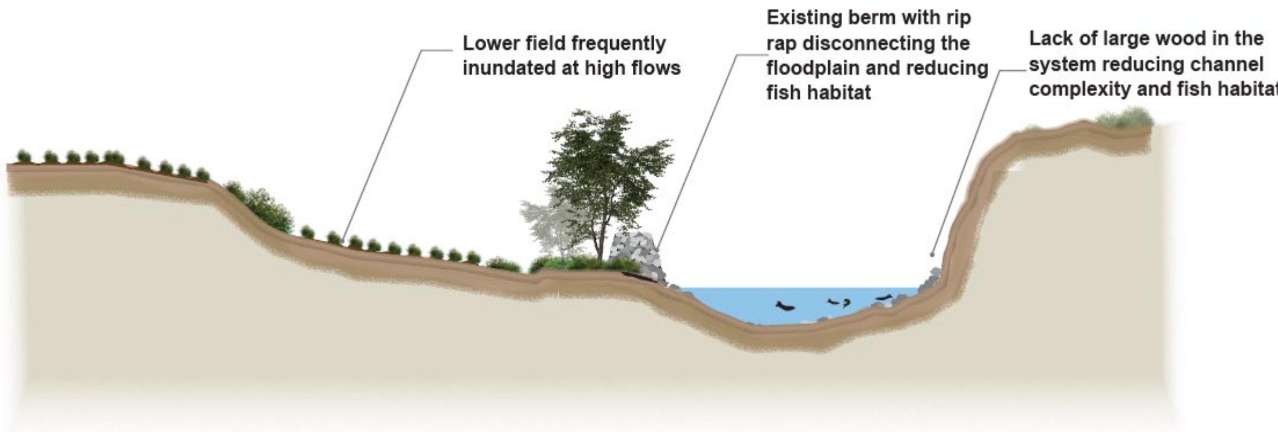


Exhibit 4-9. UM 13 – Existing Conditions and Potential Future Conditions

Existing Conditions – Cross-Section



Potential Future Conditions – Cross-Section

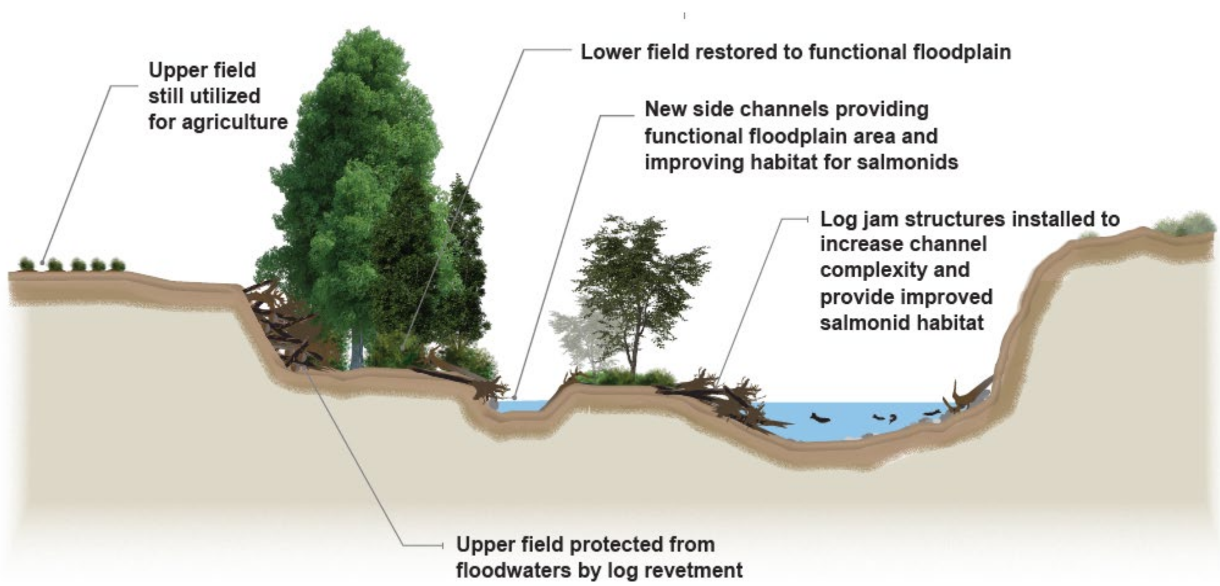


Exhibit 4-10. UM 13 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Geomorphology, Connectivity, and Aquatic Biota Touchstones. These elements would improve large wood availability, in-stream channel complexity, floodplain connectivity, and overall geomorphic function in the reach and improve potential habitat area to 88 percent of historic conditions (Exhibit 4-11). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach and improve potential smolt production to 82 percent of historic potential smolt production (Exhibit 4-12).

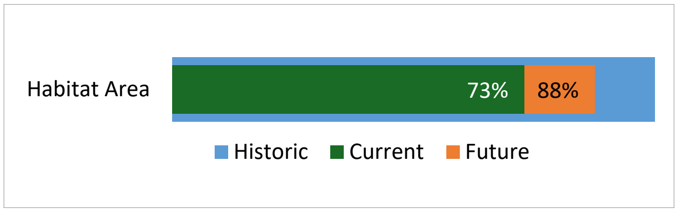


Exhibit 4-11. Potential Habitat in Reach UM 13

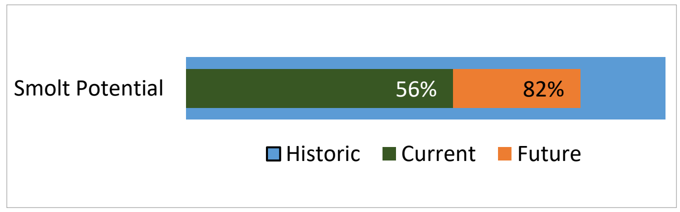


Exhibit 4-12. Potential Smolt Production in Reach UM 13

The elements listed above are not exclusively applicable to Reach UM 13. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with agriculture in the floodplain, berms or levees to protect the agriculture, and oversimplified mainstem channels with minimal aquatic habitat are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Rieth and Hermiston (Exhibit 4-13), to improve River Vision Touchstone function.

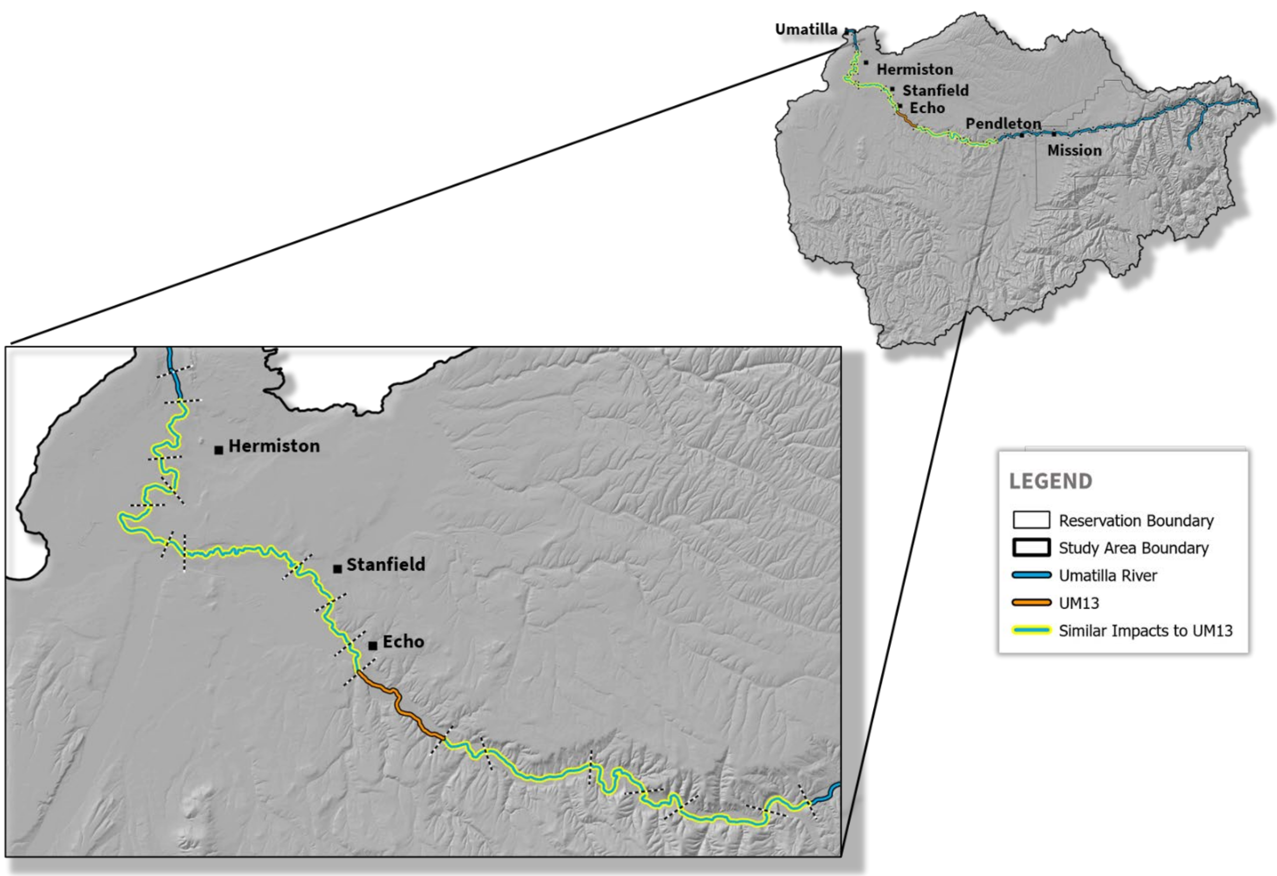


Exhibit 4-13. Reaches with Similar Impacts to UM 13

4.3.2 Umatilla River Reach UM 21

The Umatilla River Reach UM 21 conceptual design includes:

- **Floodplain restoration** – Acquisition of floodplains in areas with urban development allows for restoration of floodplain topography via floodplain benching and relocation of infrastructure—such as roads, trails, buildings, and agriculture—to provide improved floodplain resiliency in urban areas;

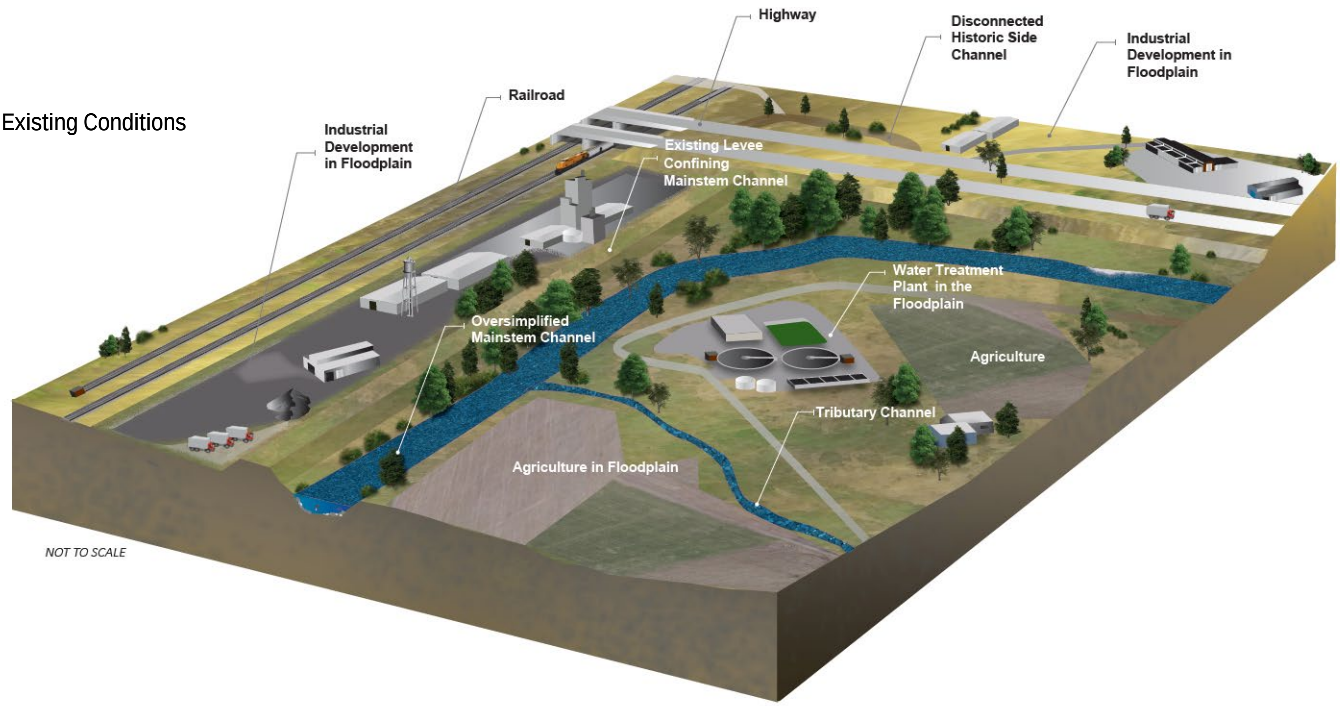
- **Alluvial fan restoration** – Tributary channels are restored with newly constructed alluvial fans featuring multiple threaded channels that improve aquatic species habitat at ecological nodes, improving sediment transport processes, and providing cold-water inputs to the mainstem Umatilla River;

- **Off-channel habitat connection** – Historic off-channel habitat is reconnected by relocating or redesigning existing infrastructure that currently impedes connection to off-channel habitat from the mainstem Umatilla River including wetlands; and,

- **Large wood structures** – Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, providing protection for redesigned and relocated infrastructure, and to promote channel migration across the restored floodplain.

Refer to Exhibit 4-14 and Exhibit 4-15 for a comparison of existing conditions and potential future conditions for UM 21.

Existing Conditions



Potential Future Conditions

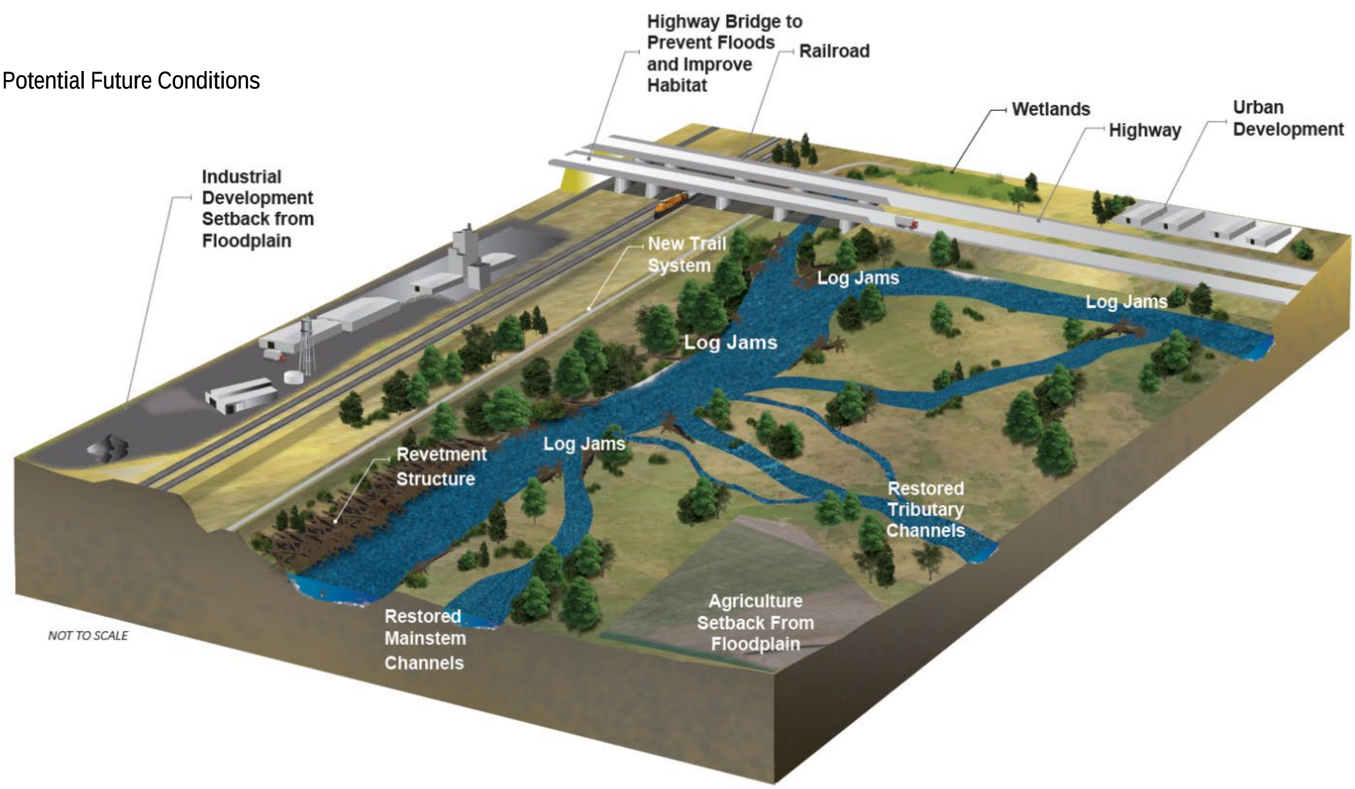
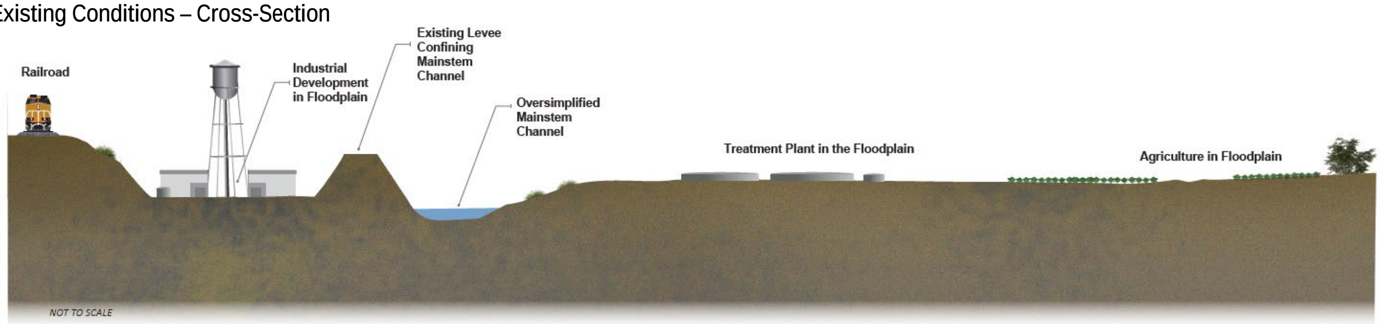


Exhibit 4-14. UM 21 – Existing Conditions and Potential Future Conditions

Existing Conditions – Cross-Section



Potential Future Conditions – Cross-Section

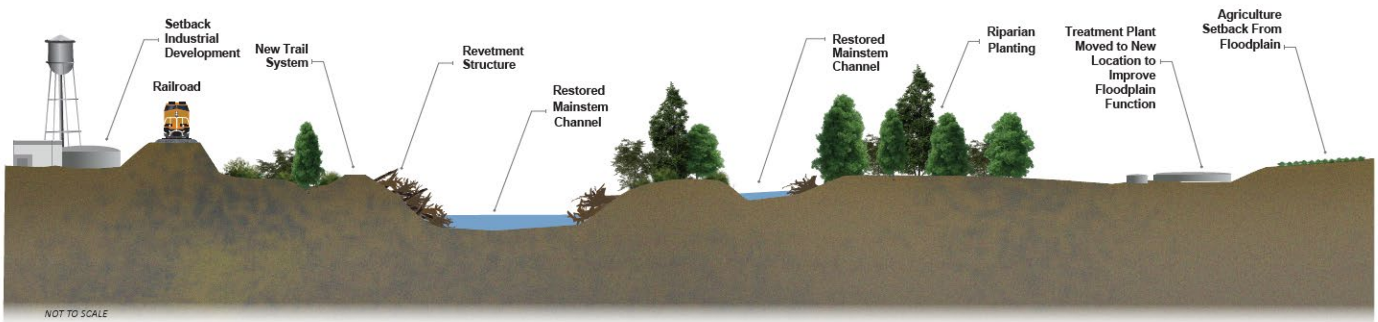


Exhibit 4-15. UM 21 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Geomorphology, Connectivity, Riparian Vegetation, and Aquatic Biota Touchstones. These elements would improve large wood availability, off-channel habitat availability, ecological node function, in-stream channel complexity, floodplain connectivity, and overall geomorphic function in the reach and improve habitat availability to 56 percent of historic conditions (Exhibit 4-16). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach by 121 percent and improve potential smolt production to 32 percent of historic potential smolt production (Exhibit 4-17).

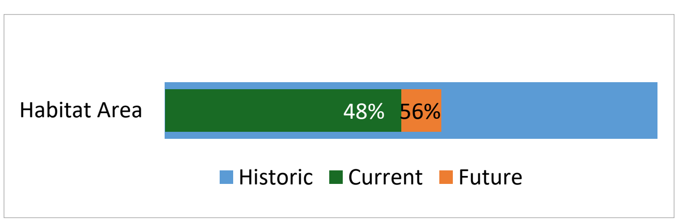


Exhibit 4-16. Potential Habitat in Reach UM 21

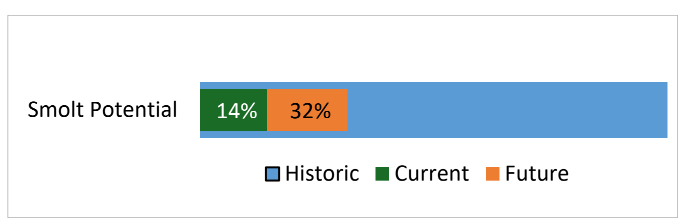


Exhibit 4-17. Potential Smolt Production in Reach UM 21

The elements listed above are not exclusively applicable to Reach UM 21. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with agriculture in the floodplain, berms or levees to protect the agriculture and railroads or urban development, oversimplified mainstem channels with minimal aquatic habitat, and degraded tributaries are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Rieth and Pendleton and reaches where tributaries enter the Umatilla River (Exhibit 4-18), to improve River Vision Touchstone function.

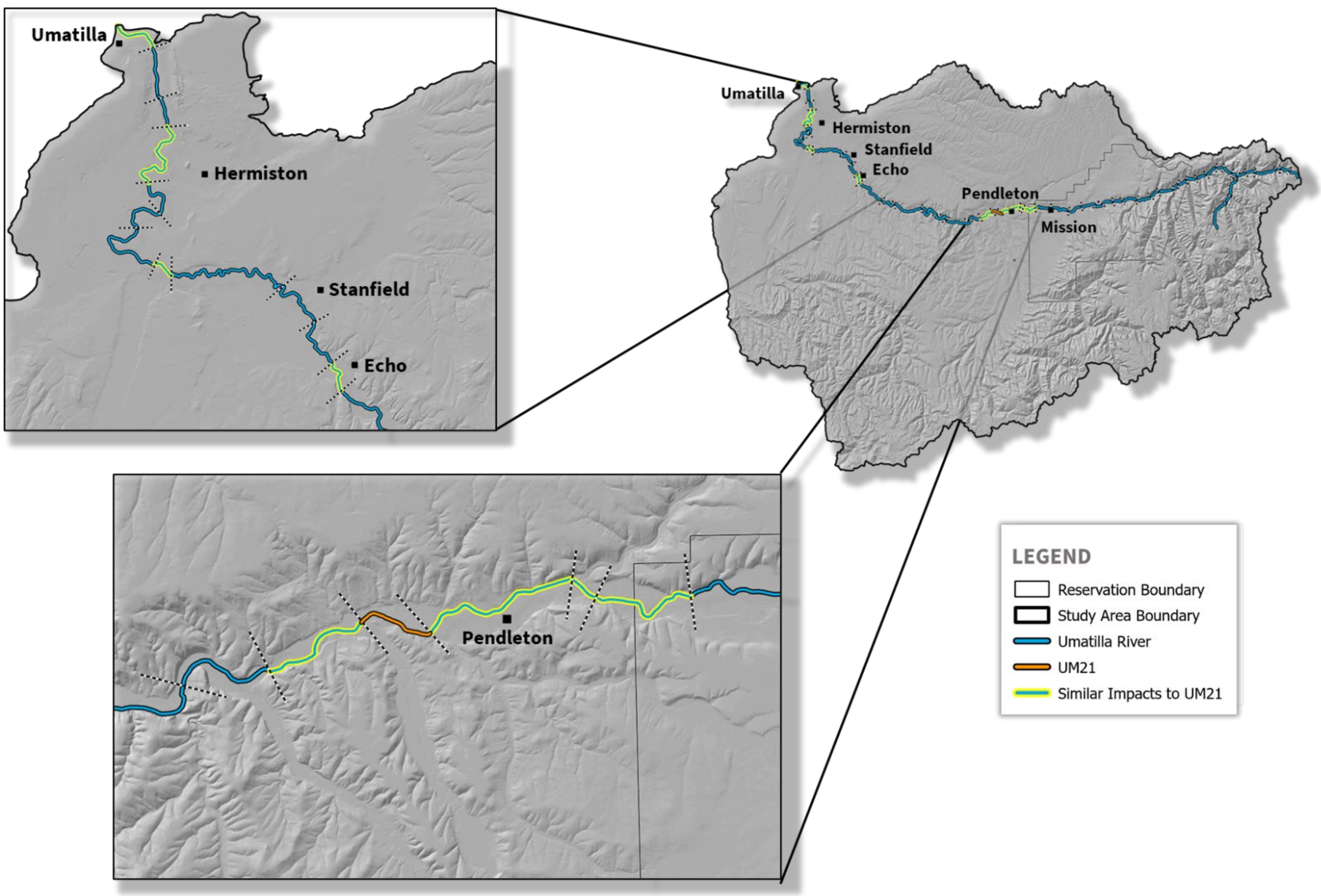


Exhibit 4-18. Reaches with Similar Impacts to UM 21

4.3.3 Umatilla River Reach UM 25

The Umatilla River Reach UM 25 conceptual design includes:

- **Levee removal or relocation** – Levees are removed from the floodplain, or relocated, to promote floodplain connectivity, reduce stream power, and reactive and reconnect existing side channels and wetlands while maintaining flood protection as necessary;

- **Floodplain restoration** – Acquisition of floodplains in areas with development allows for restoration of floodplain topography via floodplain benching and relocation of infrastructure—such as roads, trails, buildings, agriculture—to provide improved floodplain resiliency;

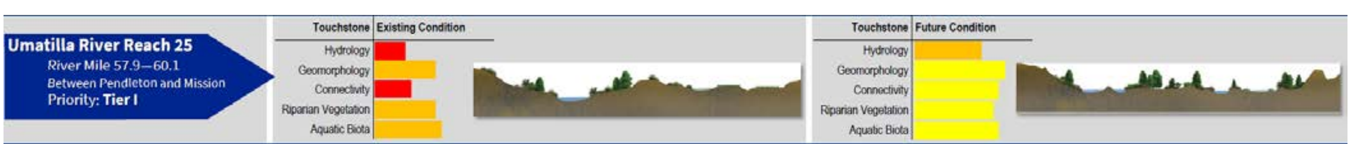
- **Off-channel habitat restoration** – Historic off-channel habitat is reconnected by restoring or excavating side channels;

- **Riparian planting** – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species;

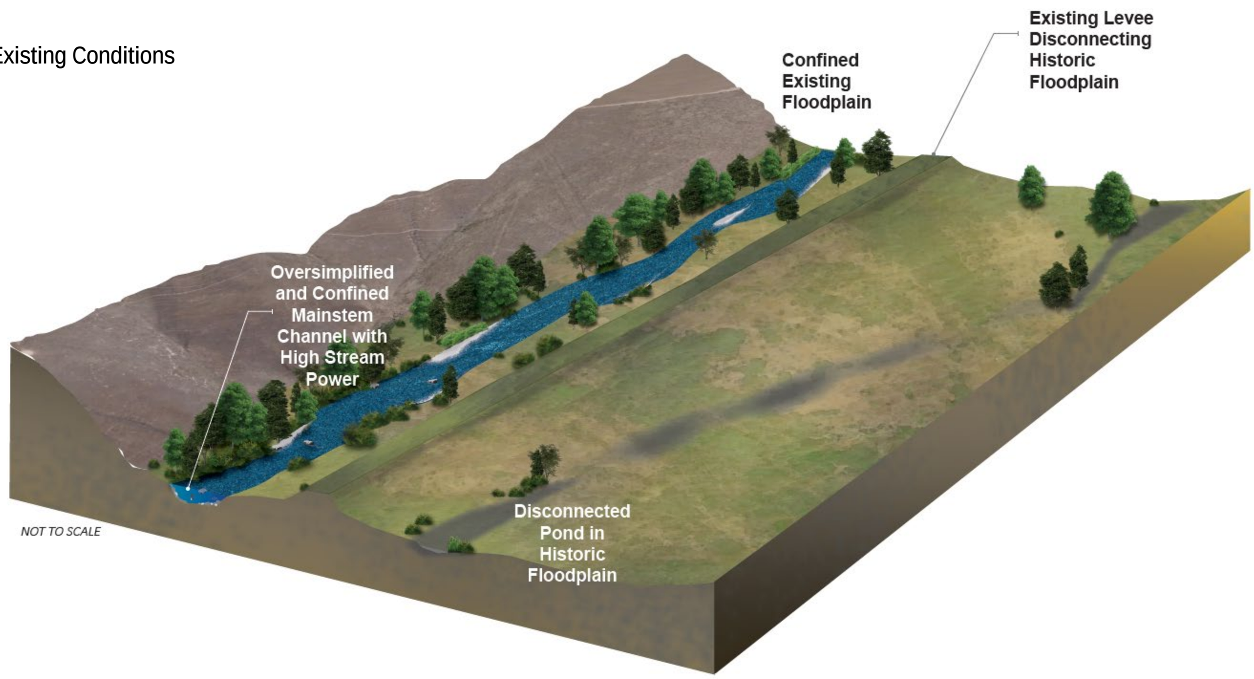
- **Wetland enhancement** – Disconnected wetlands and ponds are reconnected to be included in the active floodplain, providing improved off-channel habitat, terrestrial habitat for other species, hyporheic flow exchange to improve low flow availability and temperatures, and increase traditional First Foods availability (i.e., cattail, dogbane, and tule); and,

- **Large wood structures** – Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, and to promote channel migration across the restored floodplain.

Refer to Exhibit 4-19 and Exhibit 4-20 for a comparison of existing conditions and potential future conditions for UM 25.



Existing Conditions



Potential Future Conditions

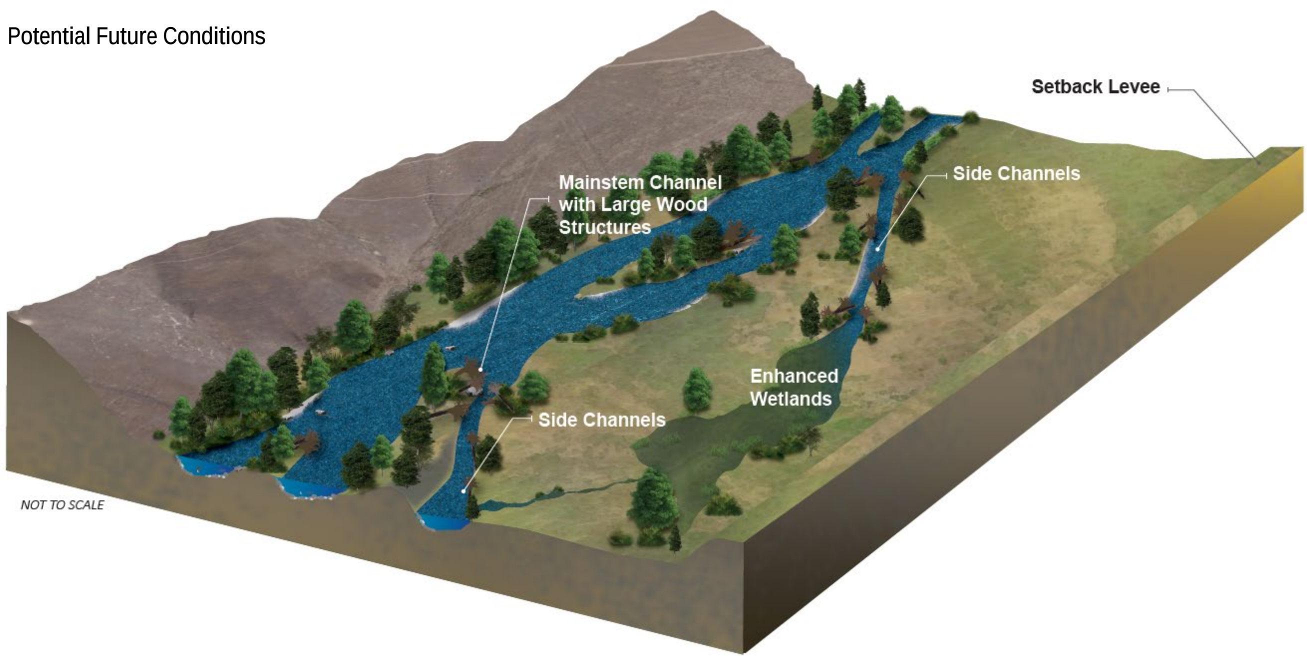
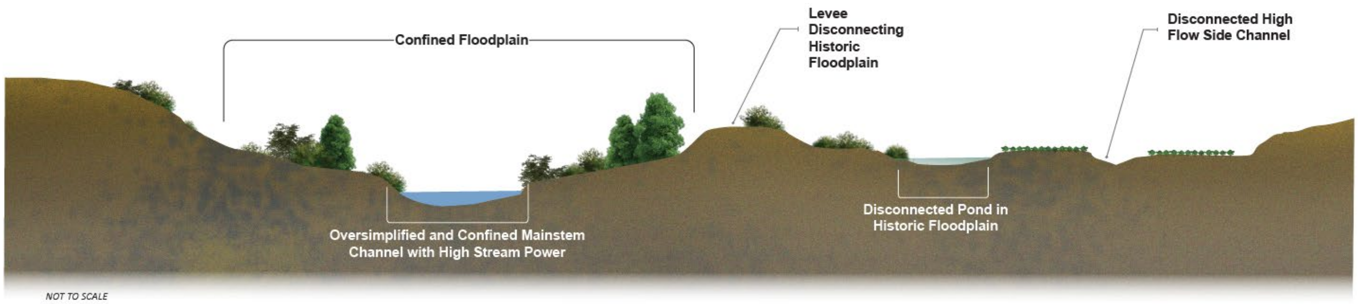


Exhibit 4-19. UM 25 – Existing Conditions and Potential Future Conditions

Existing Conditions – Cross-Section



Potential Future Conditions – Cross-Section

Exhibit 4-20. UM 25 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Connectivity Touchstones. These elements would improve large wood availability, off-channel habitat availability, in-stream channel complexity, floodplain connectivity, wetland function, riparian canopy cover, and overall geomorphic function in the reach and improve habitat availability to 83 percent of historic conditions (Exhibit 4-21). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach by 103 percent and improve potential smolt production to 47 percent of historic potential smolt production (Exhibit 4-22).

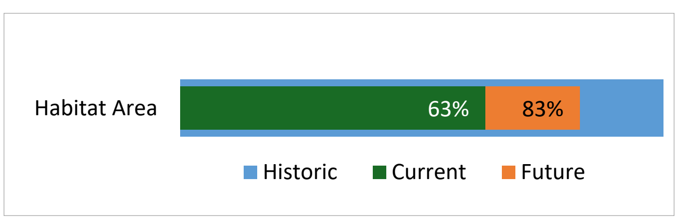


Exhibit 4-21. Potential Habitat in Reach UM 25

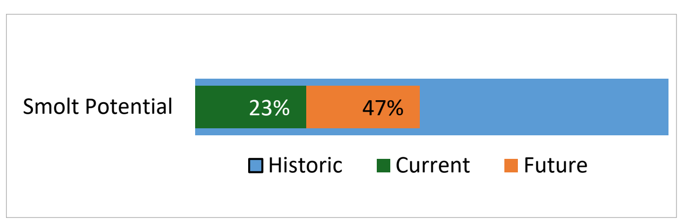


Exhibit 4-22. Potential Smolt Production in Reach UM 25

The elements listed above are not exclusively applicable to Reach UM 25. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with agriculture in the floodplain, berms or levees to protect the agriculture and other residential development in the floodplain, oversimplified mainstem channels with minimal aquatic habitat, minimal riparian canopy and health, and degraded wetlands and off-channel habitat are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Pendleton and Thorn Hollow (Exhibit 4-23), to improve River Vision Touchstone function.

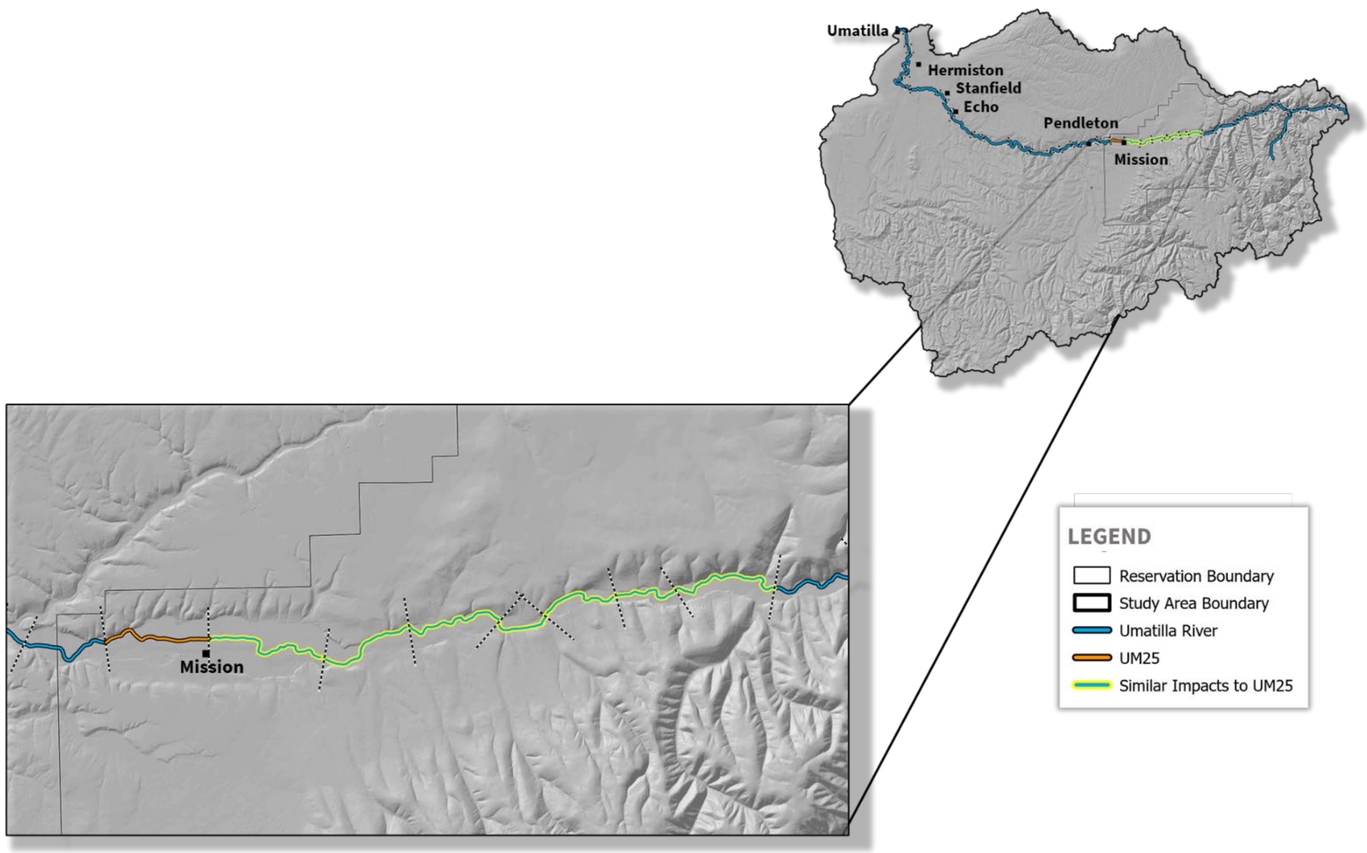


Exhibit 4-23. Reaches with Similar Impacts to UM 25

4.3.4 Umatilla River Reach UM 26

The Umatilla River Reach UM 26 conceptual design includes:

- **Floodplain restoration** – Acquisition of floodplains allows for restoration of floodplain topography via floodplain benching and planting of riparian species to provide improved floodplain resiliency and improved First Foods availability;

- **Side channel restoration** – Historic off-channel habitat is reconnected by restoring or excavating side channels to maintain flows for longer periods during the year;

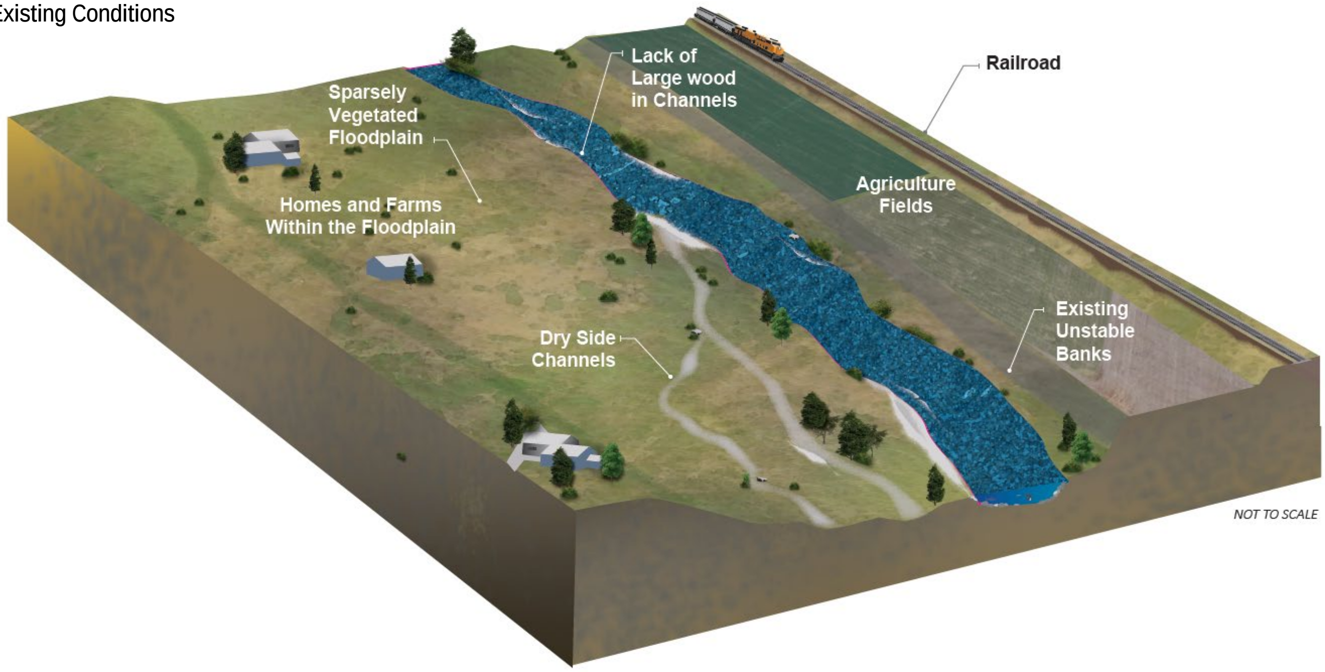
- **Riparian planting** – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species as well as First Foods availability;

- **Wetland enhancement** – Disconnected wetlands and ponds are reconnected to be included in the active floodplain, providing improved off-channel habitat, terrestrial habitat for other species, hyporheic flow exchange to improve low flow availability and temperatures, and increase traditional First Foods availability (i.e., cattail, dogbane, and tule); and,

- **Large wood structures –** Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, and to promote channel migration across the restored floodplain. Revetment structures are also installed to provide protection to infrastructure such as roads or railroads to provide more geomorphic and fish-friendly solutions.

Refer to Exhibit 4-24 and Exhibit 4-25 for a comparison of existing conditions and potential future conditions for UM 26.

Existing Conditions



Potential Future Conditions

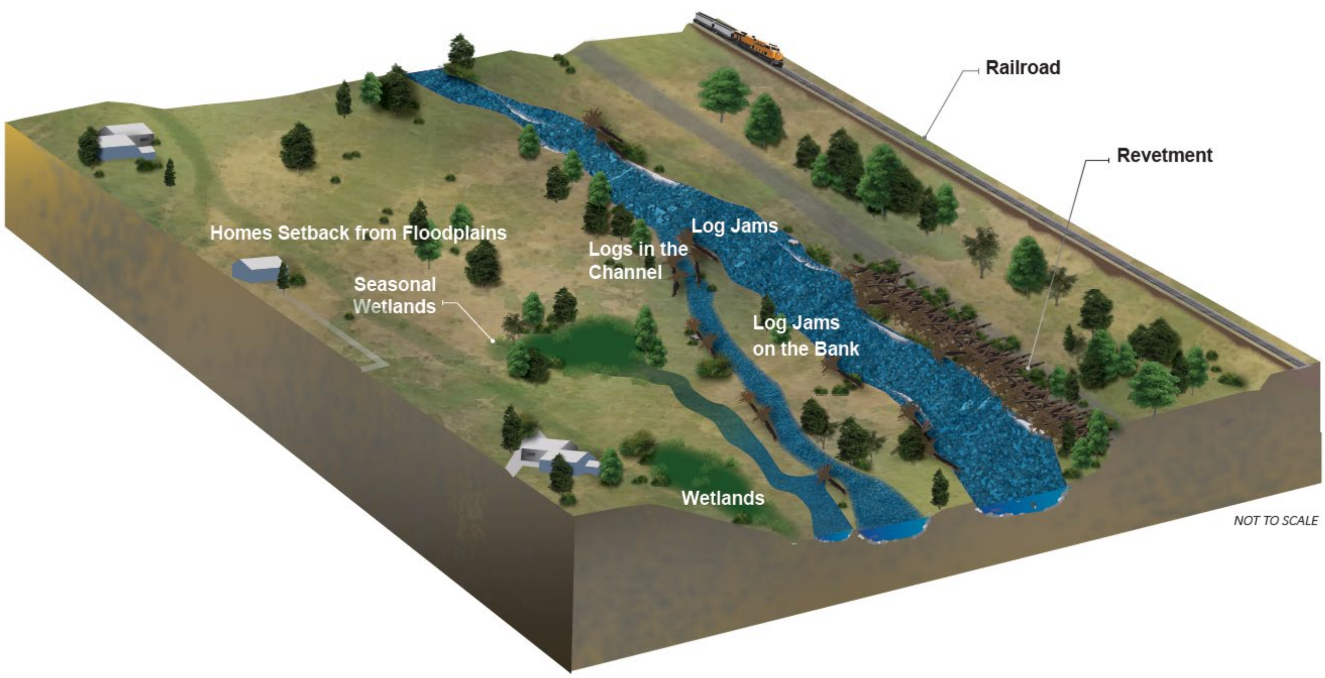
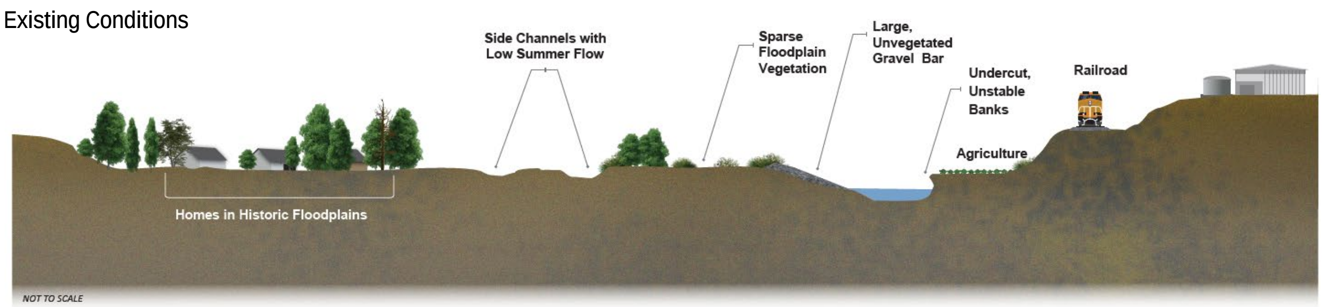


Exhibit 4-24. UM 26 – Existing Conditions and Potential Future Conditions



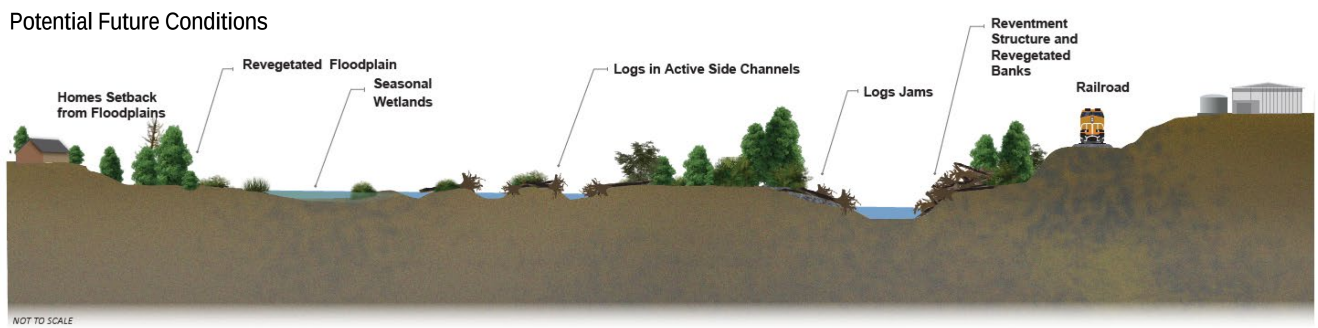


Exhibit 4-25. UM 26 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology, Connectivity, Riparian Vegetation, and Aquatic Biota Touchstones. These elements would improve large wood availability, off-channel habitat availability, side channel function and availability throughout the year, in-stream channel complexity, floodplain connectivity, wetland function, riparian canopy cover, and overall geomorphic function in the reach and improve habitat availability to 56 percent of historic conditions (Exhibit 4-26). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach by 64 percent and improve potential smolt production to 22 percent of historic potential smolt production (Exhibit 4-27).

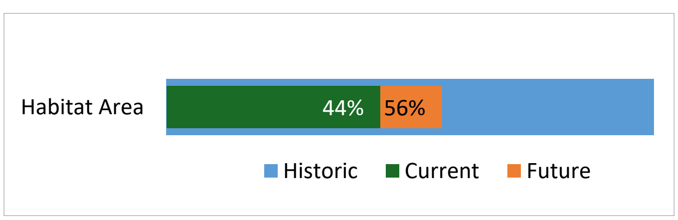


Exhibit 4-26. Potential Habitat in Reach UM 26

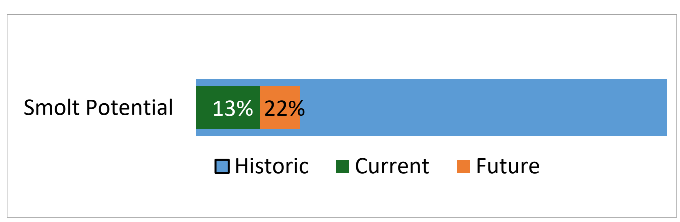


Exhibit 4-27. Potential Smolt Production in Reach UM 26

The elements listed above are not exclusively applicable to Reach UM 26. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with agriculture in the floodplain, railroads or roads in the floodplain, oversimplified mainstem channels with minimal aquatic habitat, minimal riparian canopy and health, and degraded wetlands and off-channel habitat are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Cayuse and Gibbon (Exhibit 4-28), to improve River Vision Touchstone function.

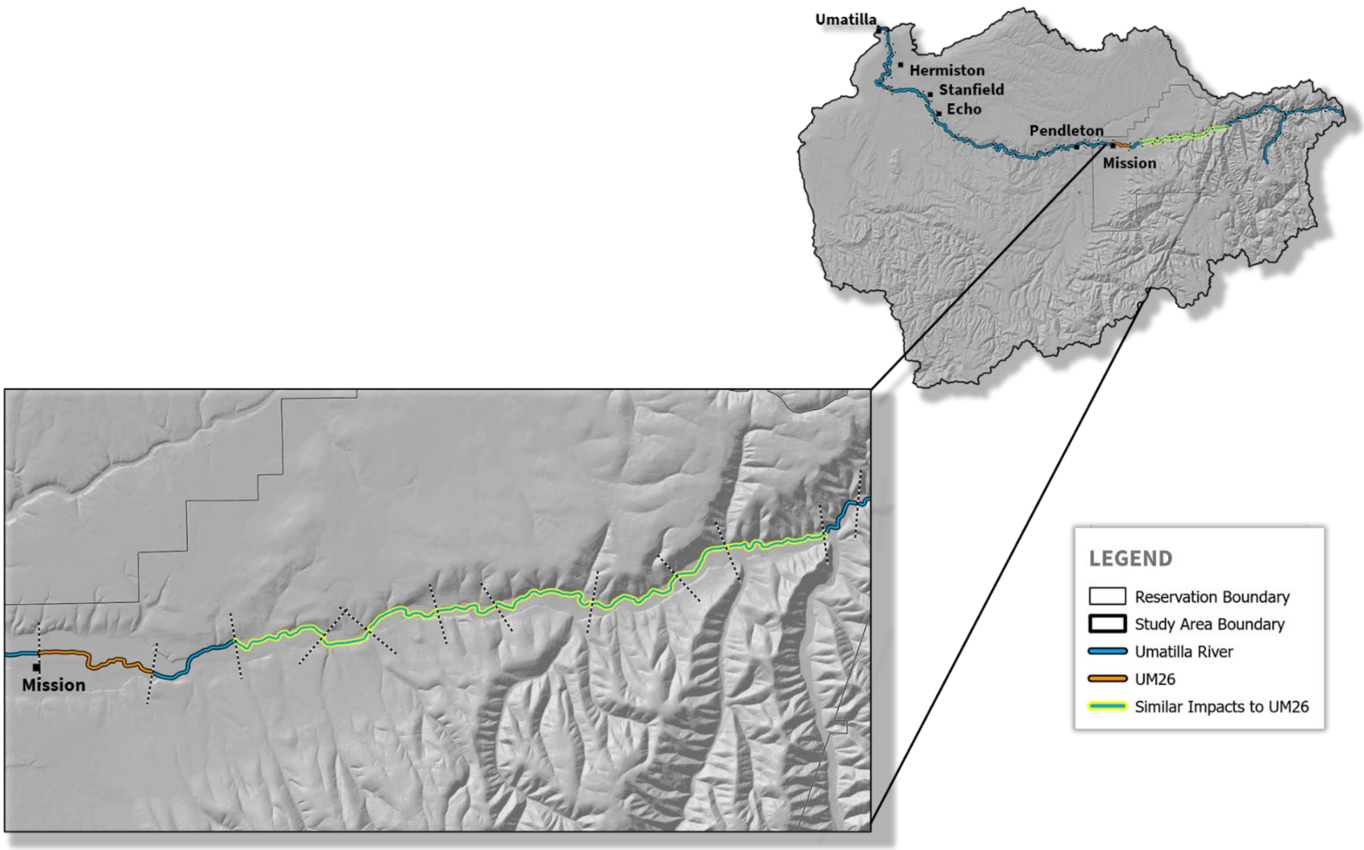


Exhibit 4-28. Reaches with Similar Impacts to UM 26

4.3.5 Umatilla River Reach UM 30

The Umatilla River Reach UM 30 conceptual design includes:

- **Floodplain restoration –** Acquisition of floodplains allows for restoration of floodplain topography via floodplain benching and planting of riparian species to provide improved floodplain resiliency and improved First Foods availability;

- **Side channel restoration** – Historic off-channel habitat is reconnected by restoring or excavating side channels to maintain flows for longer periods during the year;

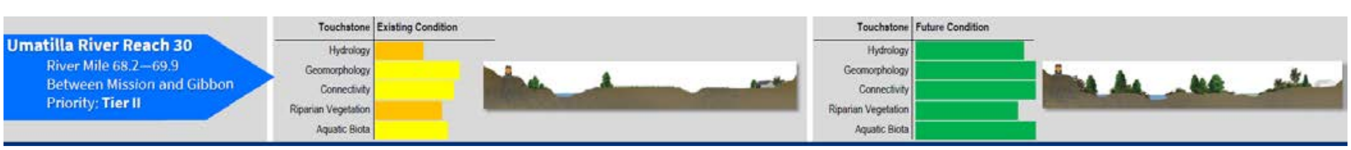
- **Riparian planting** – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species as well as First Foods availability;

- **Wetland enhancement –** Disconnected wetlands and ponds are reconnected to be included in the active floodplain, providing improved off-channel habitat, terrestrial habitat for other species, hyporheic flow exchange to improve low flow availability and temperatures, and increase traditional First Foods availability (i.e., cattail, dogbane, and tule);

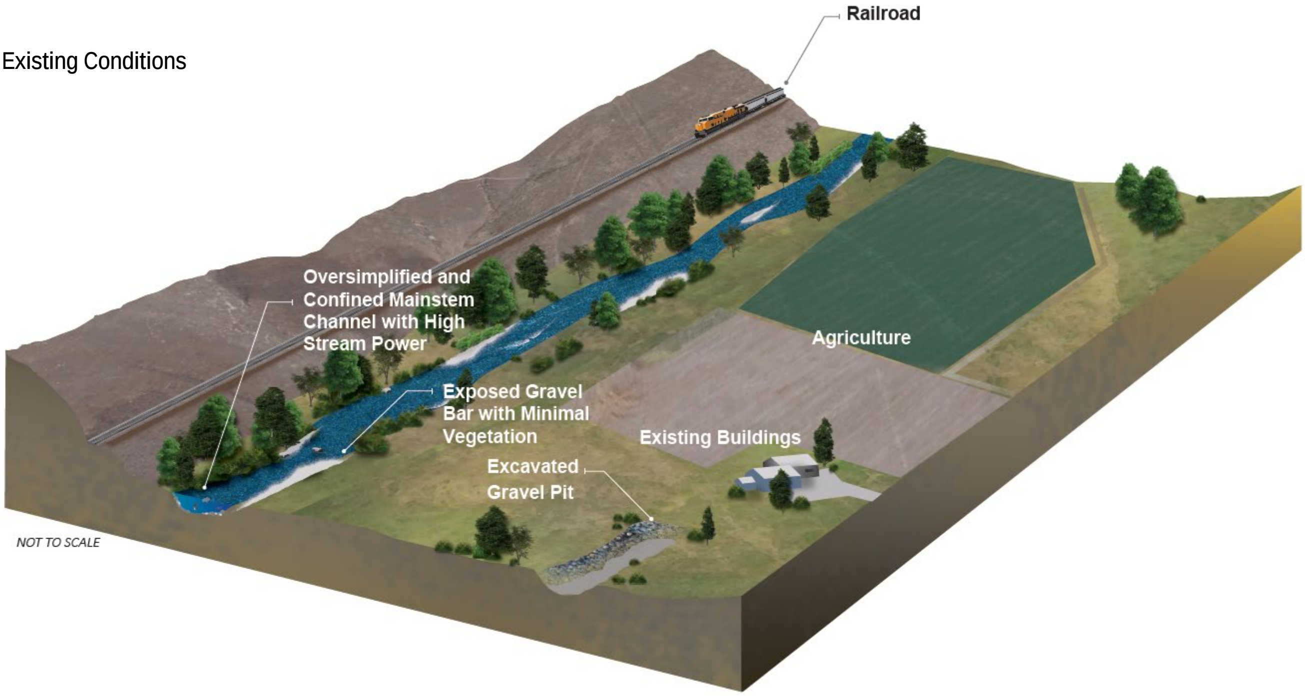
- **Beaver management** – Introduction or management of beavers would improve wetland function, improve floodplain connectivity and off-channel habitat availability, and decrease stream power to promote sediment retention and healthy riparian canopy that would provide improved First Foods availability; and,

- **Large wood structures –** Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, and to promote channel migration across the restored floodplain. Revetment structures are also installed to provide protection to infrastructure such as roads or railroads to provide more geomorphic and fish-friendly solutions.

Refer to Exhibit 4-29 and Exhibit 4-30 for a comparison of existing conditions and potential future conditions for UM 30.



Existing Conditions



Potential Future Conditions

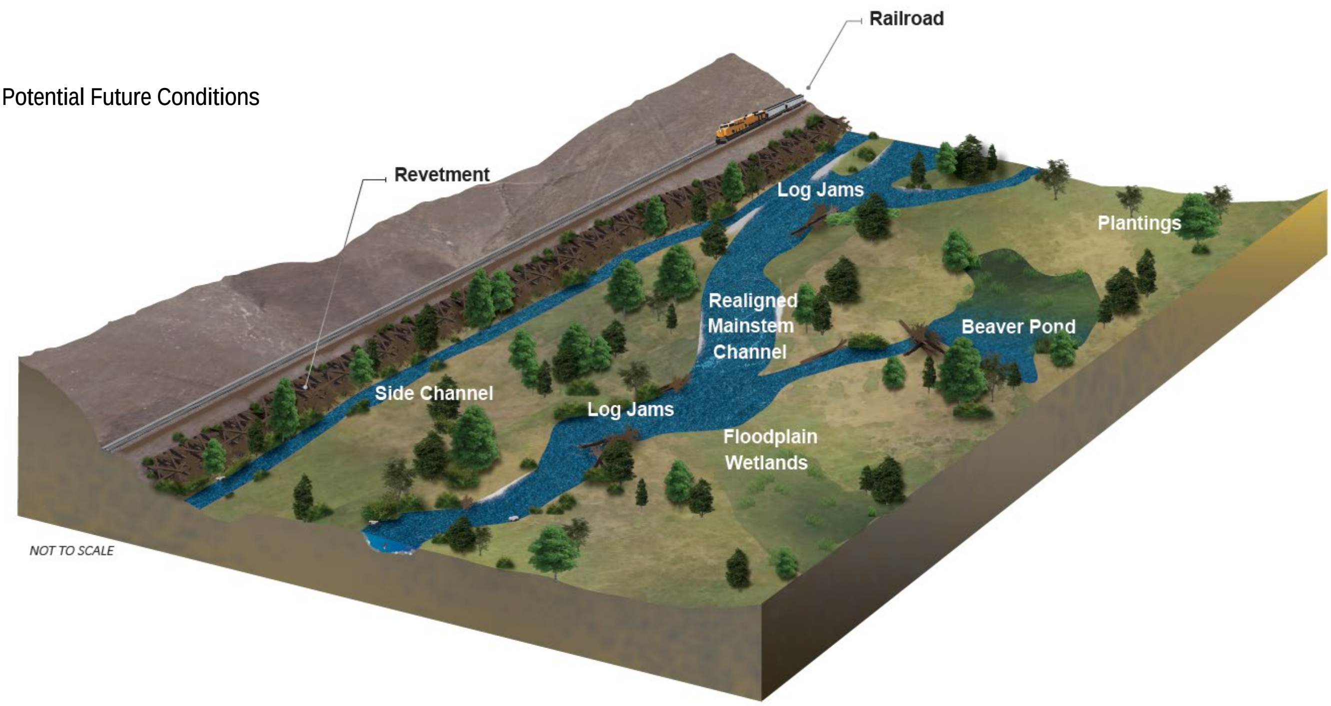
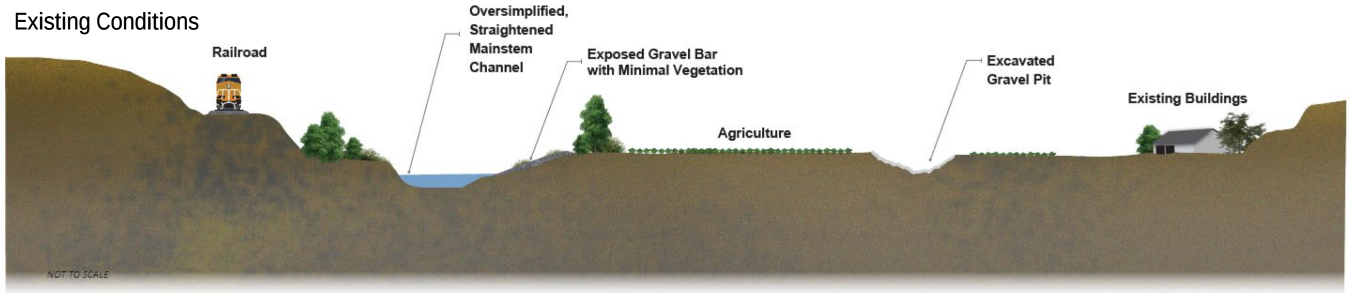


Exhibit 4-29. UM 30 – Existing Conditions and Potential Future Conditions



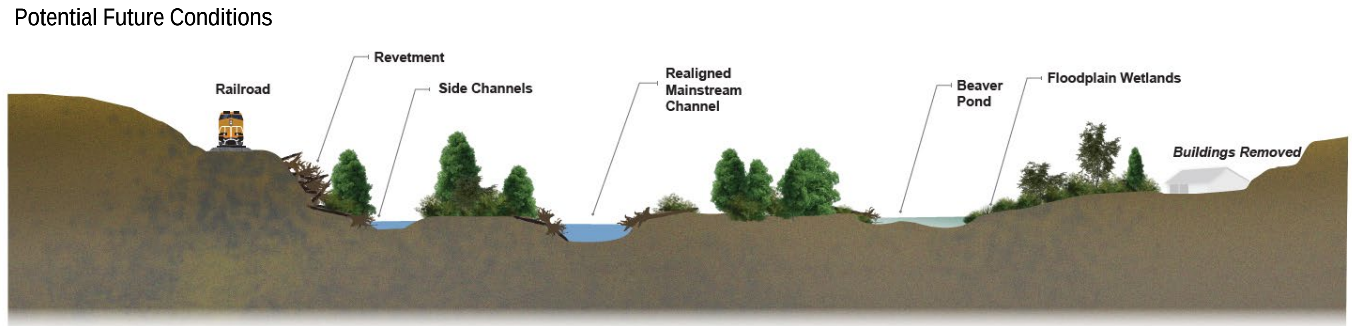


Exhibit 4-30. UM 30 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Riparian Vegetation Touchstones. These elements would improve large wood availability, off-channel habitat availability, side channel function and availability throughout the year, in-stream channel complexity, floodplain connectivity, wetland function, riparian canopy cover, and overall geomorphic function in the reach and improve habitat availability to 73 percent of historic conditions (Exhibit 4-31). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach by 56 percent and improve potential smolt production to 48 percent of historic potential (Exhibit 4-32).

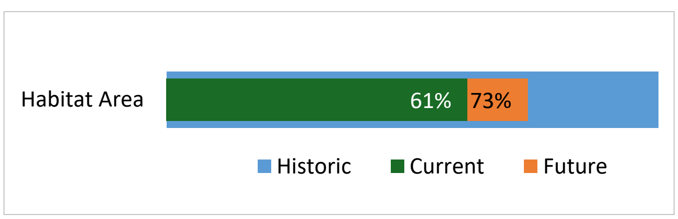


Exhibit 4-31. Potential Habitat in Reach UM 30

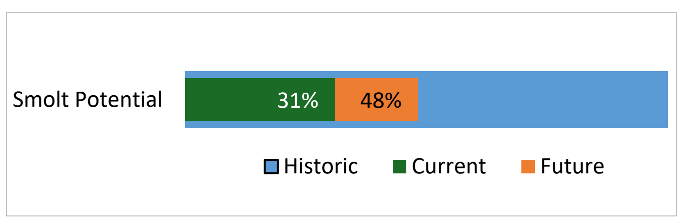


Exhibit 4-32. Potential Smolt Production in Reach UM 30

The elements listed above are not exclusively applicable to Reach UM 30. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with agriculture in the floodplain, railroads or roads in the floodplain, oversimplified mainstem channels with minimal aquatic habitat, minimal riparian canopy and health, and degraded wetlands and off-channel habitat are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Hermiston and Stanfield as well as between Cayuse and Bingham Springs (Exhibit 4-33), to improve River Vision Touchstone function.

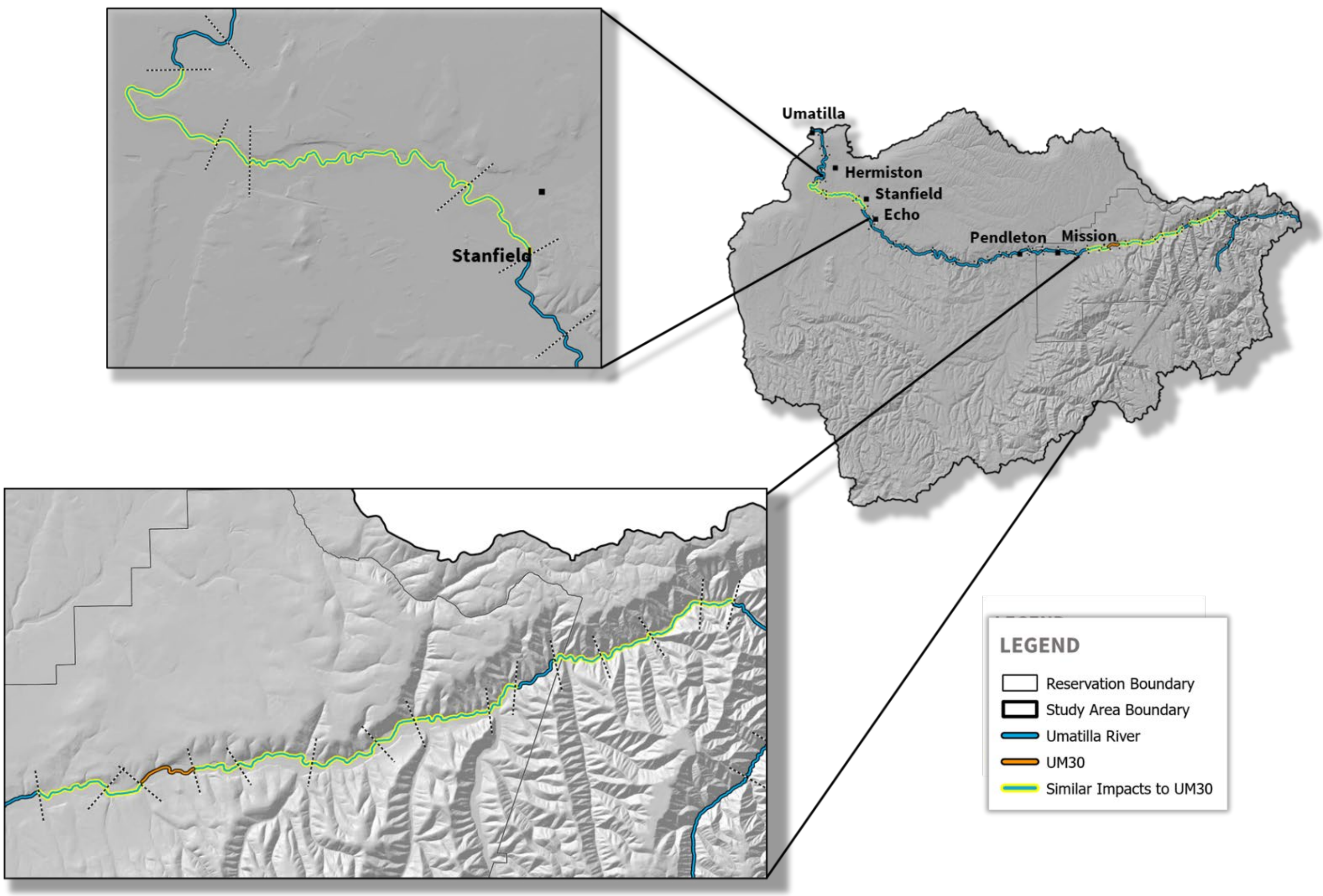


Exhibit 4-33. Reaches with Similar Impacts to UM 30

4.3.6 Umatilla River Reach UM 31

The Umatilla River Reach UM 31 design includes:

- **Removal of floodplain infrastructure** – Roads or buildings that are frequently damaged by large flow events are removed from the floodplain. Removal of this infrastructure improves floodplain function, reduces constriction of the mainstem which reduces stream power, and provides improved floodplain connectivity;

- **Floodplain restoration** – Acquisition of floodplains allows for restoration of floodplain topography via floodplain benching and planting of riparian species to provide improved floodplain resiliency and improved First Foods availability and provides the opportunity to disallow development in the floodplain;

- **Side channel restoration** – Historic off-channel habitat is reconnected by restoring or excavating side channels to maintain flows for longer periods during the year;

- **Riparian planting** – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species as well as First Foods availability;

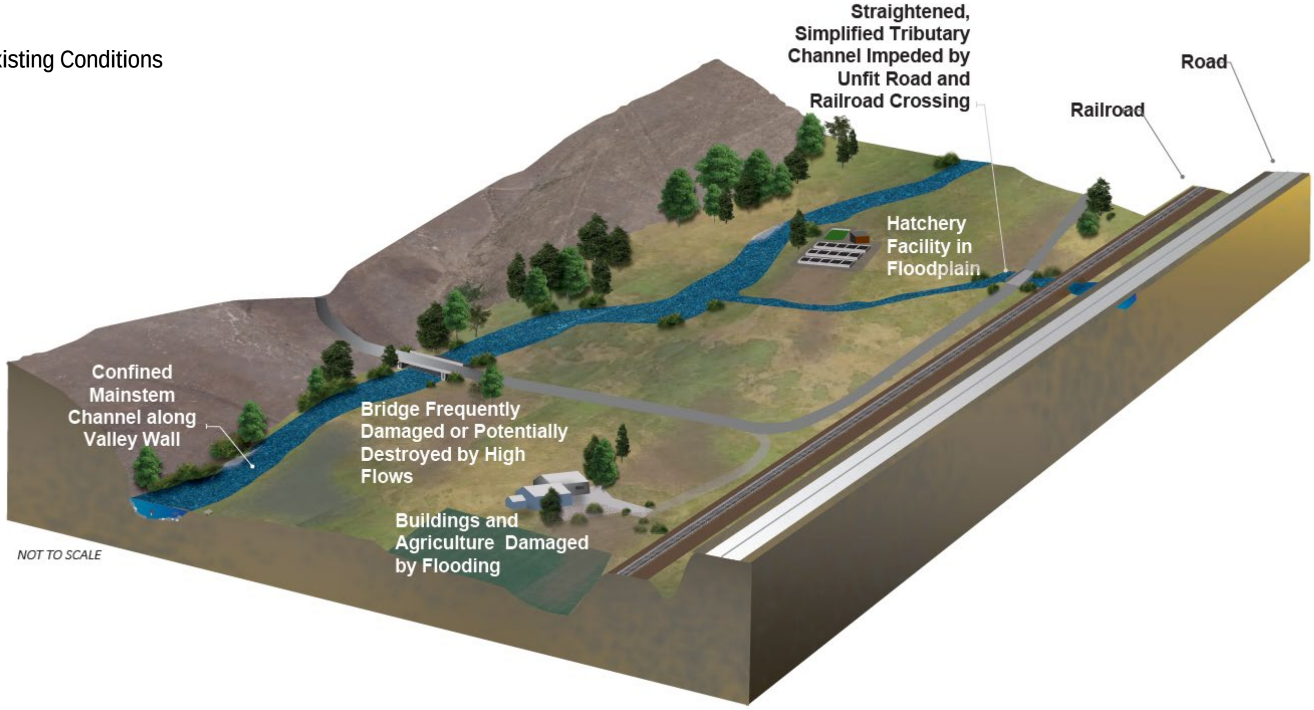
- **Wetland enhancement** – Disconnected wetlands and ponds are reconnected to be included in the active floodplain, providing improved off-channel habitat, terrestrial habitat for other species, hyporheic flow exchange to improve low flow availability and temperatures, and increase traditional First Foods availability (i.e., cattail, dogbane, and tule);

- **Tributary enhancement** – Major tributaries are restored to improve cold-water refugia and improve floodplain function; and,

- **Large wood structures** – Large wood structures are installed to promote channel complexity, retain sediment for development of floodplain planting, and to promote channel migration across the restored floodplain.

Refer to Exhibit 4-34 and Exhibit 4-35 for a comparison of existing conditions and potential future conditions for UM 31.

Existing Conditions



Potential Future Conditions

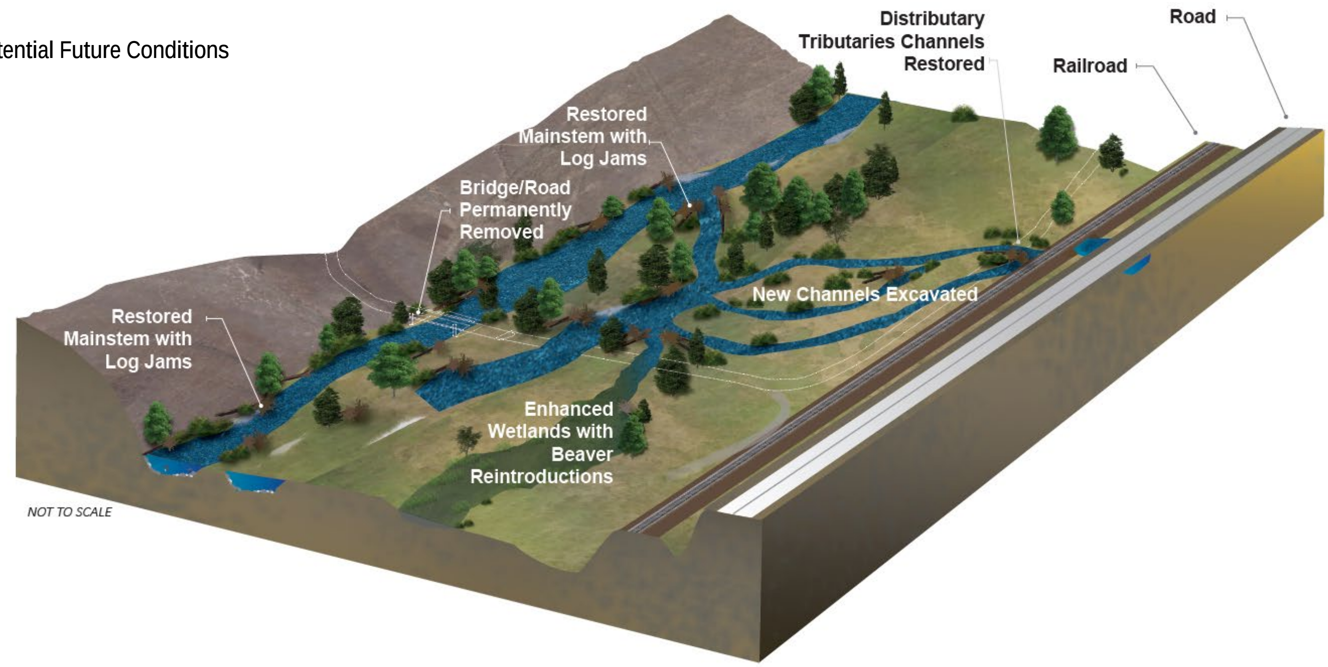
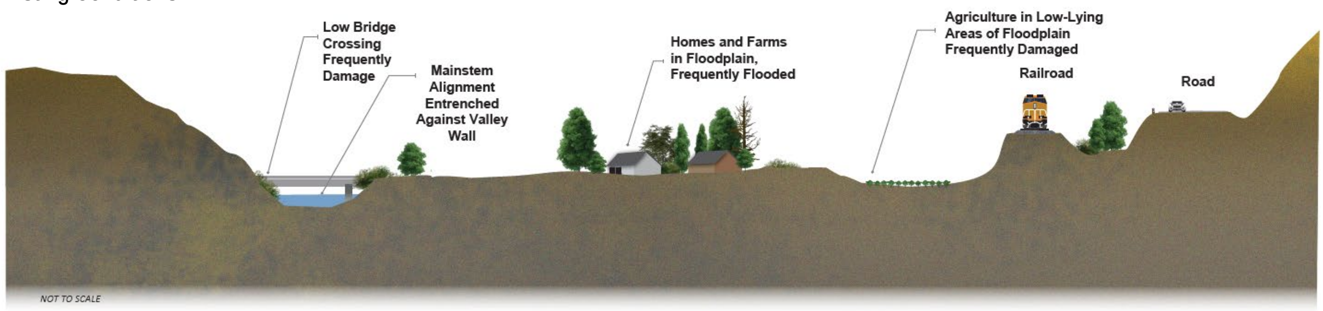


Exhibit 4-34. UM 31 – Existing Conditions and Potential Future Conditions

Existing Conditions



Potential Future Conditions

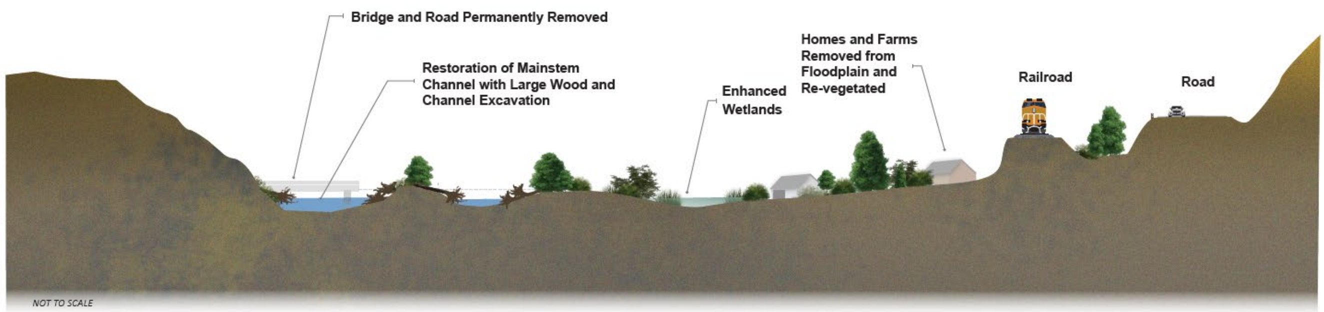


Exhibit 4-35. UM 31 – Existing Conditions and Potential Future Conditions – Cross-Sections

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Connectivity Touchstones. These elements would improve large wood availability, off-channel habitat availability, side channel function and availability throughout the year, in-stream channel complexity, floodplain connectivity, wetland function, riparian canopy cover, tributary inputs like cold-water refugia, and overall geomorphic function in the reach and improve habitat availability to 98 percent of historic conditions (Exhibit 4-36). Based on information provided in the Assessment, implementation of these design elements would increase potential smolt production in the reach by 56 percent and improve potential smolt production to 52 percent of historic potential smolt production (Exhibit 4-37).

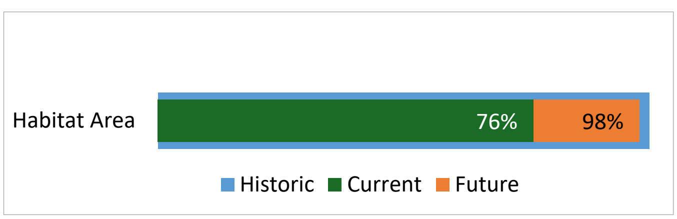


Exhibit 4-36. Potential Habitat in Reach UM 31

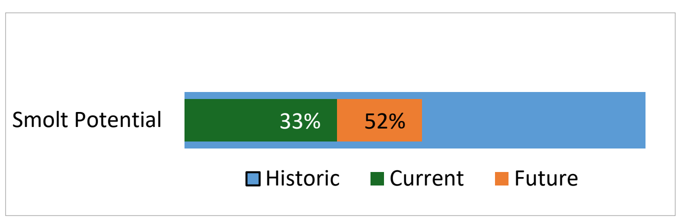


Exhibit 4-37. Potential Smolt Production in Reach UM 31

The elements listed above are not exclusively applicable to Reach UM 31. Impacts to the function of the Umatilla River are pervasive throughout the entirety of the system. Reaches with bridges across the mainstem, railroads or roads in the floodplain, oversimplified mainstem channels with minimal aquatic habitat, minimal riparian canopy and health, degraded tributary channel connection, and degraded wetlands and off-channel habitat are ubiquitous in the system. The elements in this conceptual design can be utilized throughout the Umatilla River, in particular between Hermiston and Rieth as well as between Pendleton and Bingham Springs (Exhibit 4-38), to improve River Vision Touchstone function.

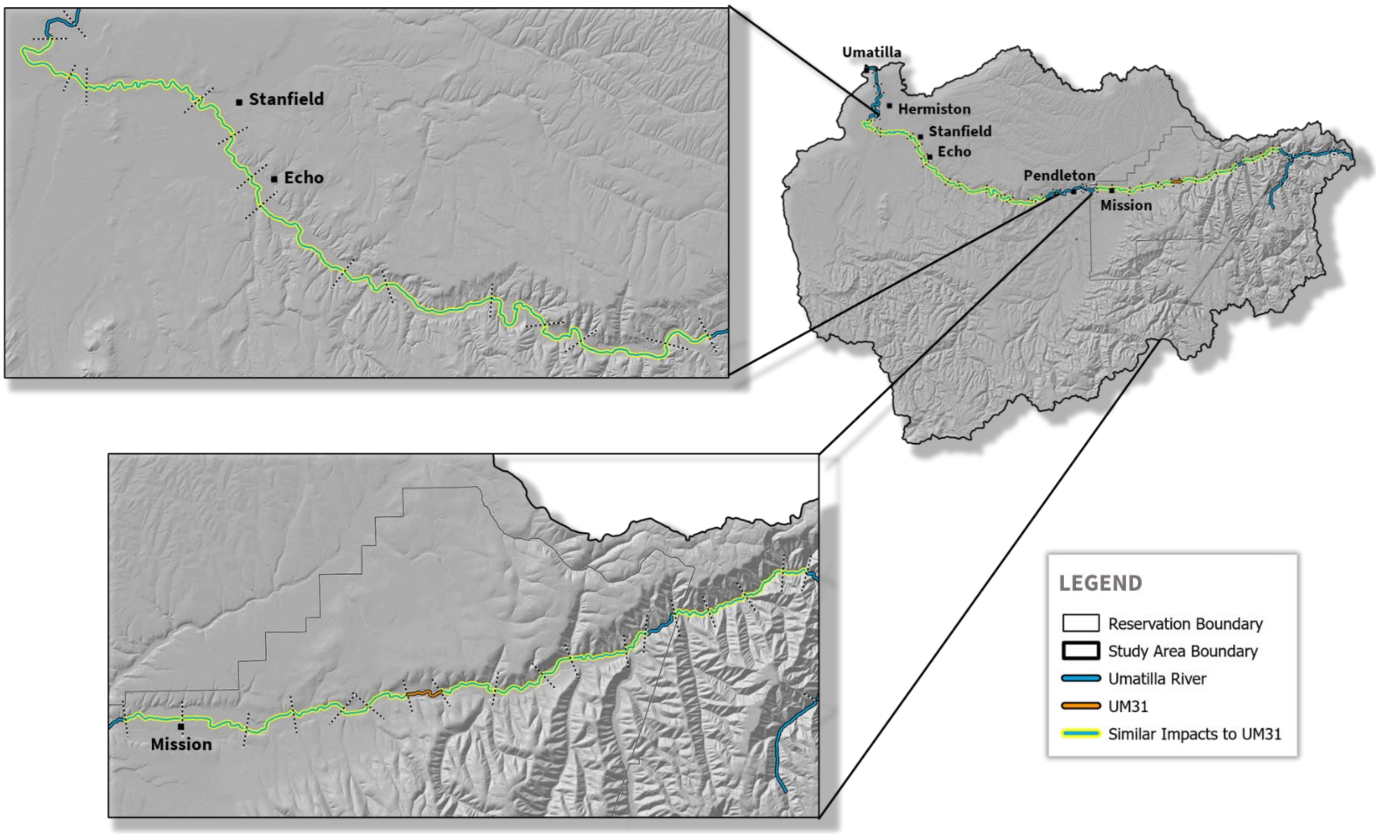


Exhibit 4-38. Reaches with Similar Impacts to UM 31

5.0 Next Steps

This section describes next steps in the Action Plan process, including implementation pathways and timelines for uplands projects (Section 5.1) and river restoration projects (Section 5.2) as well as providing a summary of the strategic planning process for the Subbasin and the Umatilla River (Section 5.3).

5.1 Uplands Projects Implementation Pathways and Timeline

Considering departure from historic conditions, implementation of uplands restoration projects that aim to improve landscape resiliency and mimic historic conditions by improving Uplands Vision Touchstones will require unique implementation pathways and schedules. However, timelines for implementation will vary depending on environmental, social, and regulatory complexities. As such, Exhibit 5-1 depicts a generalized pathway and timeline for implementing upland projects.

Assess and Prioritize. The Assessment and Prioritization steps have already been completed for this Action Plan. In the future, the CTUIR should update the data and results if applicable, based on the results of project implementation and monitoring.

Landowner Agreement. The next step towards a desired future condition is to use the information from the Assessment, prioritization tools, and Action Plan to discuss with landowners the potential opportunities in the highest priority subwatersheds. Once a landowner is willing and interested, landowner agreement and approval for site access should be obtained. After that, a detailed site evaluation should be conducted; this t may take 1 to 2 years, based on site intricacies. The opportunities tool for the subwatersheds can be used to evaluate the types of actions that can occur in the project area. This tool can aid in the landowner agreement process as well by providing CTUIR with clear, concise communication materials for public outreach. Upland sites may require multiple restoration actions to achieve desired conditions such as fuels reductions, non-native vegetation management, and road removal, which can be identified in the opportunities tool.

Implement. Restoration implementation may occur on a shorter timeline than depicted; however, if land acquisition is required it may take up to 10 years before on-the-ground actions commence.

Monitor. Finally, typical post-project monitoring plans are set up for 10 years, with specific metrics measured at different intervals. For example, project photo points may be taken once or twice per year, whereas vegetation transects may be conducted three times throughout the life of the monitoring plan.

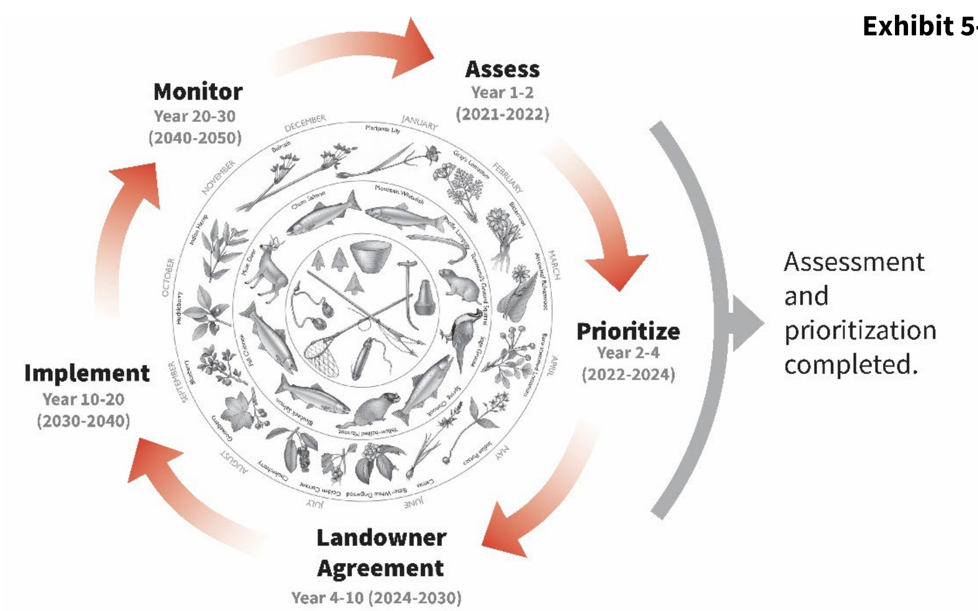


Exhibit 5-1. General Uplands Project Implementation Pathway and Timeline

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5.2 River Restoration Projects Implementation Pathways and Timeline

Similar to the uplands projects described in Section 5.1, implementation of river restoration projects that aim to improve River Vision Touchstones and improve smolt production will require unique implementation pathways and schedules, and timelines for implementation will vary depending on environmental, social, and regulatory complexities. Exhibit 5-2 illustrates a typical pathway and timeline for implementation of a river restoration project using Umatilla River Reach UM 13 as an example.

The first step is to use the information from the Assessment, prioritization tools, and Action Plan to talk with landowners about what can be done in their reach and why these actions are important. The prioritization should start with the highest priority reaches of the Umatilla River. Once a landowner is willing and interested, the second step is to obtain a landowner agreement and approval for access. Following that, the third step is to conduct a detailed site evaluation to provide a more in-depth understanding of the reach. At this stage, the opportunities tool can be used to evaluate the types of actions that can be implemented in the project reach. This tool can aid in the landowner agreement process as well by providing CTUIR with clear, concise communication materials for public outreach.

River restoration project implementation may occur on a shorter timeline than depicted; however, if land acquisition or agreements are required, it may take up to 10 years before on-the-ground actions commence. Finally, typical post-project monitoring plans are set up for 10 years, with specific metrics measured at different intervals. For example, metrics identified in the Assessment can be updated with implementation as-built conditions and updated following major flow events or at regular intervals.

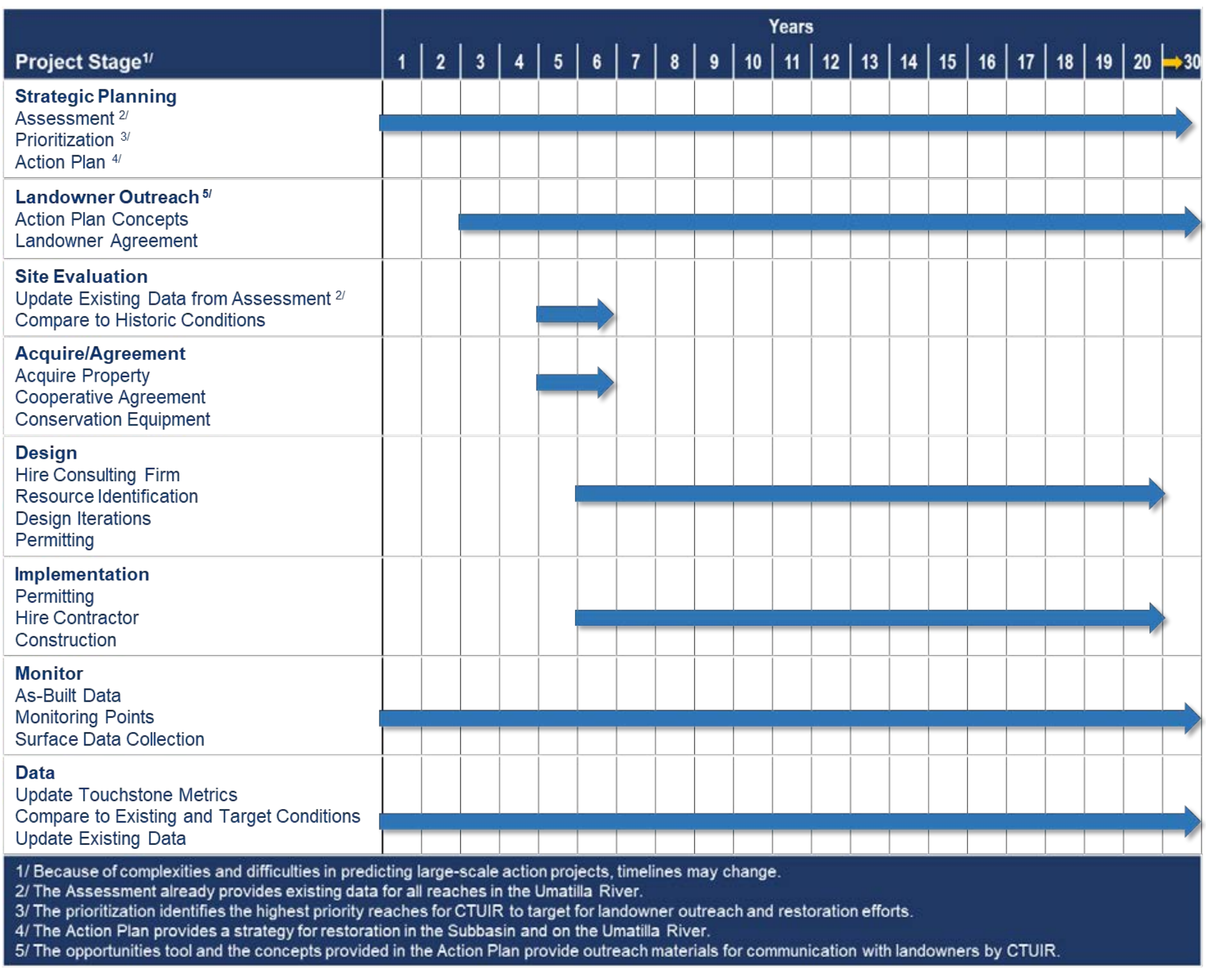

Exhibit 5-2. Typical River Restoration Project Implementation Pathway and Timeline

5.3 Strategic Planning Process

Following implementation of projects to improve uplands and river function along the pathways described previously, CTUIR can use the prioritization tools to reprioritize actions based on updated data from monitoring and any associated data gaps. The updated prioritization will provide CTUIR with an adapted strategic plan for restoration actions across the Subbasin and along the Umatilla River. The opportunities tool can then be used to re-evaluate potential actions to be taken that will improve conditions in the uplands of the Subbasin and in the Umatilla River (Exhibit 5-3 illustrates which steps might be revisited in yellow highlights). Planning for landscape improvements must be strategically executed to incorporate details and nuances associated with uplands and river restoration plans across the intended 30-year span of the Action Plan. The Assessment and the Action Plan provide a foundational, 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.

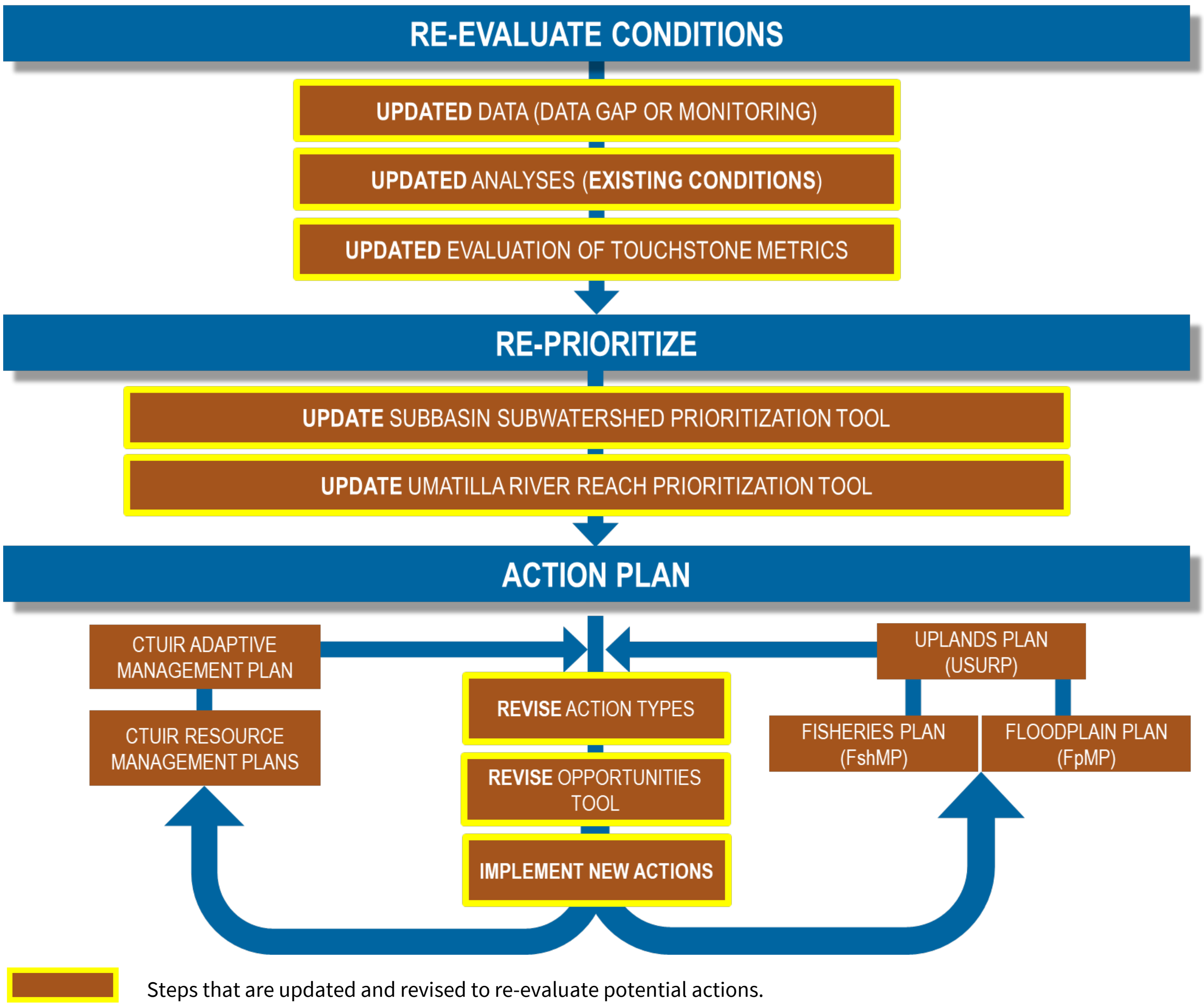

Exhibit 5-3. Strategic Planning Process for the Umatilla Subbasin and the Umatilla River

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UMATILLA RIVER Action Plan

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