UMATILLA RIVER

Action Plan

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 represented touchstones by providing the scientific foundation to promote land management activities that ensure a sustainable balance with healthy ecosystems and cultural practices into the foreseeable future. This will ultimately lead to self-sustaining populations of all native First Foods species that will be available for Tribal and non-tribal use.

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Acronyms and Abbreviations

Action Plan	Umatilla River Action Plan (this document)
Assessment	Umatilla River Assessment
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
FpMP	Floodplain Management Plan
FshMP	Fisheries Management Plan
GRAIP	Geomorphic Roads Analysis Inventory Package
HUC	Hydrologic Unit Code
LANDFIRE	LANDFIRE (LF)
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NF	North Fork Umatilla River
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OWEB	Oregon Watershed Enhancement Board
Prioritization	Geographical prioritization of subwatersheds and reaches
RM	River Mile
SPP	Smolt Production Potential
Subbasin	Umatilla Subbasin (USGS HUC8)
Subwatershed	USGS HUC12
SF	South Fork Umatilla River
TMDL	Total Maximum Daily Load
TEK	Traditional Ecological Knowledge
UM	Mainstem Umatilla River
USGS	U.S. Geological Survey
USFS	U.S. Forest Service
URAP	Umatilla River Action Plan
URMP	Umatilla River Management Plan
USUMP	Umatilla Subbasin Uplands Management Plan
WQMP	Water Quality Management Plan
Watershed	USGS HUC10

1.0 Introduction

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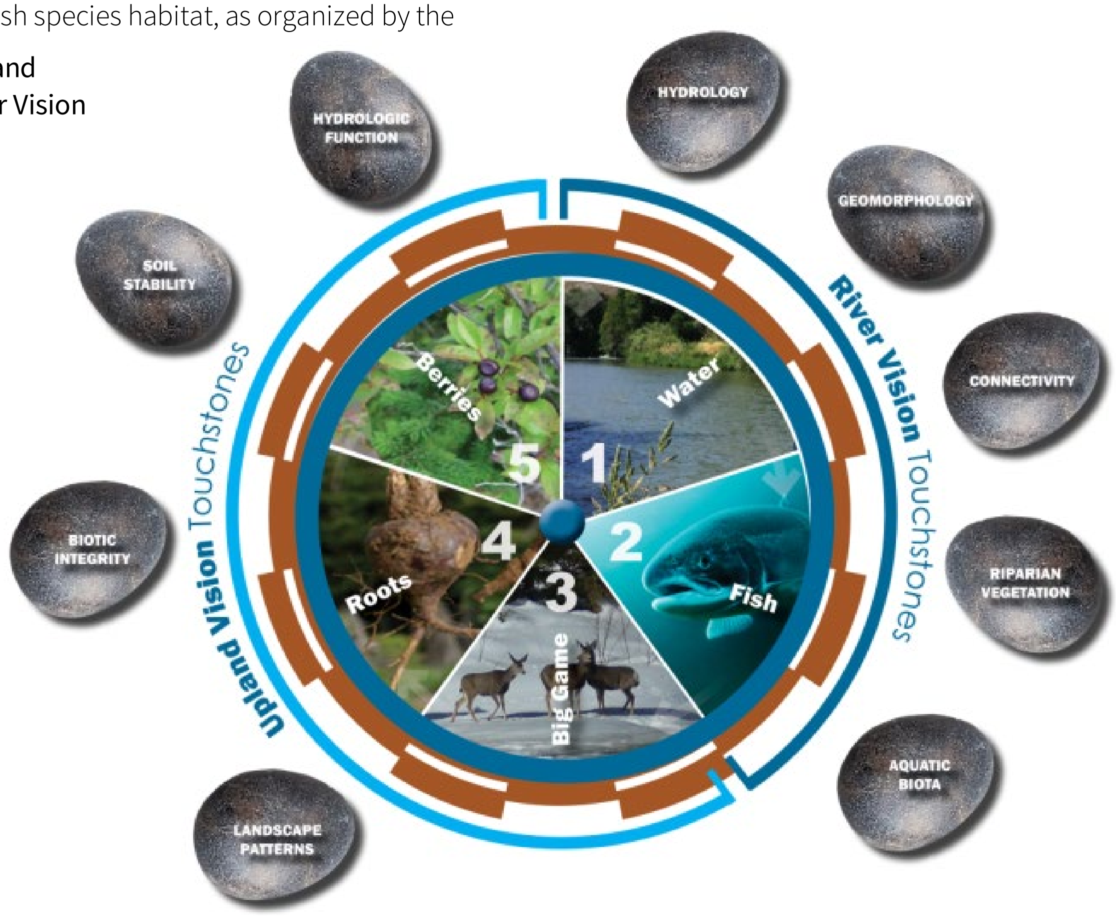
The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Department of Natural Resources (DNR) Fisheries Program has collated existing data, reports and input from state co-managers, Federal and local agencies, and other stakeholders into this watershed-scale assessment of historic, current,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

1.1 Project Purpose and Need

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

Figure 1. Upland Vision and River Vision Touchstones



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

Figure 2. Umatilla Subbasin and Ceded Land Boundary

The primary study area Includes approximately

107 miles

of stream and the associated floodplain

1.2 Project Vision, Goal, and Objectives

The URAP vision is the restoration of 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. The image below provides a summary of the URAP objectives.

1.3 Project Area

As noted above, the study is divided into a primary and secondary study area. The following provides a brief overview of the regional context and further detail about the secondary study area and the primary study area.

1.3.1 Regional Setting

As a tributary for the Columbia River, the Umatilla River flows from the Blue Mountains of northeastern Oregon to its confluence with the Columbia River near the town of Umatilla, Oregon. The Subbasin is one of 62 subbasins that make up the Columbia River basin. The Subbasin is 2,290 square miles in area and features the Blue Mountain Uplands (meadows and forested lands above 3,000 feet elevation), Blue Mountain Slopes (steep walled canyons between 2,000- and 3,000-feet elevation), Pendleton Plains (gently rolling slopes between 1,200- and 2,000-feet elevation), and the Stream Bottomlands (flat floodplains edged by moderate to steep slopes). 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 107 miles of river.

1.3.2 Secondary Study Area (Umatilla Subbasin)

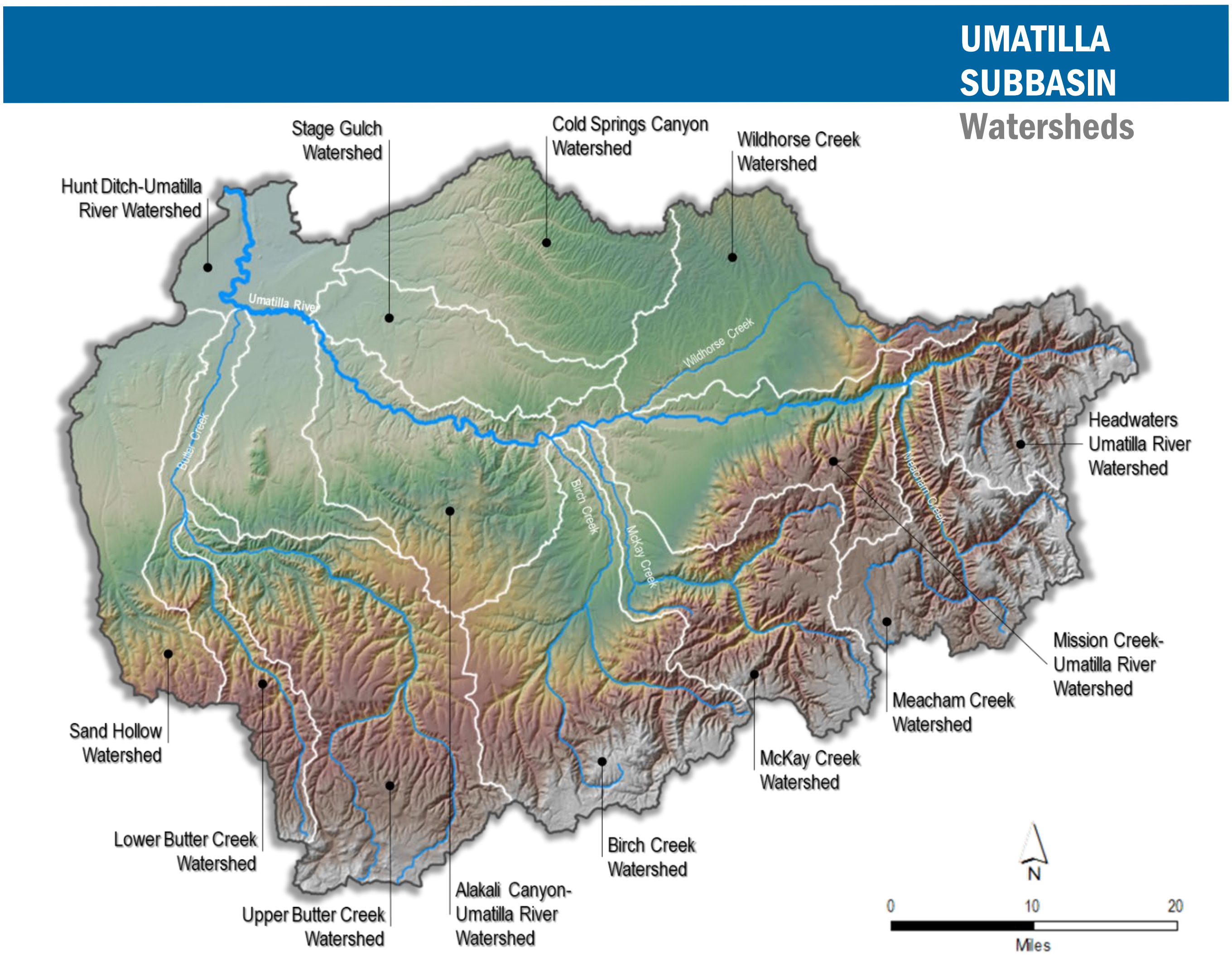
The Subbasin, which consists of the Umatilla River and all subwatersheds, makes up the secondary study area for the project. The secondary study area includes a reconnaissance-level assessment of the upland conditions and tributary processes across the Subbasin that influence the primary study area. The Subbasin is 2,290 square miles in area and includes 271 square miles which make up the Confederated Tribes of the Umatilla Indian Reservation. 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 thirteen 10-digit HUC10 watersheds and seventy-seven 12-digit HUC12 subwatersheds.

Mainstem Umatilla is

89 miles

1.3.3 Primary Study Area (Umatilla River)

In addition to the 107-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 primary study area, shown below, includes the 107 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 includes the development of several towns and communities including Umatilla, Hermiston, Echo, Stanfield, Pendleton, Mission, and Gibbon. The primary study area was further broken down into reaches that have similar and consistent physical properties, utilizing a combination of physical characteristics and metrics. Further analyses to evaluate each reach were then performed using the data compiled and metrics established for the URAP. More detail for the reach breaks is included in the technical appendices.



1.4 Project Process

The purpose of the URAP 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 this, the URAP included three main steps (Figure 3):

> **Assessment:** Existing data sources were provided by the CTUIR and collected separately 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 was 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 provides illustrations and documentation of the findings of the data review and analyses based on the touchstones and includes further technical documentation in the form of the technical appendices.
>
> **Restoration Prioritization:** The Prioritization used analysis of the information presented in the Assessment to identify the reaches and subwatersheds that were most departed from historic conditions and geographically prioritize these areas for restoration. A spreadsheet was developed that can be updated in the future as new data is collected or as projects are implemented. A tool was then developed that provided the restoration action types that can be used in the reaches and subwatersheds to restore Uplands Vision and River Vision touchstone function. Restoration action criteria are described in the tool to include potential benefit in project areas as well as feasibility of restoration actions in the project areas.
>
> **Action Plan:** The Action Plan is intended to provide the CTUIR with a strategic management plan and pathway for implementing restoration actions throughout the Subbasin and in the Umatilla River. The Action Plan includes management plans for uplands in the Umatilla Subbasin, the river channel and associated floodplains of the Umatilla River, and the aquatic species of the Subbasin. Actions that can be undertaken in the Subbasin and in the Umatilla River are provided and a reach-by-reach map book of actions for the Umatilla River is provided along with conceptual designs for six high priority locations on the Umatilla River.

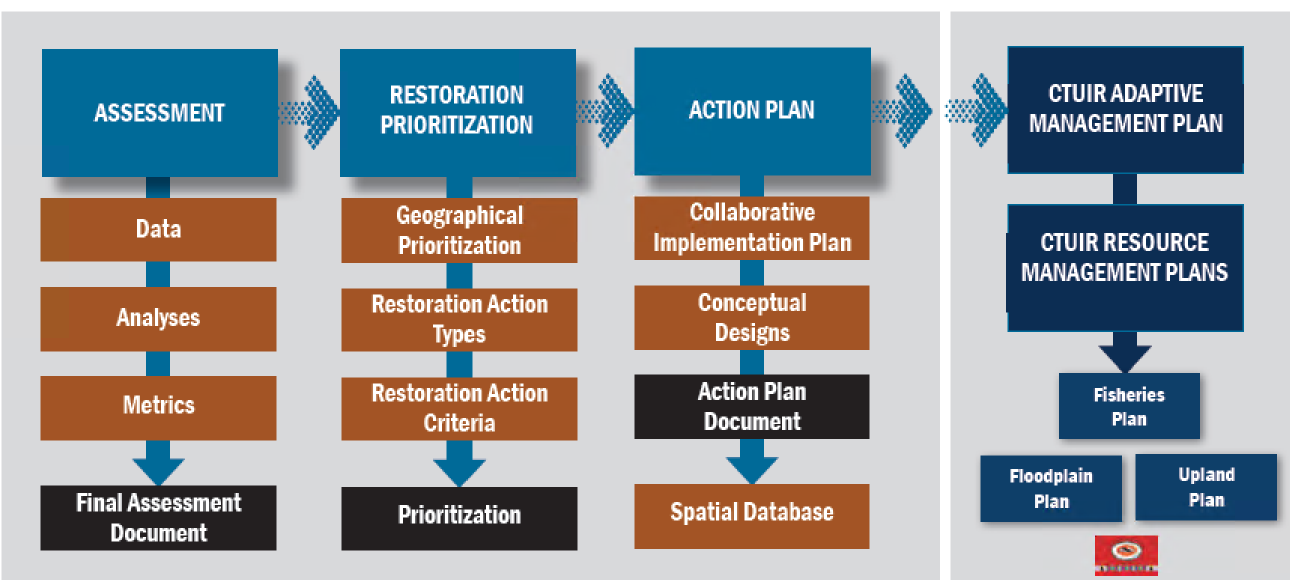


Figure 3. Outline of the URAP

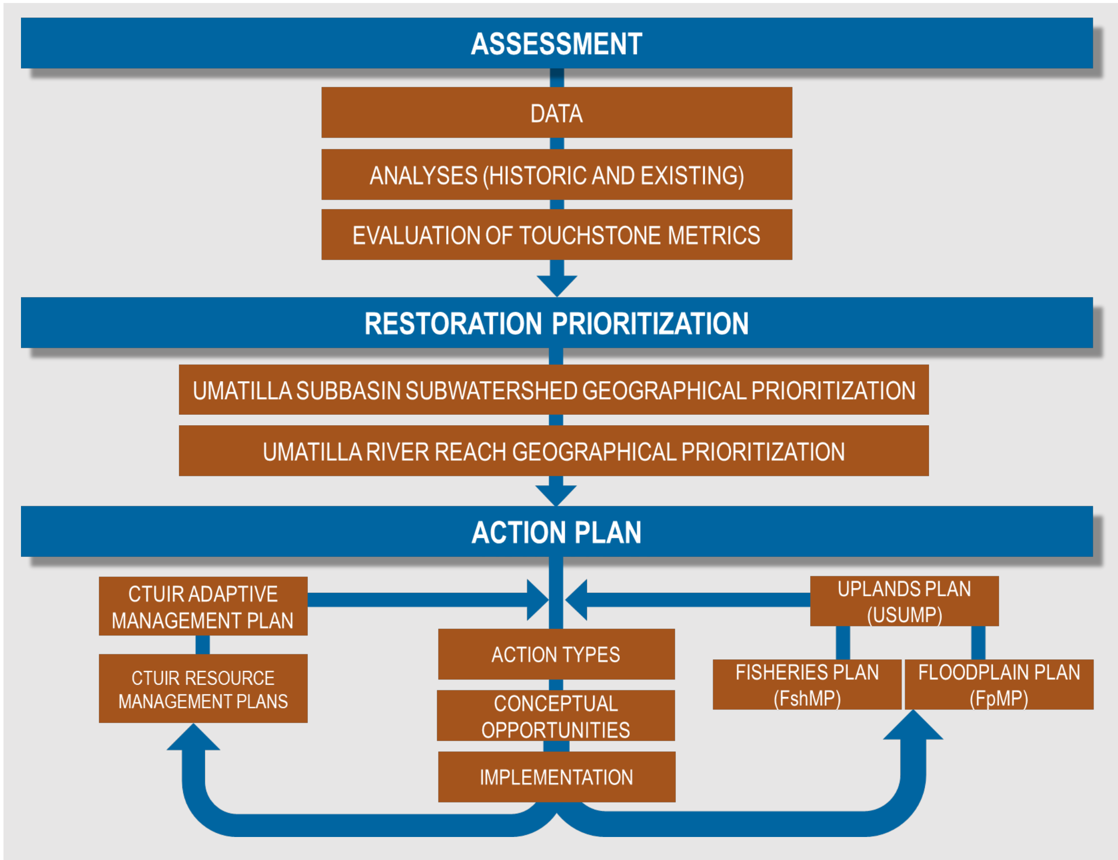


Figure 4. Outline of the Pieces of the Action Plan

1.5 Project Context

The CTUIR have 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.

1.6 Data Gaps

The Assessment technical appendix includes an annotated bibliography providing a more complete, though not exhaustive, 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 provided, they would play a critical role in the prioritization of the Subbasin and Umatilla River. For example, monitoring of implemented projects could provide information that would be used to update the prioritization and potential future restoration activities. Identified data gaps are listed in Table 1.

Table 1. Umatilla Subbasin Data Gaps

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
Place name mapping
Beaver Restoration Assessment Tool (BRAT) Report
Significant cultural resources sites
Big game historic and current habitat availability
Umatilla River Water Rights Assessment (Freshwater Trust 2010)

2.0 Assessment Key Findings

Analyses of the existing datasets provided by the CTUIR and other stakeholders were utilized 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 were identified geographically (Figure 5). The following sections summarize the findings of the Assessment of the secondary study area (Section 2.1) and the primary study area (Section 2.2).

Figure 5. TEK Use Types (adapted from Hunn et al. 2015)

2.1 Secondary 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, mean summer streamflows in the mainstem Umatilla River are expected to decrease between 20 and 60 cubic feet per second (cfs) between Meacham Creek and Birch Creek and by more than 60 cfs from Birch Creek to the confluence with the Columbia River (Isaak et al. 2017). 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 (Figure 6) 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).

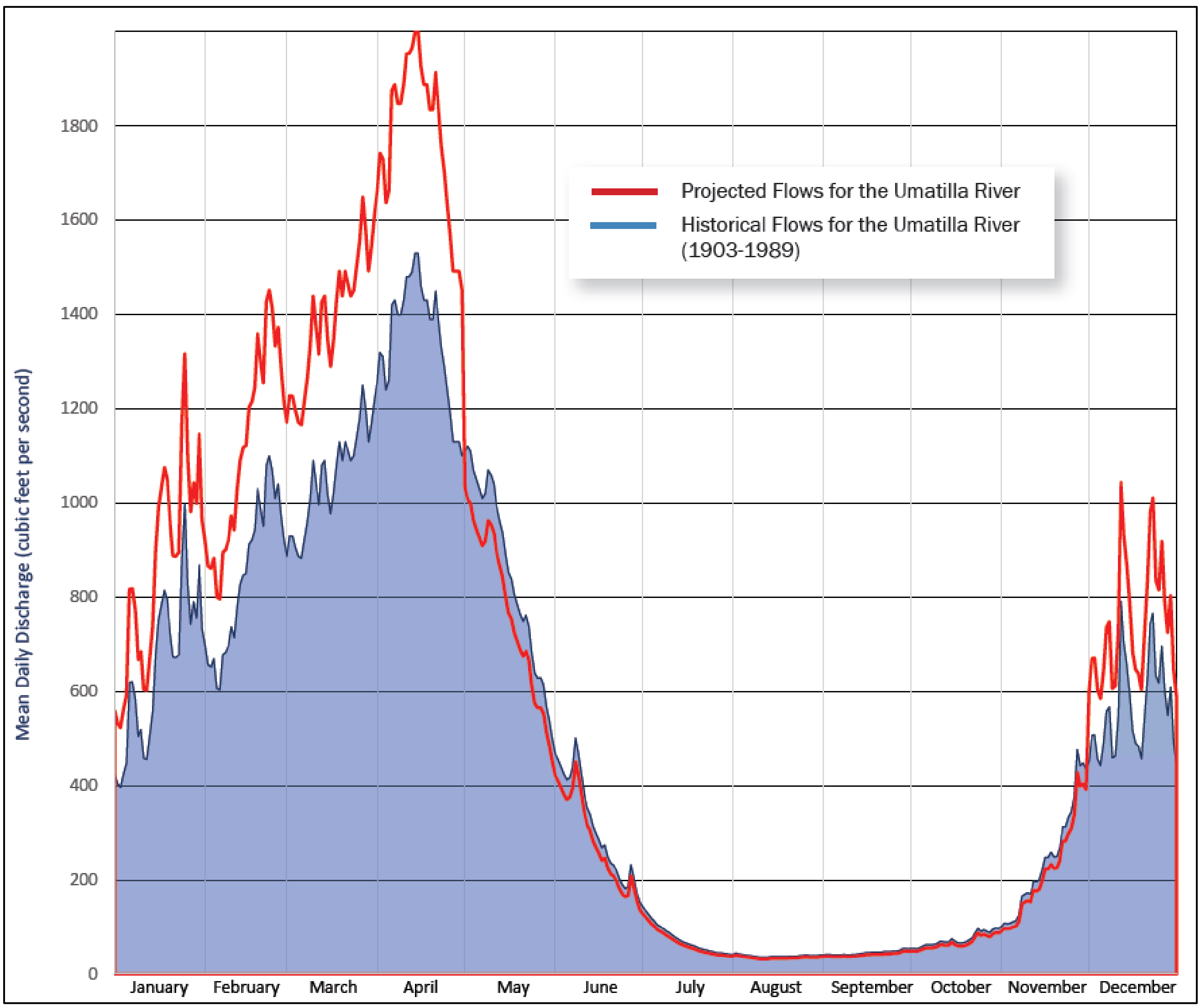


Figure 6. Predicted Subbasin Hydrology

2.1.2 Soil Stability Touchstone

In the Subbasin, 54 percent of the soils are highly erodible (Figure 7) (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 production to agriculture has reduced availability of traditional foods, reduced range for wildlife, and reduced soil stability. Over-grazing by livestock has introduced non-native plants and timber extraction has depleted forest stands, further reducing soil stability and increasing sediment routing to streams. This decrease in soil stability under Post-Euro-American settlement is a particular concern given the erodible nature of the soils in the 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 an extra 343 tons of sediment per year to streams in the subbasin (Figure 8). A total of 85 miles of streams in the subbasin are receiving more than 60 tons of sediment per year from roads.

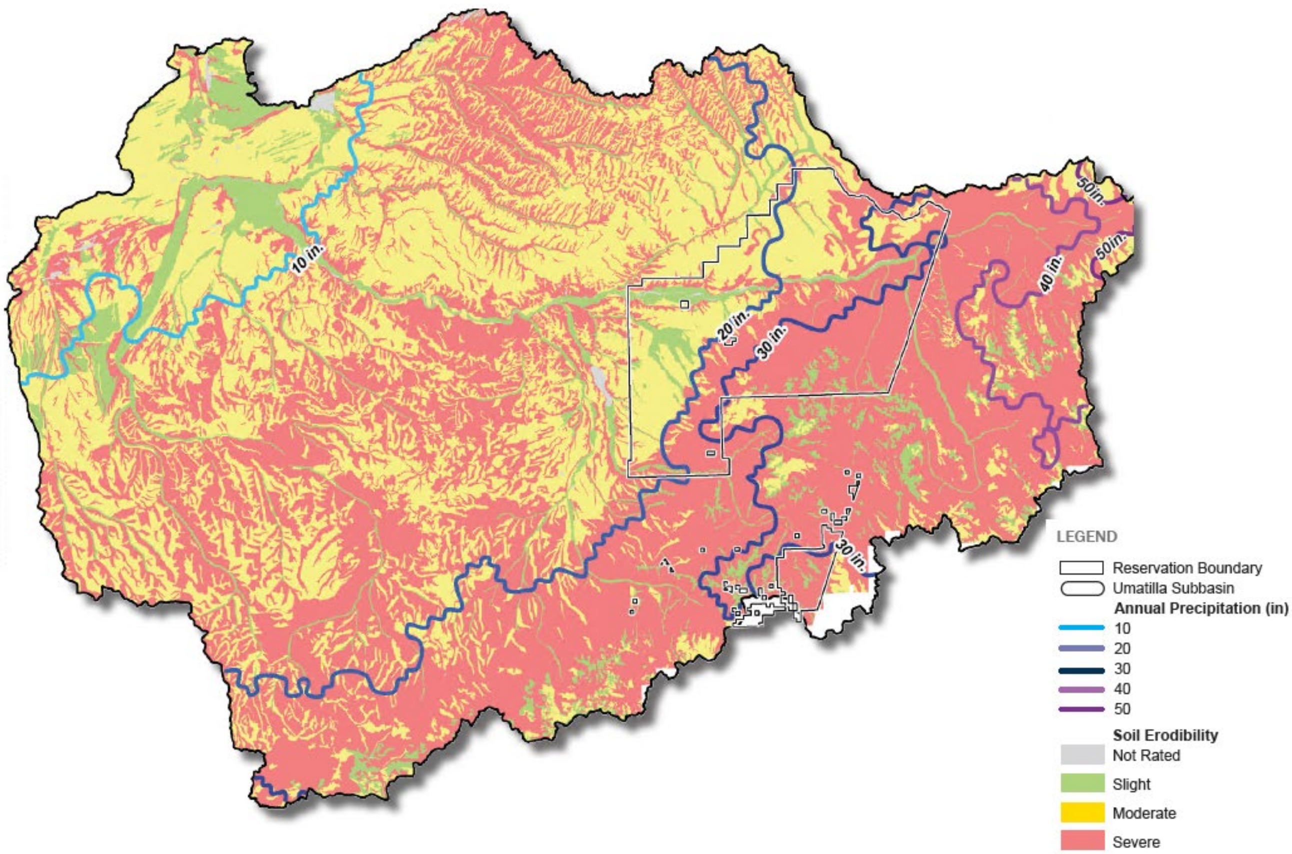


Figure 7. Soil Erodibility and Annual Precipitation in the Umatilla Subbasin

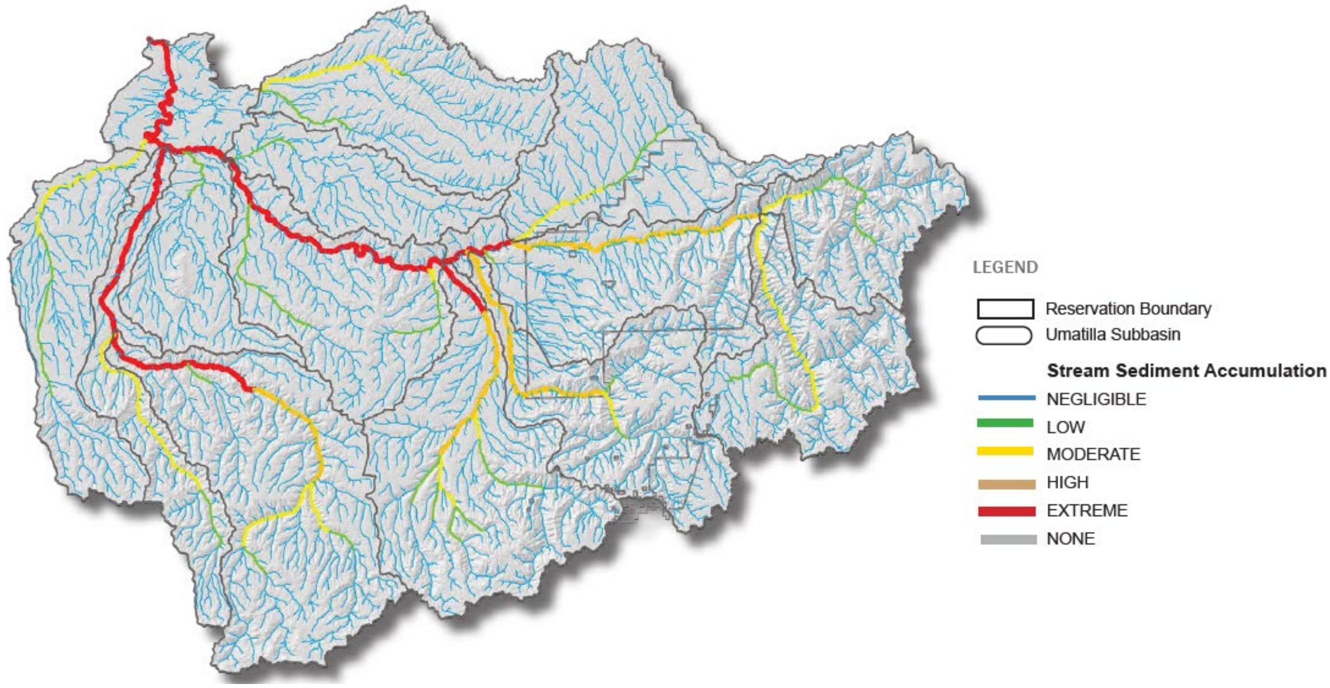


Figure 8. Stream Sediment Accumulation from Roads in the Umatilla Subbasin

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, only 62 percent of the subbasin remains untouched (Figure 9) 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.

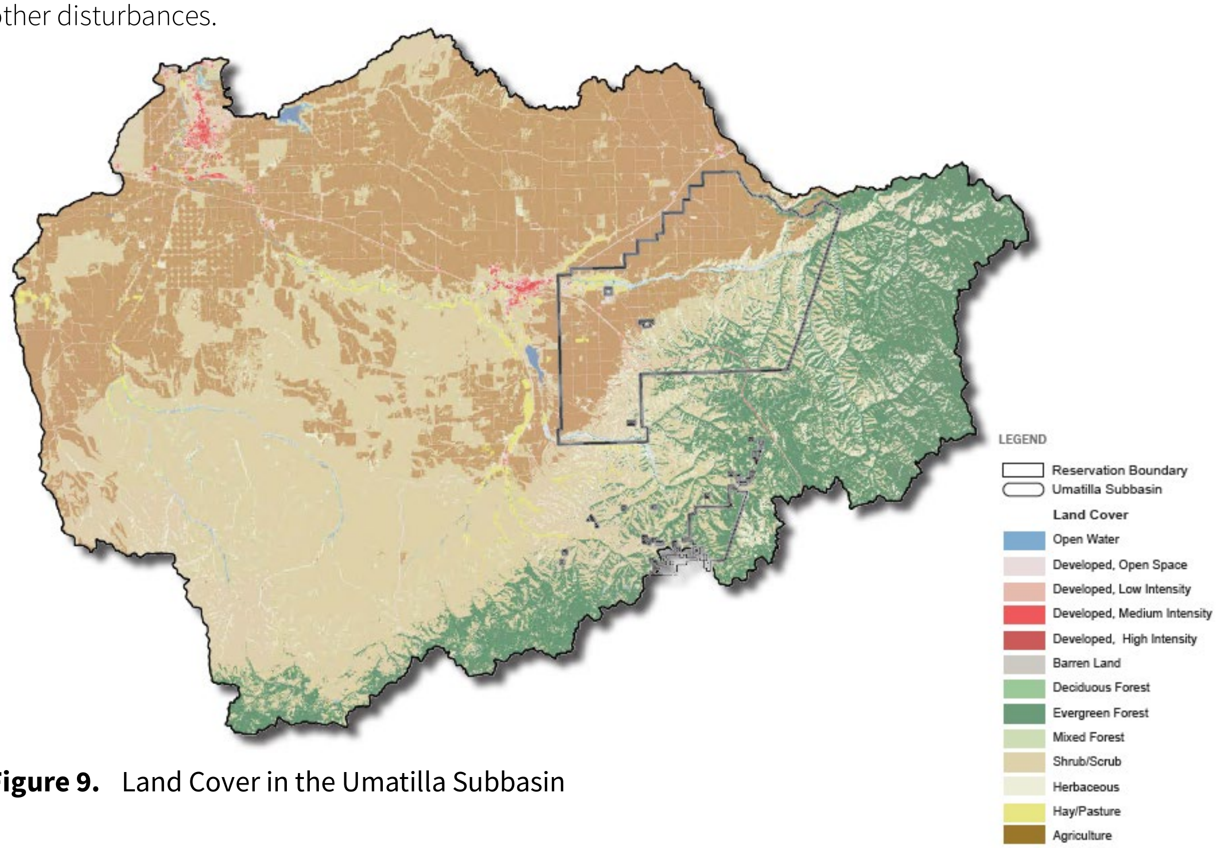


Figure 9. Land Cover in the Umatilla Subbasin

Catastrophic fires, mechanical disturbance, and insects/disease have further decimated areas that remain intact (Figure 10). Nearly 23,000 acres of the Subbasin have been impacted by high intensity fires between 2004 – 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.

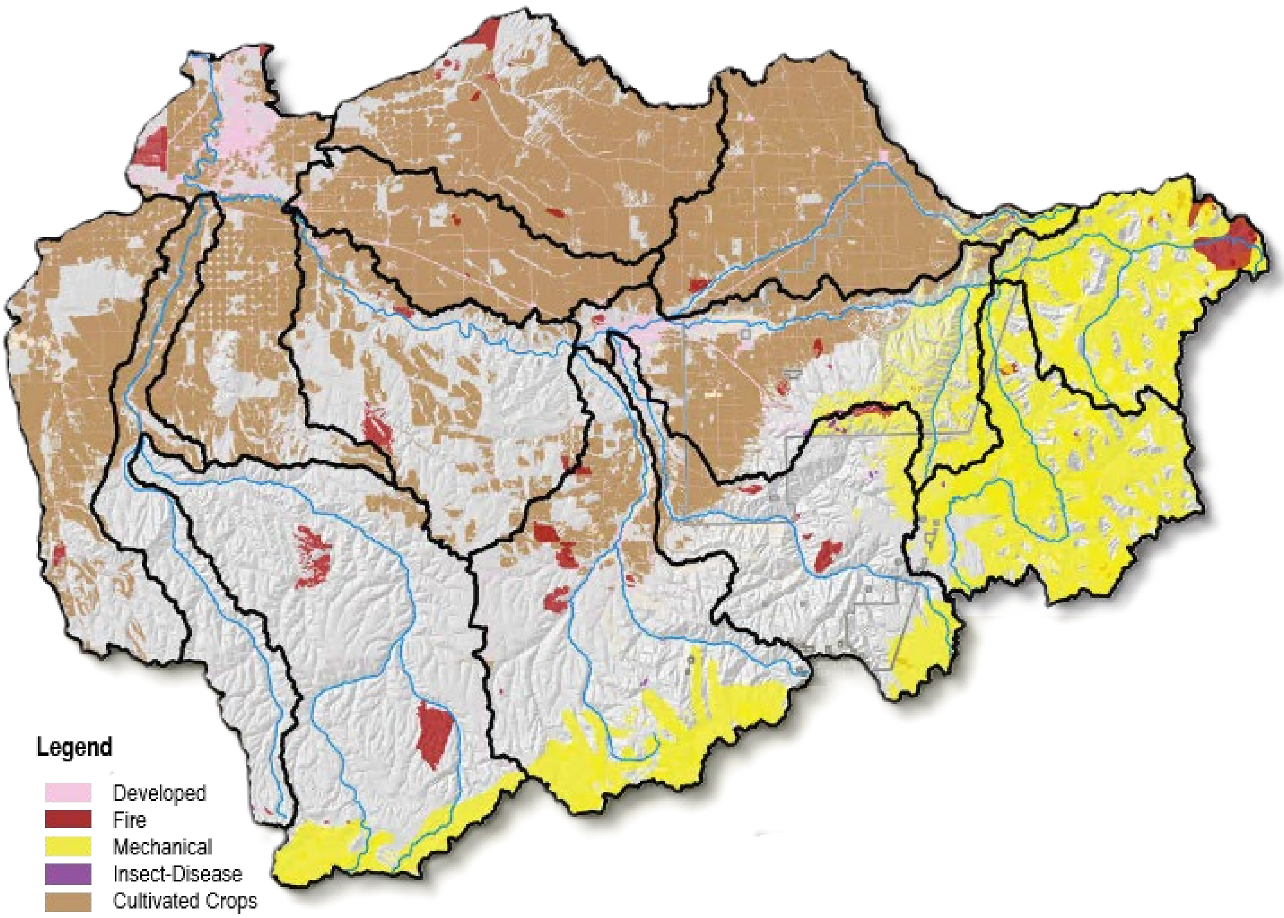


Figure 10. Disturbances in the Umatilla Subbasin

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 is heavily impacted by the introduction and spread of non-native species, further reducing biotic integrity (Figure 11). Over 57 percent of the vegetation in the Subbasin is highly departed from historic conditions (LANDFIRE 2016).

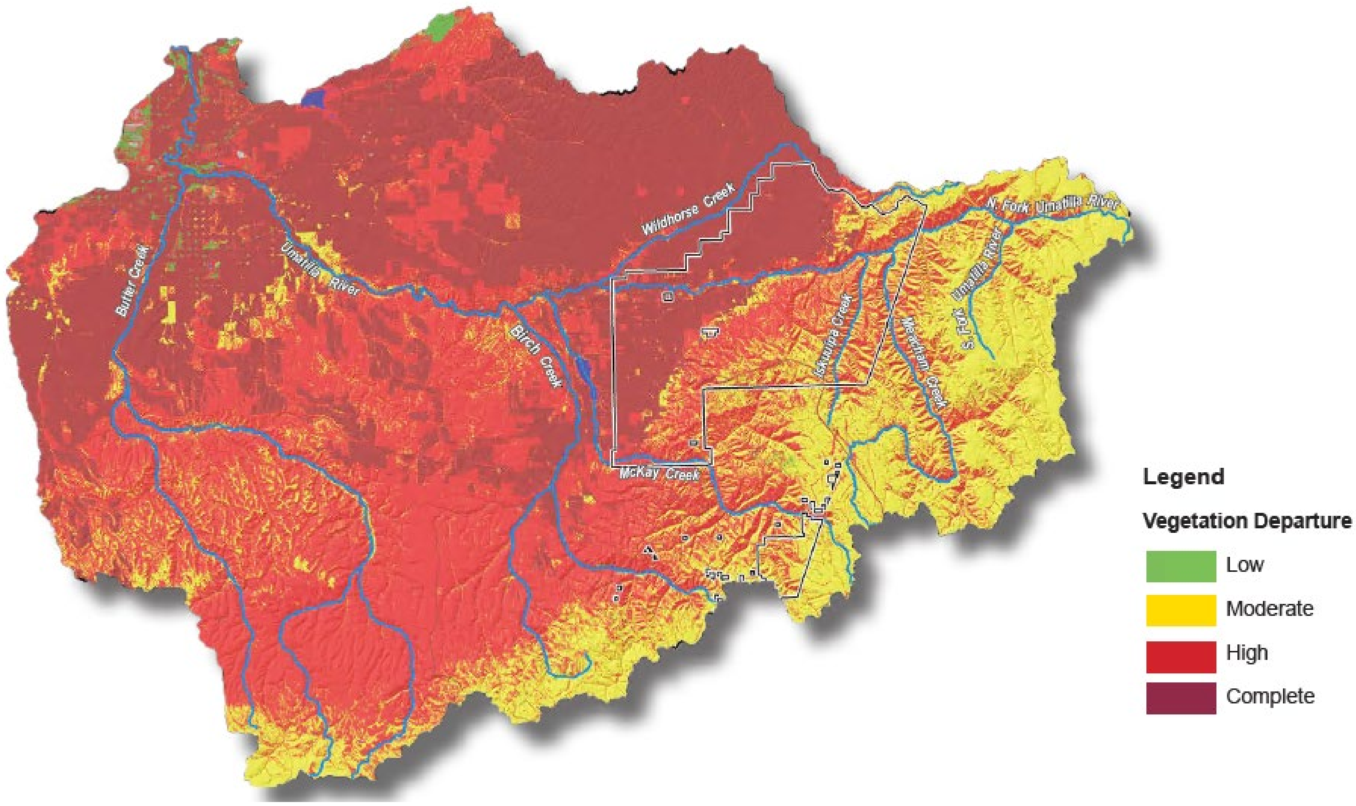


Figure 11. Vegetation Departure in the Umatilla Subbasin

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. 33 percent of vegetation in the Subbasin is early seral, 66 percent is mid seral, and only 1 percent is late seral (Figure 12) (LANDFIRE 2016). 17 percent of the intact canopy cover in the Subbasin is less than 10 meters tall, 20 percent is greater than 20 meters tall, and 63 percent is between 10 and 20 meters tall (Figure 12) (LANDFIRE 2016). The reduced variability in successional stages and canopy heights in the vegetation is an indicator of poor uplands conditions throughout the Subbasin.

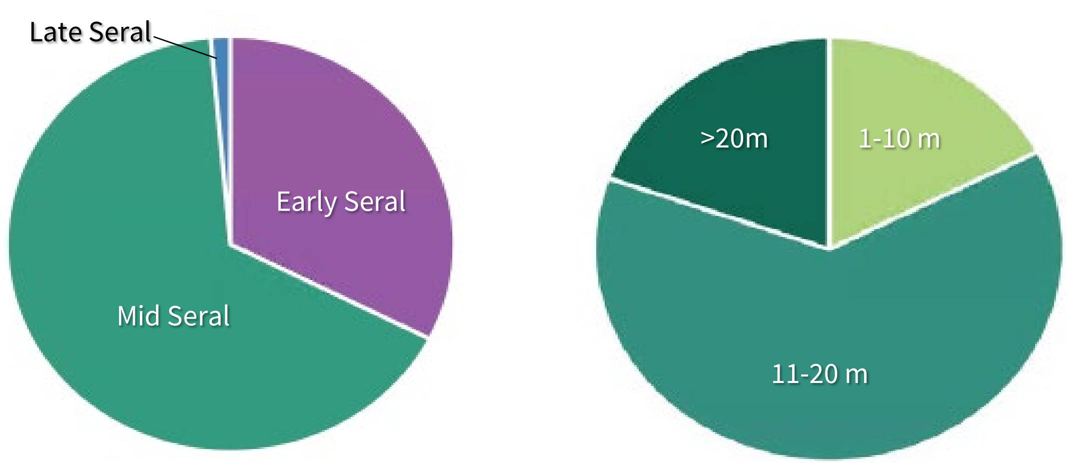


Figure 12. Seral Stage Distribution in the Umatilla Subbasin (left) and Current Tree Height Distribution (right)

2.2 Primary Study 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 (Section 2.2.1.1) and Water Quality (Section 2.2.1.2).

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 generallyT accepted as the reason for the extirpation of Chinook salmon in the Subbasin. Surface water consumption in the Umatilla Subbasin is diverted for irrigation 69 percent of the time (Figure 13) (Umatilla Subbasin 2050 Water Management Plan). Slight 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. However, the natural hydrograph has been restored and numerous tributaries still run dry as the summer progresses.

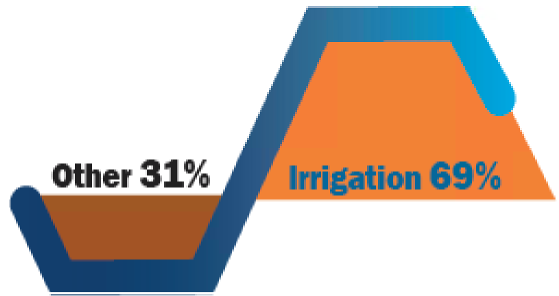


Figure 13. Surface Water Consumption in the Umatilla Subbasin

2.2.1.2 Water Quality

As described in the Umatilla Subbasin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) (2001), salmonids are highly sensitive to temperatures in the streams they inhabit. Temperatures between 64- and 74-degrees F are considered sub-lethal which can lead to death of salmonids within weeks to months. Temperatures greater than 74 degrees F can lead to death within hours to days. 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 () (Isaak et al. 2017).

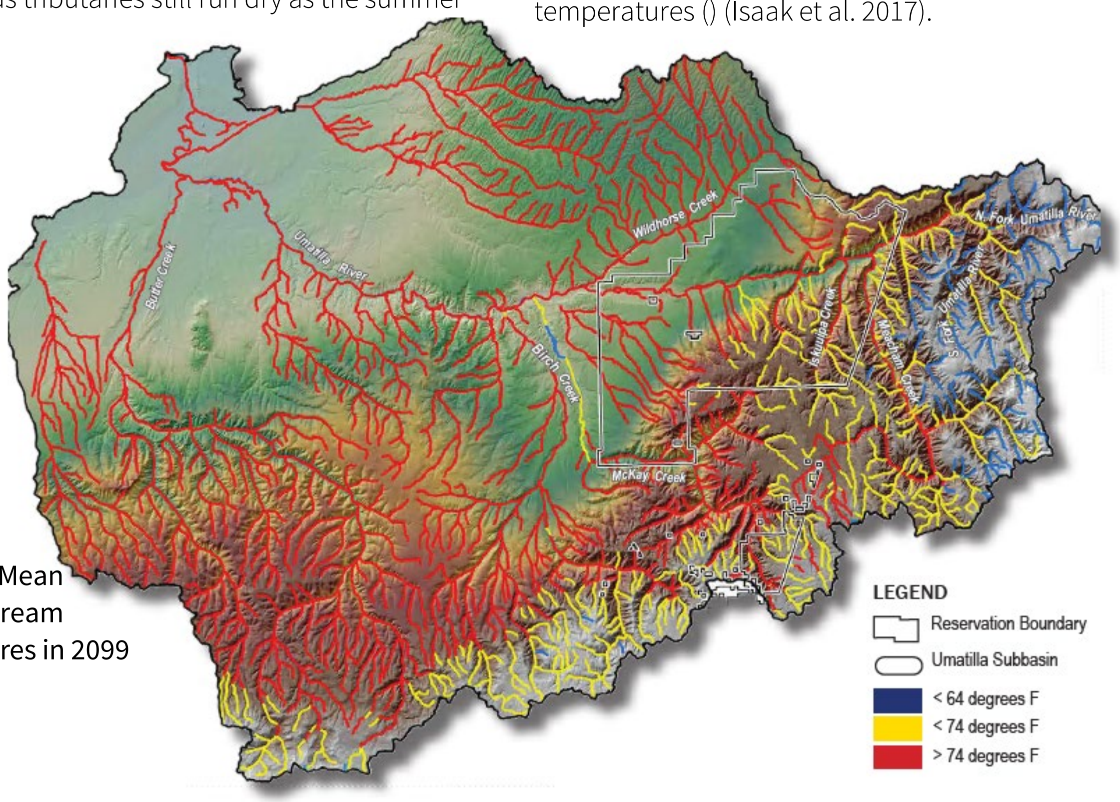


Figure 14. Mean Summer Stream Temperatures in 2099

2.2.2 Geomorphology Touchstone

Based on historic aerial imagery from 1952, the mainstem Umatilla River channel complexity has decreased by 55 percent. Current conditions on the mainstem Umatilla River includes a total of 33 miles of off-channel habitat. Historic conditions in 1952 would have included 52 miles of off-channel habitat. Because Euro-American settlement on the Umatilla River had been impacting the channel for at least 100 years by 1952, it is likely that the off-channel habitat would have been much more abundant (Figure 15).

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 110 miles, a 20 percent decrease from historic conditions.

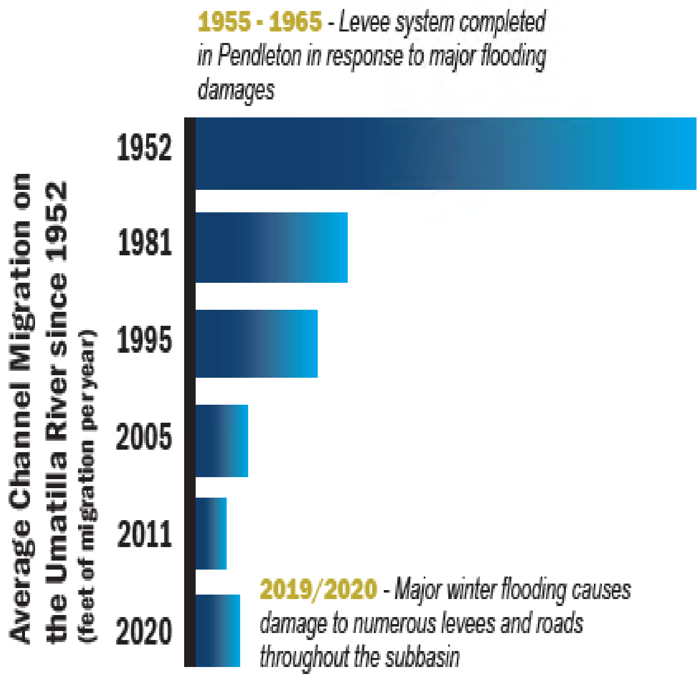


Figure 15. Average Channel Migration in the Umatilla River since 1952

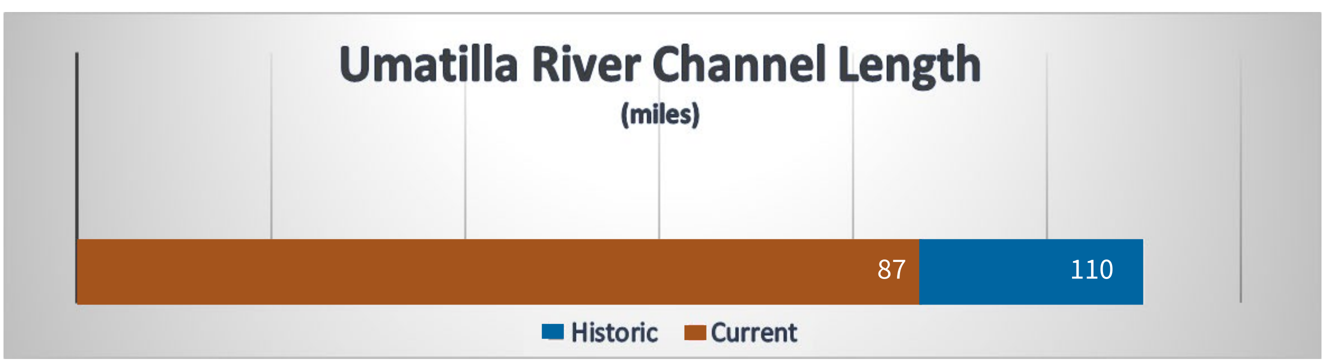


Figure 16. Umatilla River Channel Length

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.), over 44 percent of the total length of the river (Figure 17). Similarly, the current 100-year flow inundation extents only occupy about 40 percent of the historic floodplain (Figure 18).

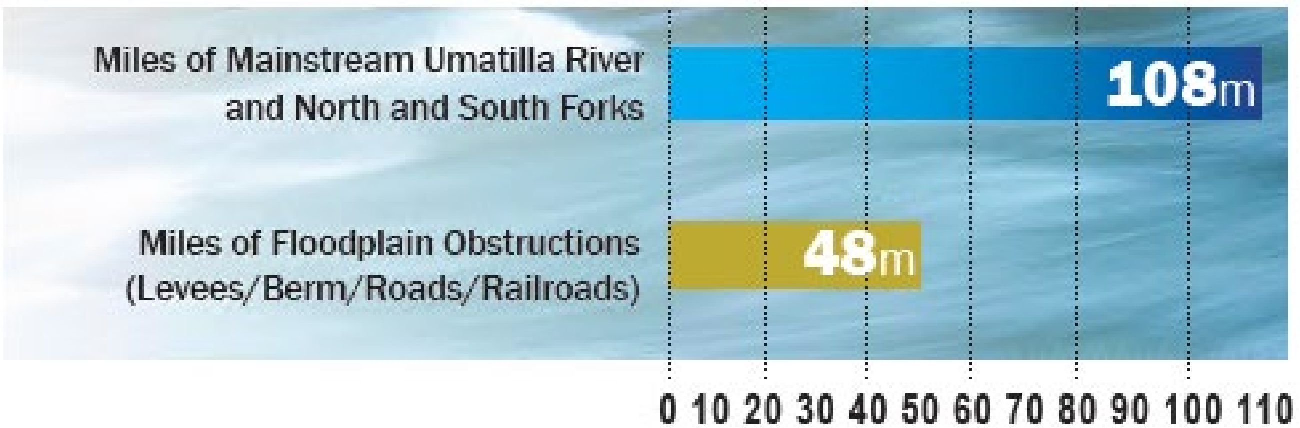


Figure 17. Lateral Obstructions on the Mainstem Umatilla River

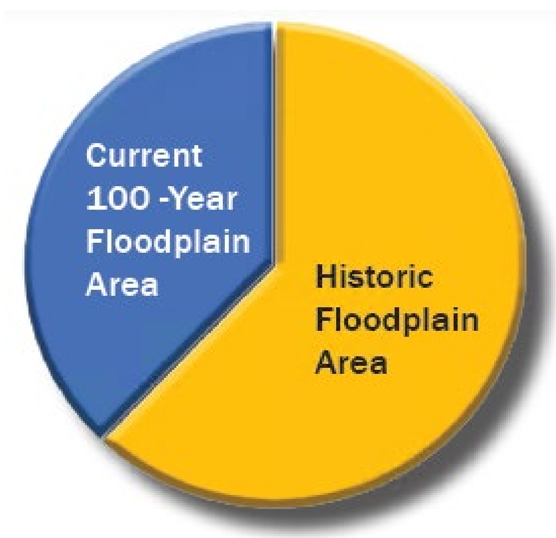


Figure 18. Floodplain Connectivity on the Mainstem Umatilla River

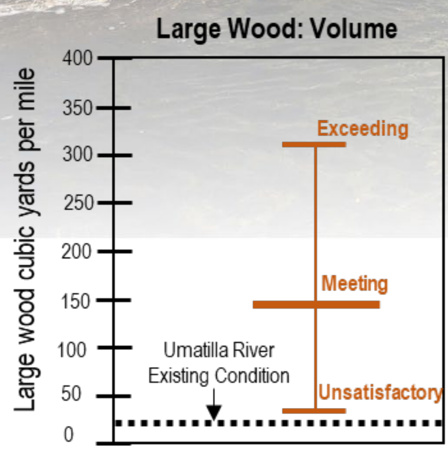
2.2.4 Riparian Vegetation Touchstone

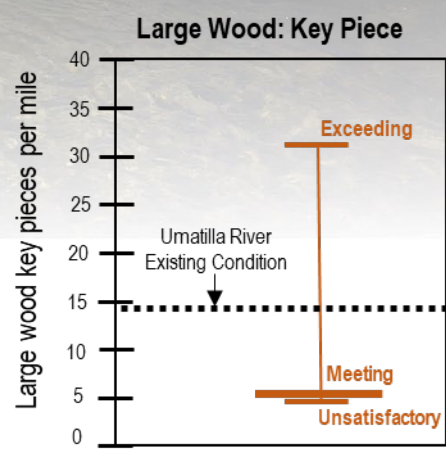
LARGE WOOD

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 avaiability 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, but are smaller than the key pieces that would have been in the river historically.

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

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

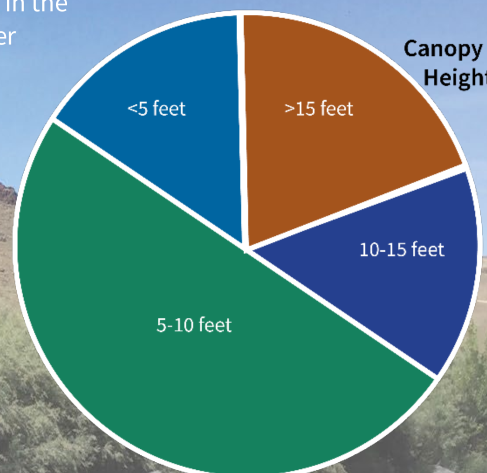




CANOPY HEIGHT

Historically, the river bottoms were dense with trees, including cottonwood, willow, and other species. Since time immemorial, the CTUIR managed these stands using controlled fires in order to create the conditions needed to support the First Foods. However, much of these riparian forests were cleared for agriculture, timber, and for development. The disconnection of the river from the floodplain reduces 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



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 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 (Figure 19). For spring Chinook salmon, spawning habitat has decreased by 38 percent, summer rearing habitat has decreased by 41 percent, and winter rearing habitat has decreased by 37 percent from historic conditions. For steelhead, spawning habitat has decreased by 41 percent, summer rearing habitat has decreased by 41 percent, and winter rearing habitat has decreased by has decreased by 37 percent from historic conditions. For bull trout, summer rearing habitat has decreased by 43 percent and winter rearing habitat has decreased by 37 percent from historic conditions. Smolt production potential modeling for Pacific lamprey in the mainstem Umatilla River is convoluted due to the limited amount of information relating to typical redd and larval density in different habitat types and mortality rates. However, results show that spawning habitat has decreased by 38 percent, summer rearing habitat has decreased by 41 percent, and winter rearing habitat has decreased by 37 percent from historic conditions.

Figure 19. Potential Habitat in the Mainstem Umatilla River for Spring Chinook, Steelhead, Bull Trout, and Lamprey

Smolt production potential modeling for the four focal species (spring Chinook, steelhead, bull trout, and lamprey) 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 (Figure 20). For spring Chinook, this loss of habitat has resulted in a 75 percent decrease in smolt production potential. For steelhead, this has resulted in a 79 percent decrease in smolt production potential. For bull trout, this has resulted in a 47 percent decrease in smolt production potential. For lamprey, this has resulted in a 74 percent decrease in production potential in the mainstem Umatilla River.

Figure 20. Smolt Potential for the Mainstem Umatilla River for Spring Chinook, Steelhead, Bull Trout, and Lamprey

3.0 Prioritization

Analysis of existing data sources identified the reaches and the subwatersheds that were the most departed from historic conditions. The further departed from historic conditions, the higher priority the reach or the subwatershed for action. The following section presents the prioritization for the Subbasin subwatersheds (Section 3.1) and the Umatilla River reaches (Section 3.2).

3.1 Umatilla Subbasin Subwatershed Prioritization

The more departed the subwatershed from historic conditions, the higher the prioritization for the subwatershed for restoration actions. Subwatersheds are prioritized based on departure from historic conditions as described in this document, including potential smolt production in the streams in the subwatershed as well as by TEK data. 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 (Figure 21).

3.2 Umatilla River Reach Prioritization

The more departed the reach from historic conditions, the higher the prioritization for the reach for restoration actions. Reaches are prioritized based on departure from historic conditions including potential smolt production in the streams in the Umatilla River as well as by TEK. 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 (Figure 22). North Fork and South Fork Umatilla River was prioritized as "Conservation" or "Restoration" rather than Tiers because of the lack of data analyzed in these reaches.

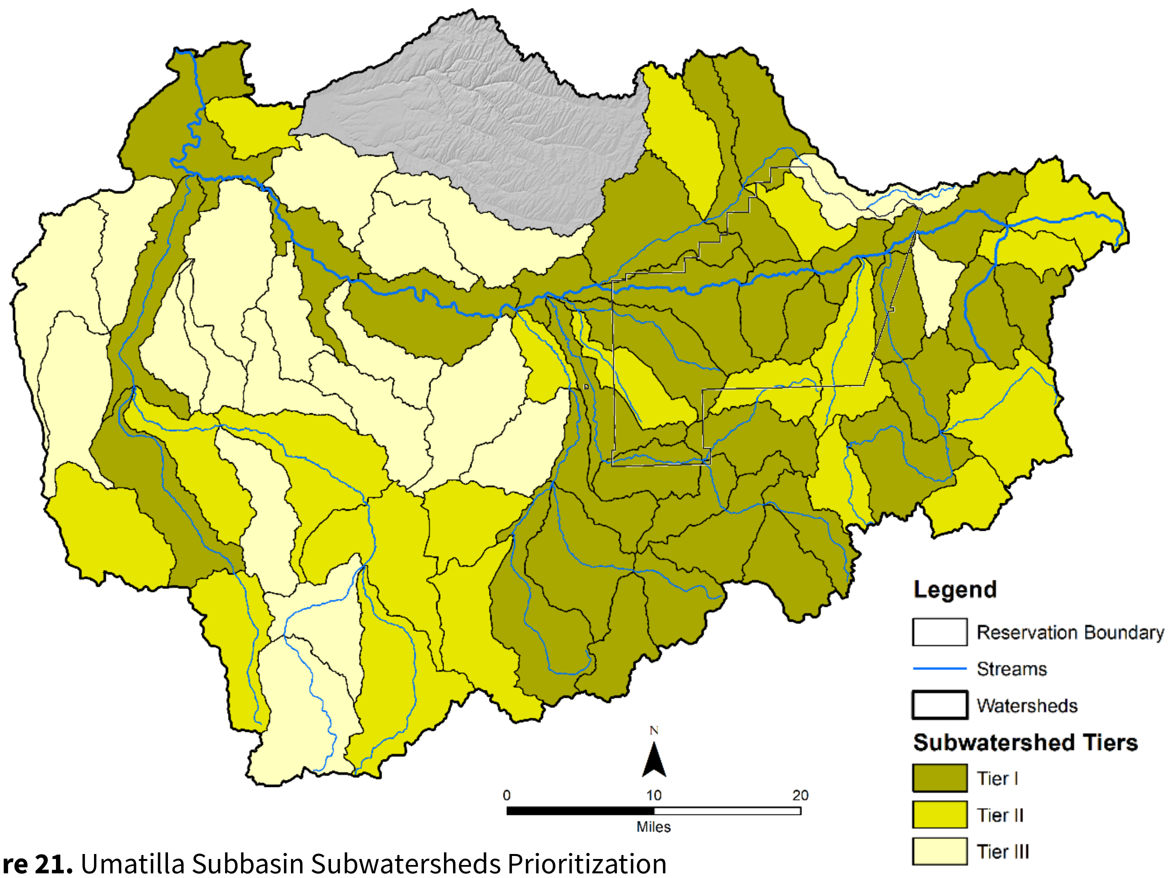


Figure 21. Umatilla Subbasin Subwatersheds Prioritization

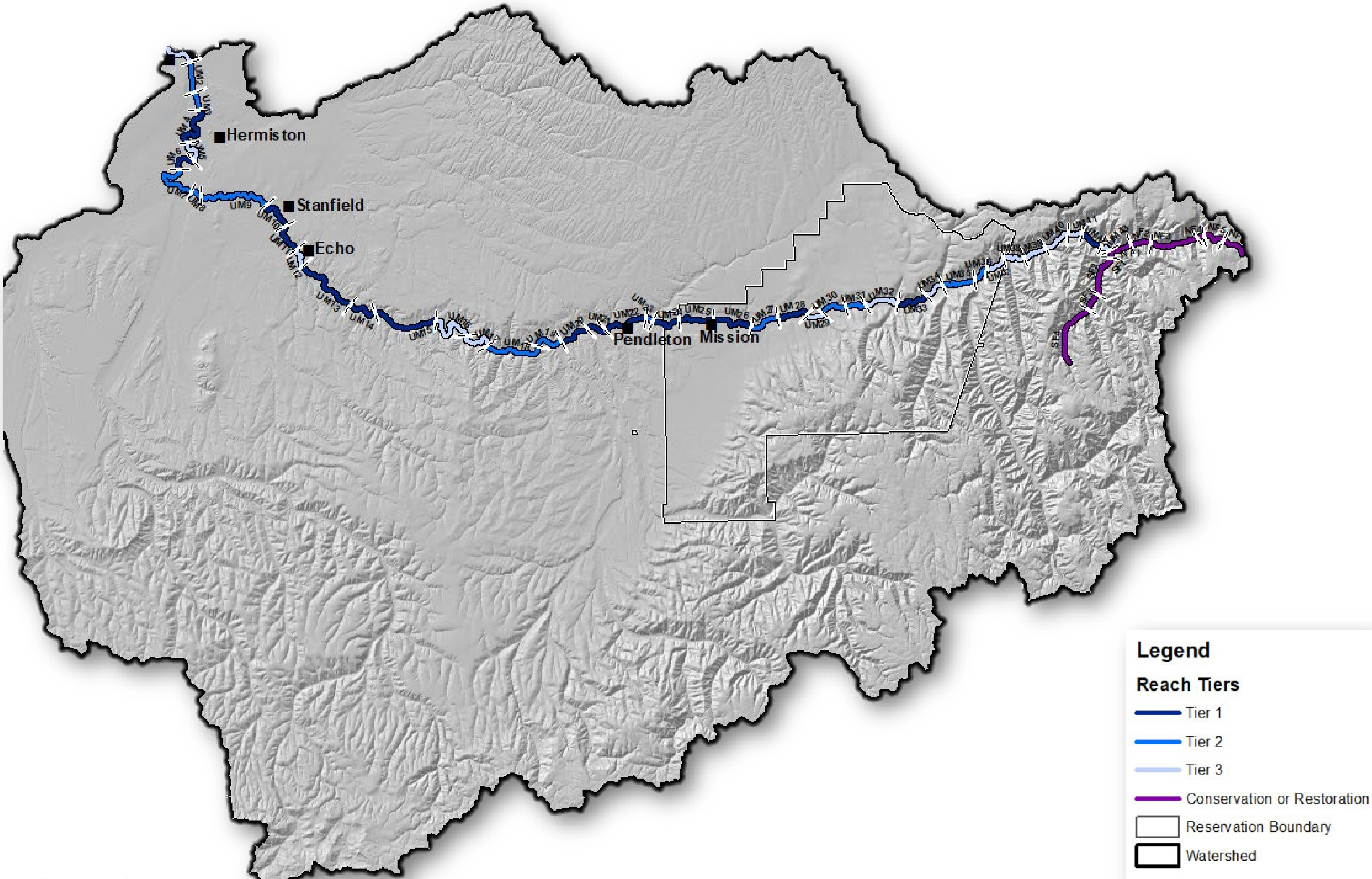


Figure 22. Umatilla River Reach Prioritization

4.0 Action Plan

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

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

Numerous management plans have already 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).

4.1 Uplands Management Plan Process

The Umatilla Subbasin Uplands Management Plan (USUMP) utilizes the Assessment, Prioritization, 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 USUMP provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring (Figure 23).

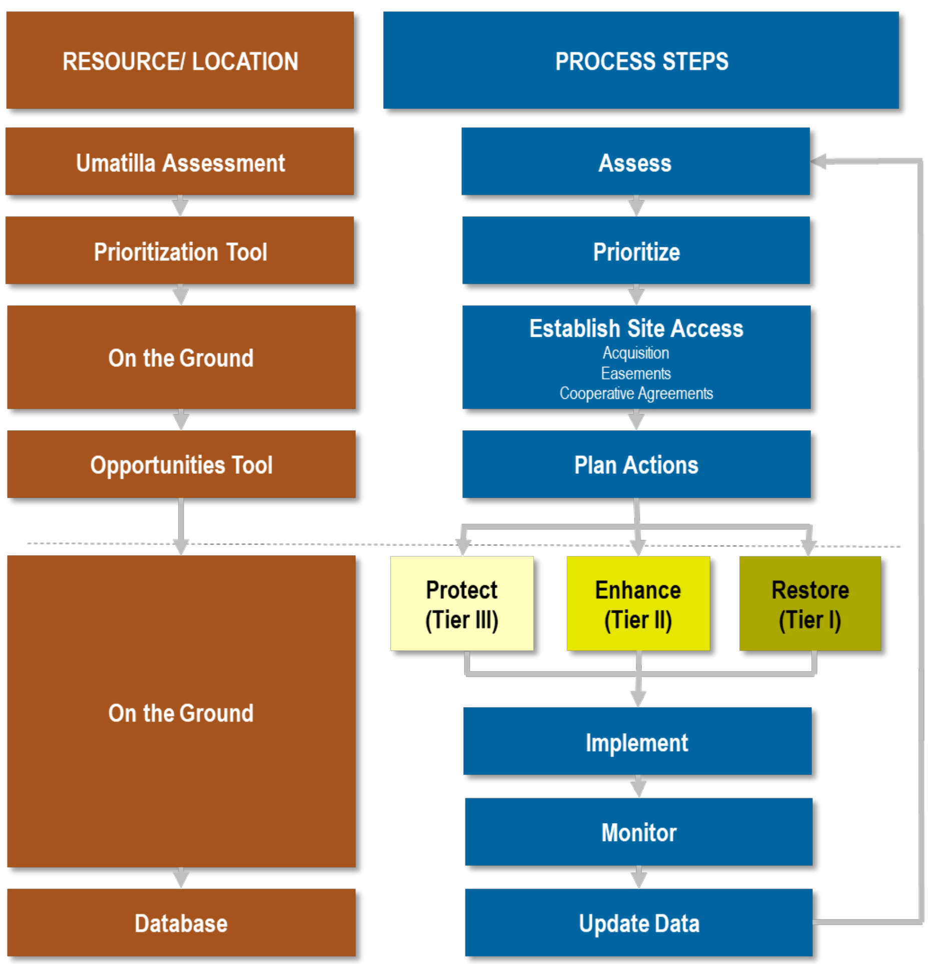


Figure 23. Uplands Management Plan Process

The first step in the USUMP is assessment. Information to inform this stage is already provided in the Assessment and is meant to be updated as new information is obtained or as specific actions are implemented. Prioritization of subwatersheds in the Subbasin is then identified as is done in the Prioritization tool that is detailed in Section 1.1. Assessment and prioritization can also be undertaken on 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 next step. This step is unnecessary on land owned by CTUIR, but would be required on land owned by state, federal, or private landowners. Establishing site control can be accomplished through direct land acquisition, establishing easements, or cooperative agreements as described in Section 4.1.1. 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 stakeholders 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. The cooperative data management would include building digital data repositories that would house updated information and that can be freely accessed by the agreed upon stakeholders. Examples of potential uplands data gaps to fill include the geographic extent of invasive plant species in the Subbasin, the extent and function of wetlands in the Subbasin, 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 in the Subbasin.

Land Acquisition or Agreements – Large-scale land acquisition or landowner agreements with Subbasin stakeholder or private landowners should be sought after to provide comprehensive uplands implementation opportunities. Patchwork implementation of uplands planning provides some progress but in order 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 – Establishment of policies meant to put uplands function in the Subbasin as the highest priority must be developed and implemented. Many of these policies already exist in the previously described existing management plans. However, these policies must be coalesced and become the governing principles for responsible use of the uplands resources in the Subbasin.

Alongside the large-scale planning efforts listed above, Subbasin managers can identify specific planning actions as the next step in the USUMP 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 next step. Follow-up monitoring and data management will aid in tracking restoration performance and future needs over time. The monitoring and data management is then utilized to update the Prioritization and continue the USUMP 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 are provided in the opportunities spreadsheet tool and applied to the subwatersheds based on the Prioritization. The opportunities tool shows the potential benefit to uplands function based on the selected action types.

4.1.1 Action Types

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 (Table 2). Project actions will promote the development of healthy riparian and uplands areas to promote sustainable growth of First Foods and to promote overall subwatershed health. The list of project activities provide 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 fifteen options, generally arranged from passive to active. Each proposed action was identified with a specific purpose and expected function. The actions were identified to be the most effective and appropriate actions for each given subwatershed. Some actions were designed to provide a management plan for the uplands in the Subbasin while others are designed to provide on-the-ground benefits like introducing beavers to subwatersheds to promote healthy ecosystems throughout the Subbasin. Table 2 lists the identified actions for each subwatershed in the Subbasin.

4.2 Umatilla River Management Plan

The Umatilla River Management Plan (URMP) utilizes the Assessment, Prioritization, 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 URMP provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring. The URMP includes two management plans: the Floodplain Management Plan (FpMP) and the Fisheries Management Plan (FshMP).

Table 2. Uplands Action Types

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   + Low Benefit
++ Moderate Benefit   − Little or No Benefit

Like the USUMP, 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 and further described in Section 4.1, data gaps exist throughout the Subbasin for critical River Vision metrics. Cooperative data management, like what is described in Section 4.1, would include building of digital data repositories that would house updated information that can be freely accessed by the agreed upon stakeholders. 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 sought after to provide comprehensive floodplain management 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 up the CTUIR 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 – Establishment of policies meant to put floodplain function in the Umatilla River as the highest priority must be developed and implemented. No development should be allowed in the floodplains, whether that is agricultural, residential, or otherwise. This strict policy is 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 the floodplain development 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 longitudinal and lateral approach will promote self-sustaining wood recruitment over time, maximum loading of wood volumes throughout all reaches of the Umatilla River, lateral connectivity to decrease stream power and promote hyporheic exchange, and provide buffers to expected climate impacts.

The FpMP provides a pathway to manage the aggressive, large-scale approaches described above (Figure 24). The first step in the FpMP is assessment. Information to inform this stage is 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 then identified as is done in the Prioritization tool that is detailed in Section 3.2. Assessment and prioritization can also be undertaken on different scales. For example, a particular set of reaches can be assessed and prioritized for actions.

Establishing site access of large swaths of the floodplain of the Umatilla River to carry out protection, enhancement, or restoration actions is the next step. This step is unnecessary on land owned by CTUIR, but would be required on land owned by state, federal, or private landowners. Establishing site control can be accomplished through direct land acquisition, establishing easements, or cooperative agreements as described in Section 4.2.2.

How functional the floodplain is should be identified utilizing the Prioritization as described in Section 3.2. Floodplains that are identified as Tier III are likely to be slated for "Protection", Tier II sites are likely to need

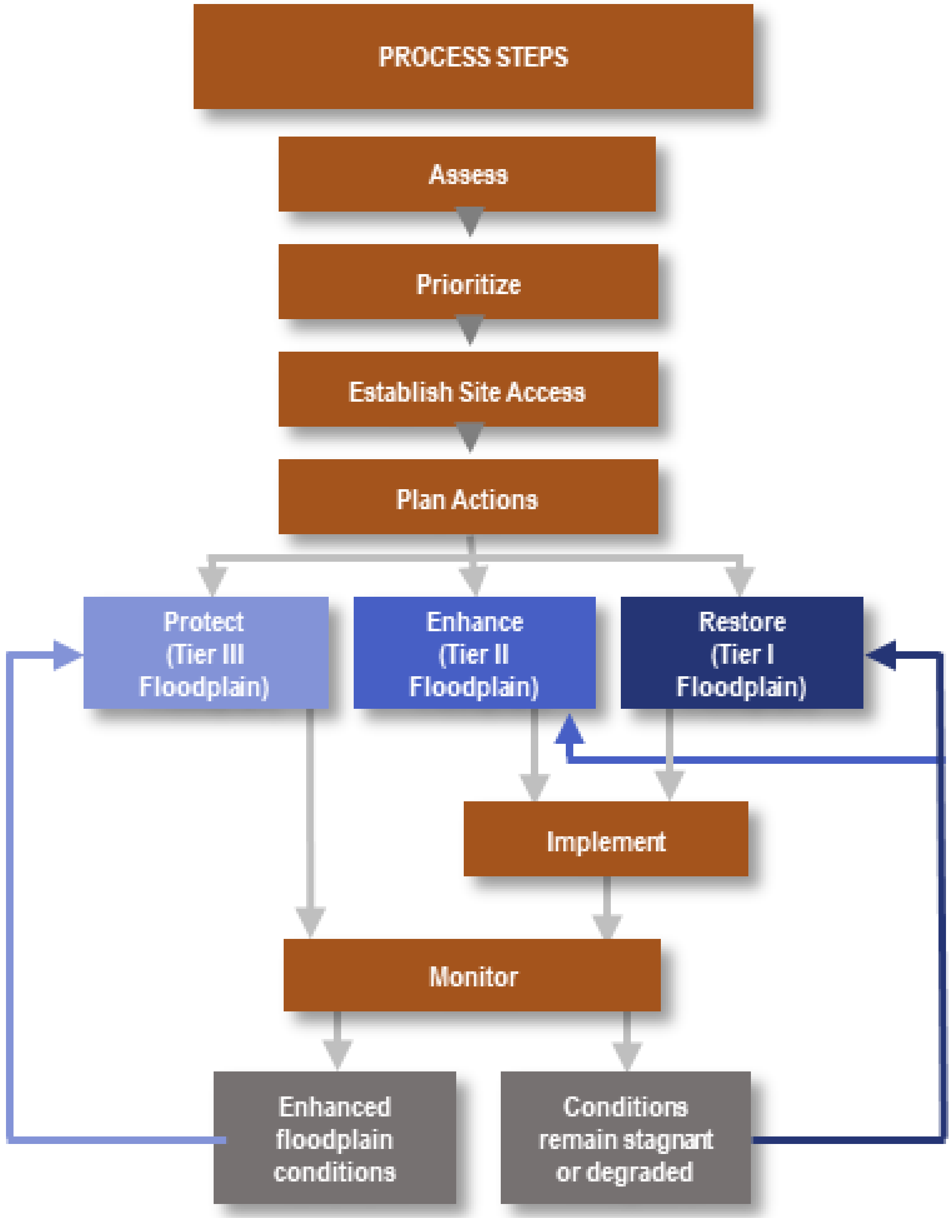


Figure 24. Floodplain Management Plan (FpMP)

"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 the site should be considered for more aggressive "Enhancement" or "Restoration" strategies.

4.3 Floodplain Management Plan Process

The Umatilla Subbasin Floodplain Management Plan (FpMP) utilizes the Assessment, Prioritization, and opportunities tool, along with on the ground action and monitoring to implement protection, restoration, and enhancement efforts in support of the CTUIR Floodplain Vision.

To restore means to bring habitat back to a desired conservation condition. Enhancing will increase the ability of habitat and related natural systems. Lastly, to protect is to maintain the ability of habitat and related natural systems. If conditions remain stagnant or seem to be degrading, further enhancement and/or restoration plan actions will need to be reimplemented. If enhanced floodplain conditions are observed, protection of these natural systems will continue.

The FpMp provides a process for assessing, prioritizing, establishing access, planning actions, implementing actions, and monitoring.

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 (Figure 25).

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 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, electrofishing, and, where appropriate, screw trap operations. Methods for monitoring adults

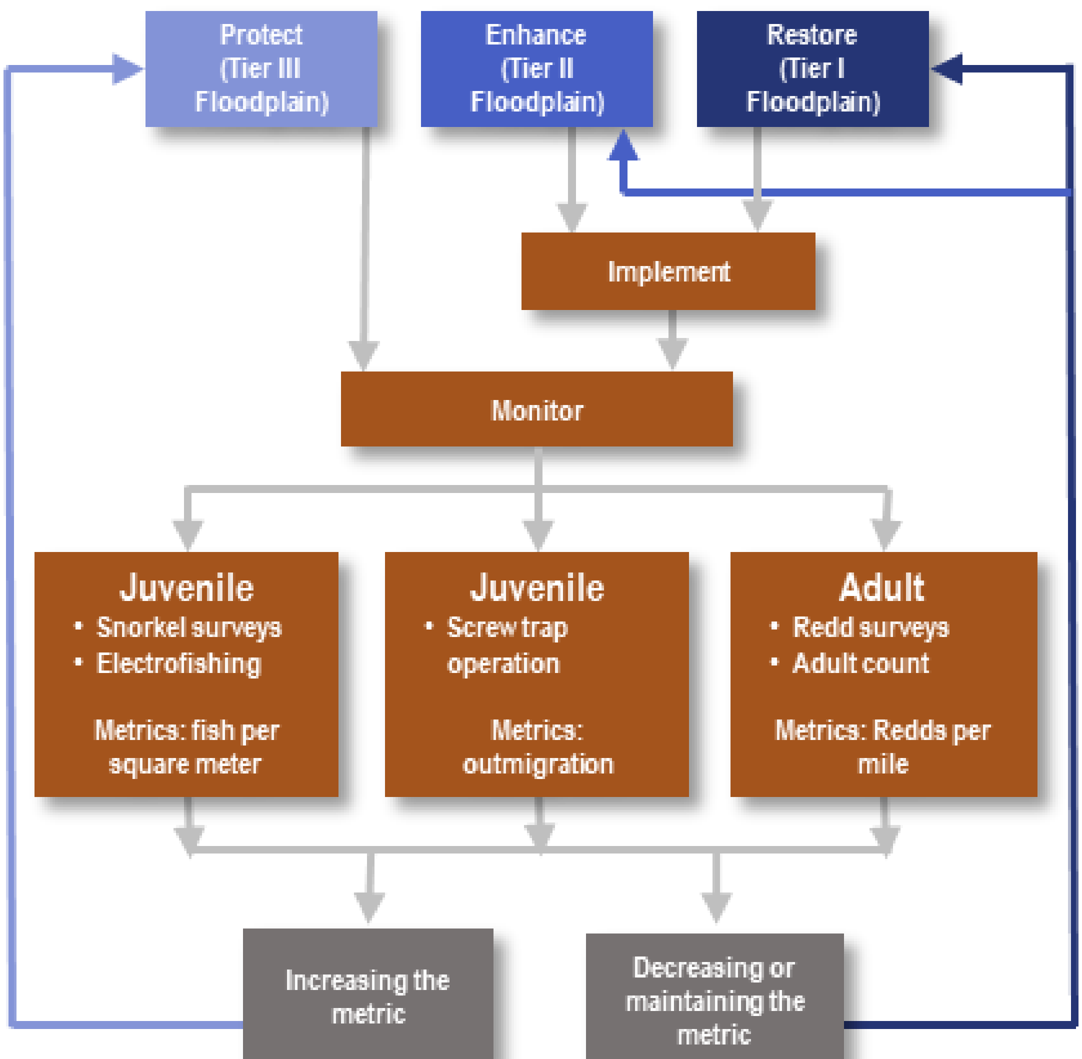


Figure 25. Fisheries Management Plan (FshMP)

include redd surveys, and, where appropriate, dam or weir counts. Calculated metrics from snorkel surveys or electrofishing includes 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 of these metrics is 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.

4.4 Umatilla River Reach Actions

Project actions were identified for each reach in the Umatilla River from the list of 40 options, generally arranged from passive to active. Each proposed action was identified with a specific purpose and expected function. The actions were identified to be the most effective and appropriate actions for each given reach. Some actions were designed to encourage aggradation and reconnecting the floodplain while others are designed to increase channel complexity, provide cover, and to act to catch mobile debris or provide infrastructure protection where needed. Table 3 lists the identified actions for each reach in the Umatilla River. The action types identified for each reach is also compiled in a geodatabase and a reach-by-reach map book (Appendix A).

4.5 Conceptual Opportunities

The intent of developing conceptual designs for groups of typical instream, riparian, and floodplain restoration and habitat enhancement designs 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. Typical conceptual designs have been developed that are intended to provide visual representations of the existing conditions of stretches of the Umatilla River and to illustrate the potential future conditions. The 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 have been developed utilizing six typical sites as identified below (Appendix B). Design categories were selected by the CTUIR 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 design categories chosen include portions of the river with varying degrees of degradation and restoration potential. The following section describes in more detail the conceptual designs for each of the six locations.

Figure 26 provides summary information and conceptual diagrams associated with the River Vision touchstone function for the six conceptual project areas. The conceptual diagrams illustrate the existing conditions as represented by the typical cross-section within a given project area. Based on the proposed actions identified for each project area (Table 3), Figure 26 illustrates the future conditions. The conceptual diagrams under future conditions depict the resulting conditions as represented by the change in the typical cross section. Overall, the figure demonstrates existing conditions being addressed by the proposed actions and the resulting future conditions. Stages of geomorphic process are not necessarily linear in progression and may not reflect what can be achieved immediately under various restoration scenarios. Therefore, Figure 26 represents anticipated outcomes in the short term if restoration actions are initiated.

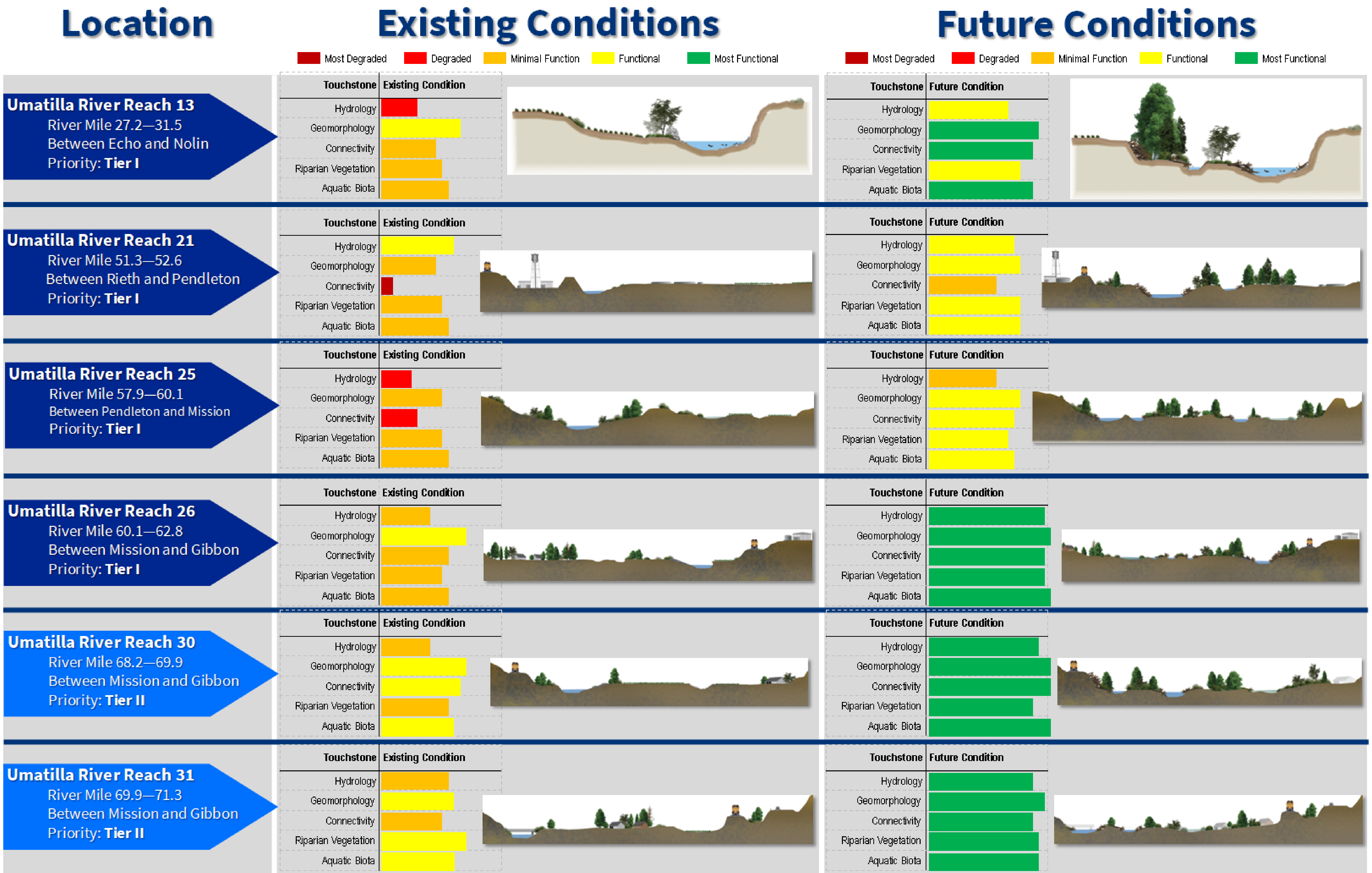
Table 3. Proposed Actions for Each Project Area

#	River Vision Treatment Group and Activities	Hydrology	Geomorphology	Connectivity	Riparian vegetation	Aquatic Biota
	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

Figure 26. Summary Information and Conceptual Diagrams



4.5.1 Umatilla River Reach UM 13

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 reactive 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 Figures 27 and 28 for a comparison of existing conditions and proposed conceptual designs for UM 13.

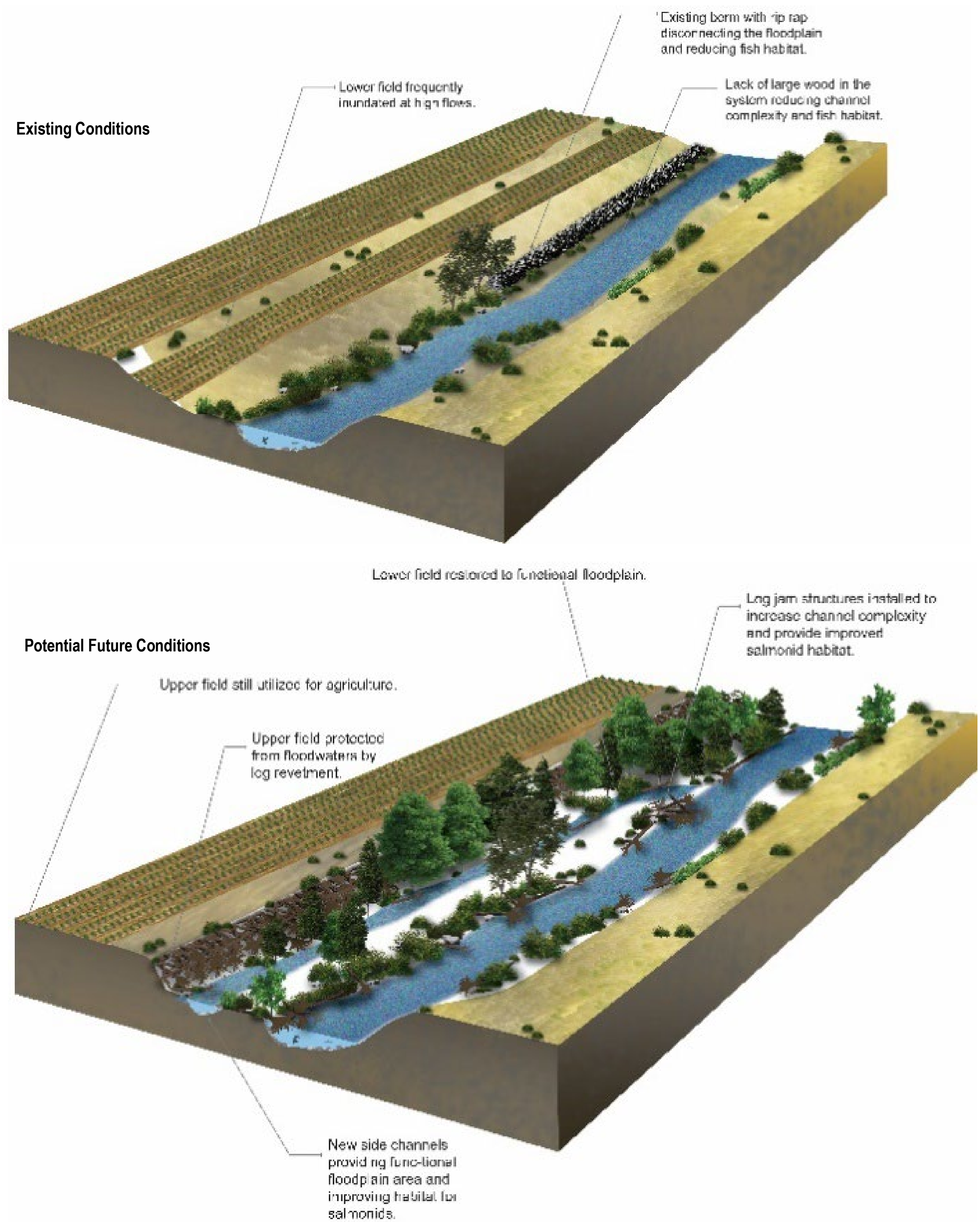
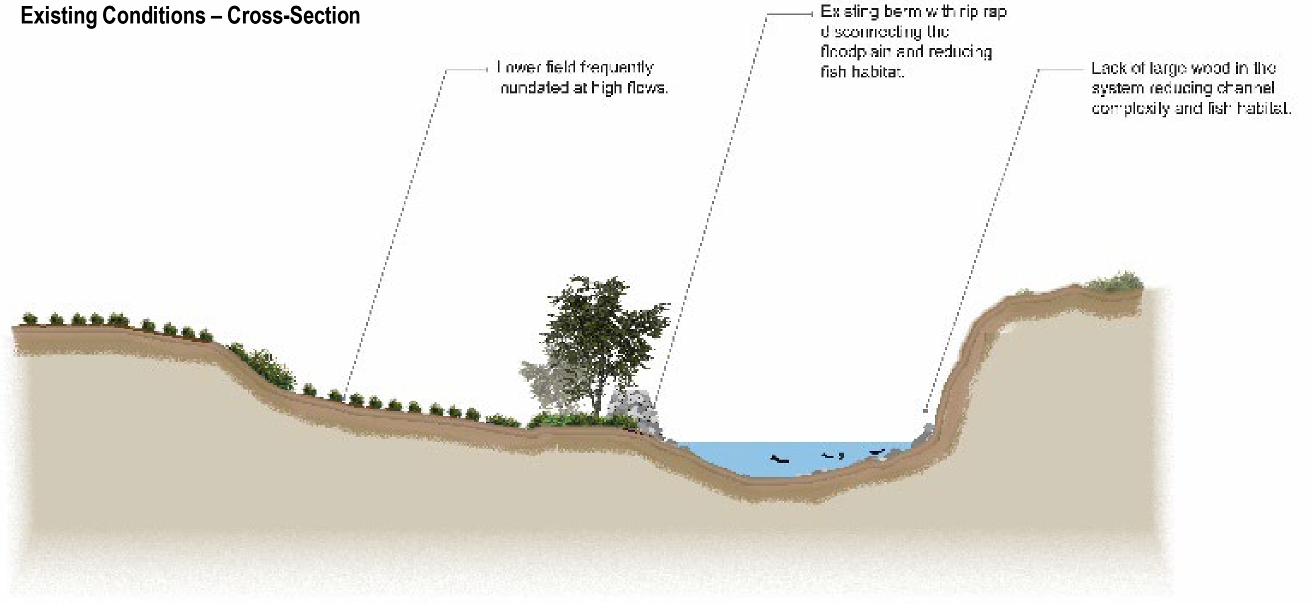


Figure 27. UM 13 – Existing Conditions and Potential Future Conditions

Existing Conditions – Cross-Section



Potential Future Conditions – Cross-Section

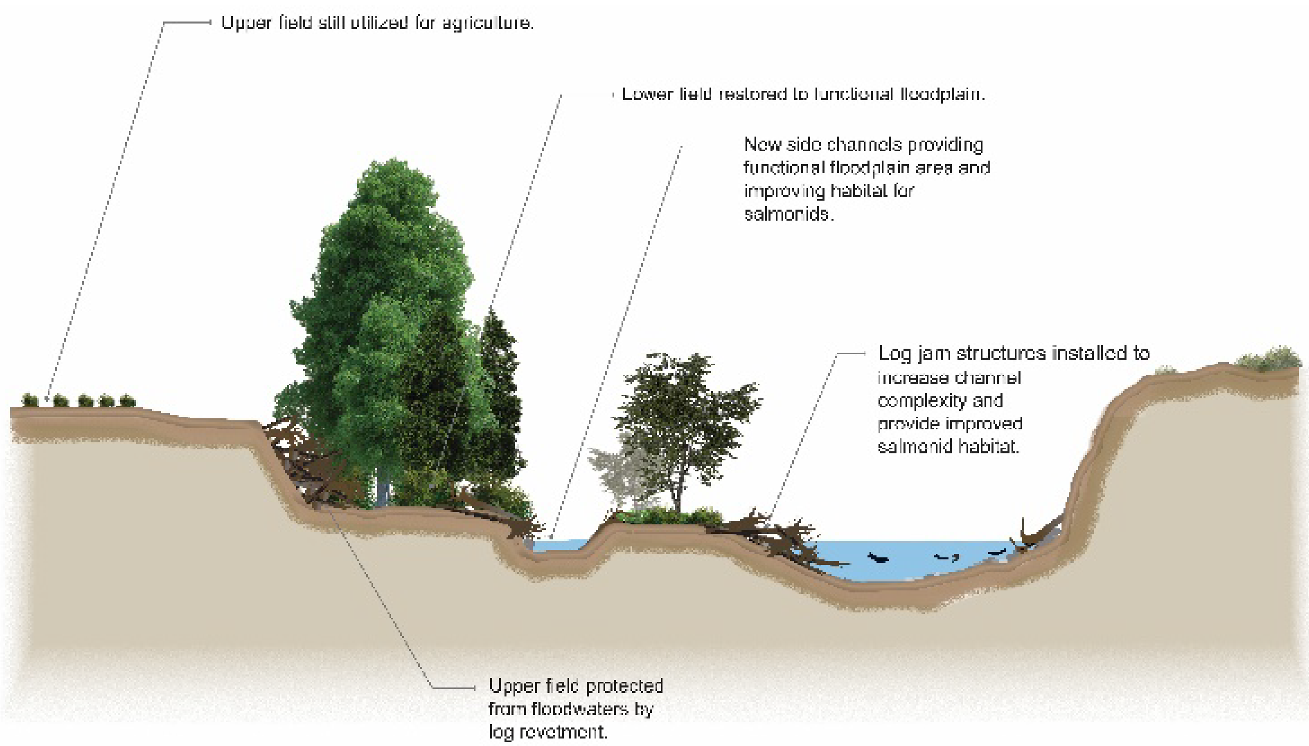


Figure 28. UM 13 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Geomorphology, Connectivity, and Aquatic Biota touchstones (Figure 29). These elements would improve large wood availability, in-stream channel complexity, floodplain connectivity, and overall geomorphic function in the reach. Based on information provided in the Assessment and the Smolt Production Potential (SPP) model, 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 (Figure 30).

Potential Habitat

Figure 29. Potential Habitat in Reach UM 13

Potential Smolt Production

Figure 30. 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 (Figure 31), to improve River Vision touchstone function.

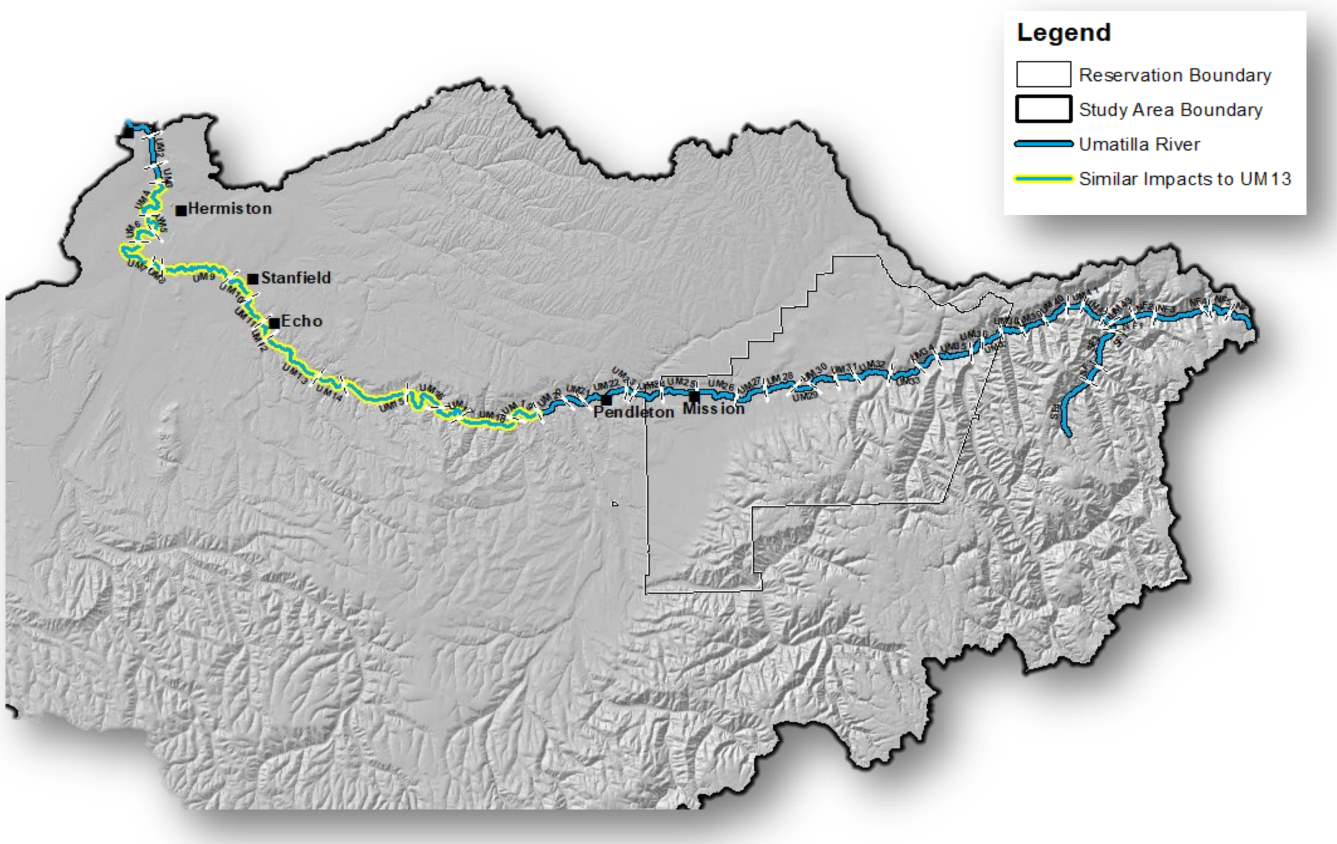


Figure 31. Reaches with Similar Impacts to UM 13

4.5.2 Umatilla River Reach UM 21

Umatilla River Reach UM 21 conceptual design includes:

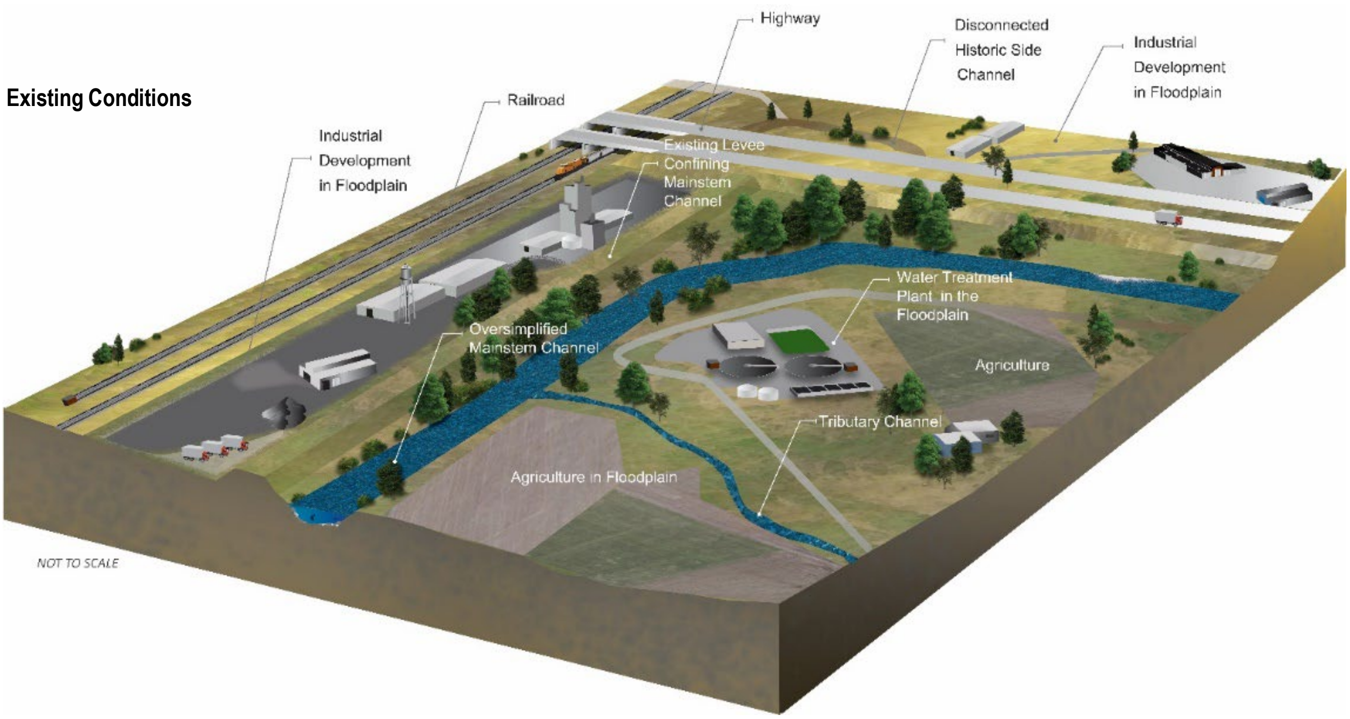
Floodplain restoration – Acquisition of floodplains in areas with urban development allows for restoration of floodplain topography via floodplain benching and relocation of infrastructure like roads, trails, buildings, agriculture, etc. to provide improved floodplain resiliency in urban areas;

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; 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 Figures 32 and 33 for a comparison of existing conditions and proposed conceptual designs for UM 21.



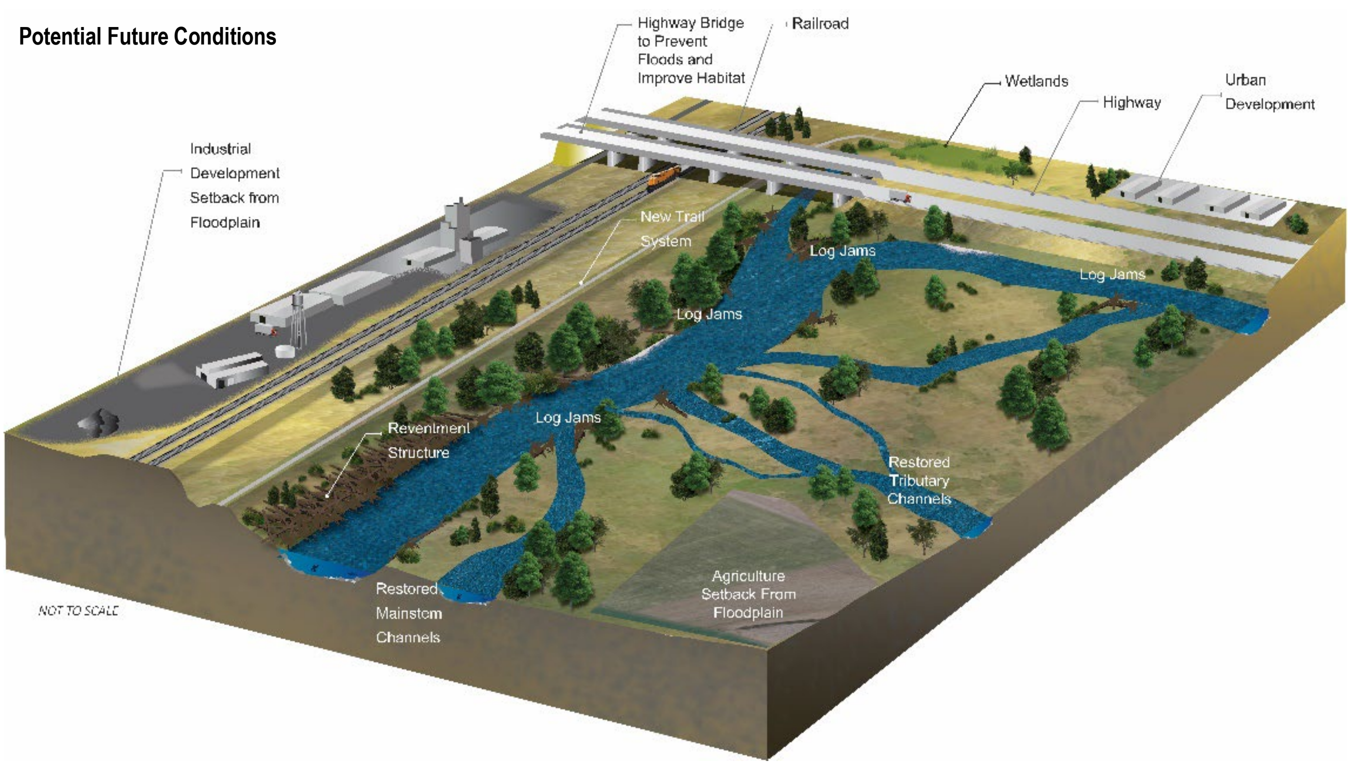


Figure 32. UM 21 – Existing Conditions and Potential Future Conditions

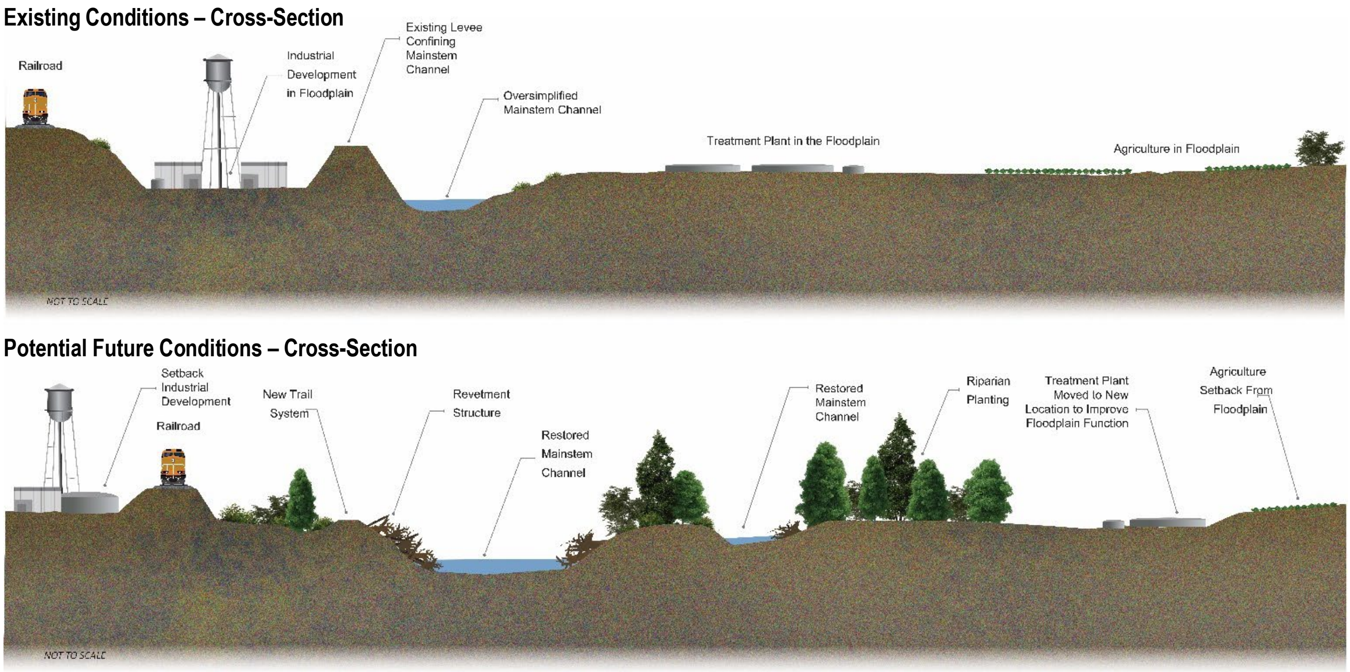


Figure 33. UM 21 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Geomorphology, Connectivity, Riparian Vegetation, and Aquatic Biota touchstones (Figure 34). 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. Based on information provided in the Assessment and the SPP model, 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 (Figure 35).

Figure 34. Potential Habitat in Reach UM 21

Figure 35. Potential S molt 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 (Figure 361), to improve River Vision touchstone function.

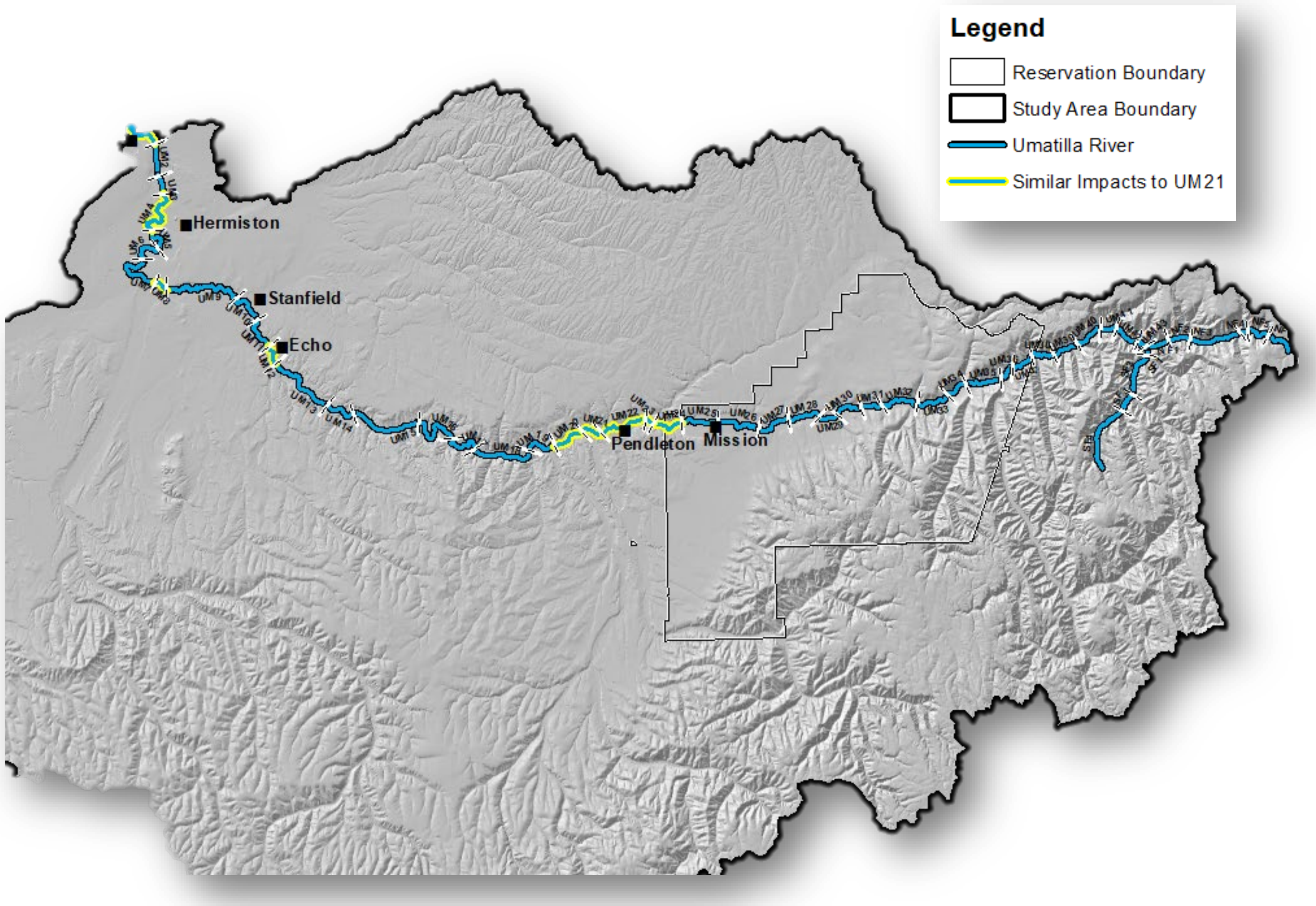


Figure 36. Reaches with Similar Impacts to UM 21

4.5.3 Umatilla River Reach UM 25

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 necessary 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 like roads, trails, buildings, agriculture, etc., to provide improved floodplain resiliency;

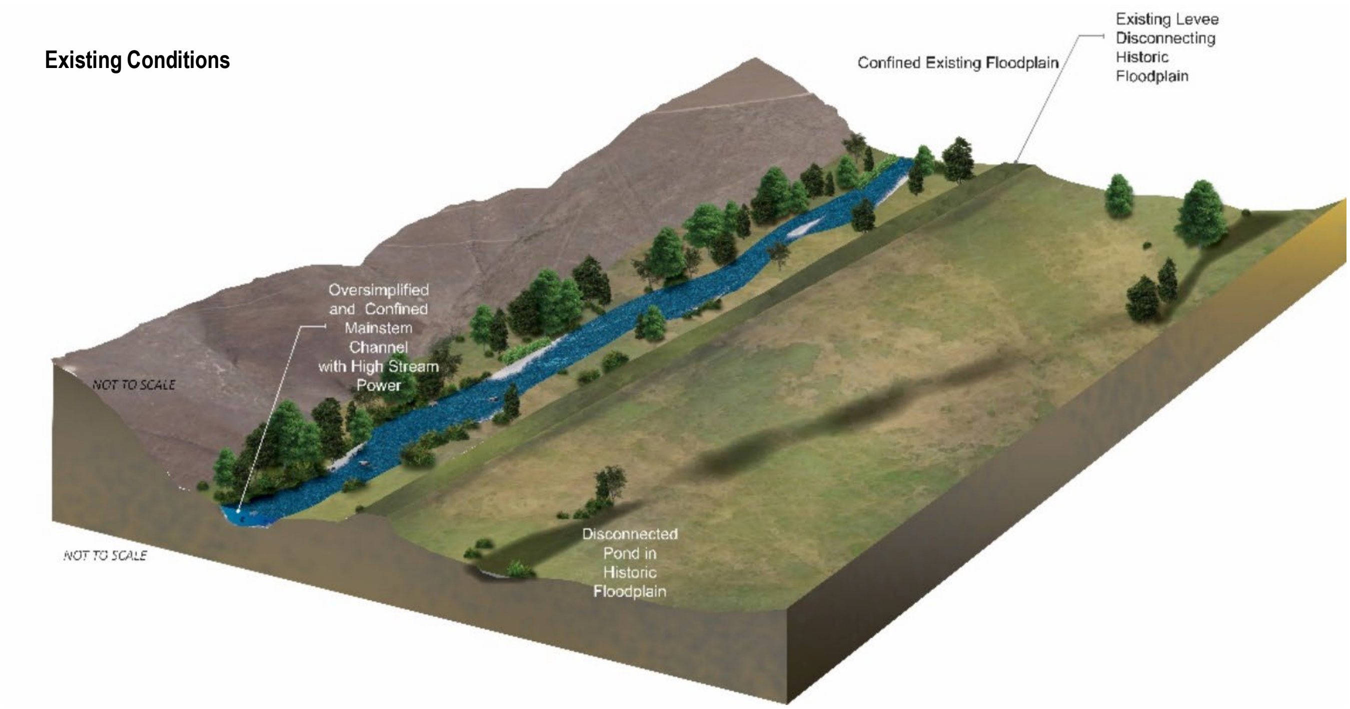
Off-channel habitat restoration – Historic off-channel habitat is reconnected by restoring or excavating side channels;

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, and hyporheic flow exchange to improve low flow availability and temperatures; 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 Figures 37 and 38 for a comparison of existing conditions and proposed conceptual designs for UM 25.



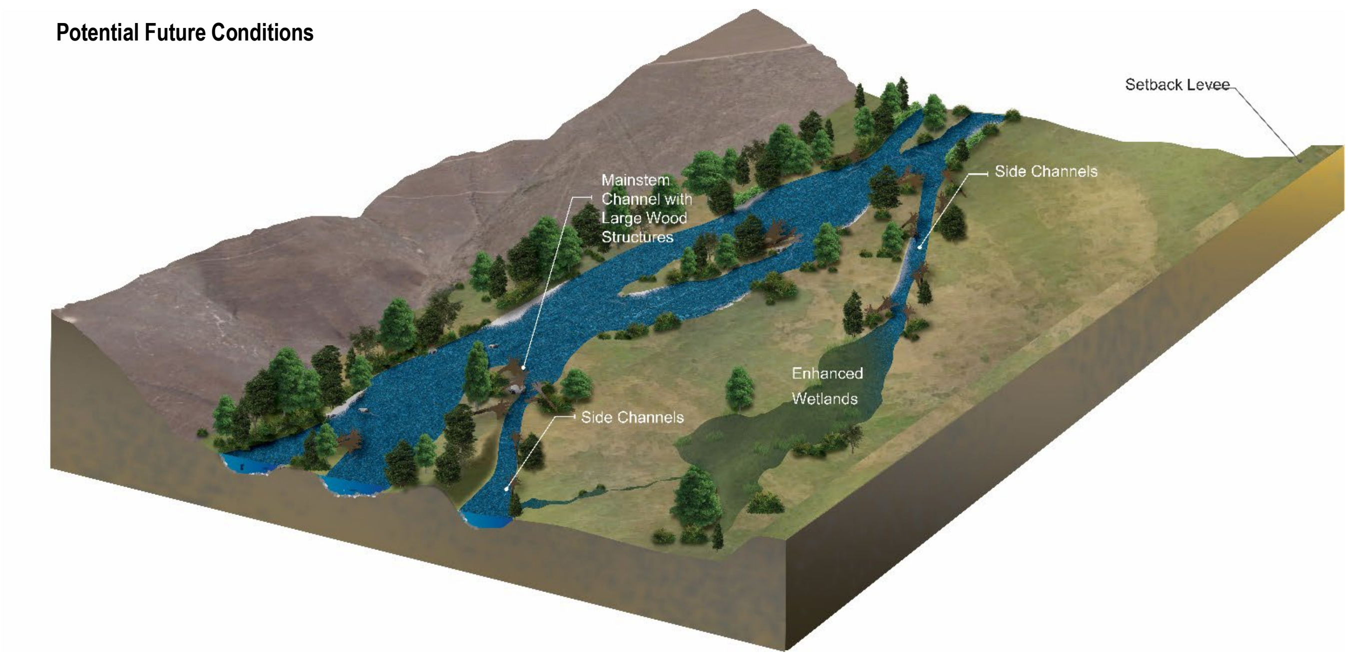
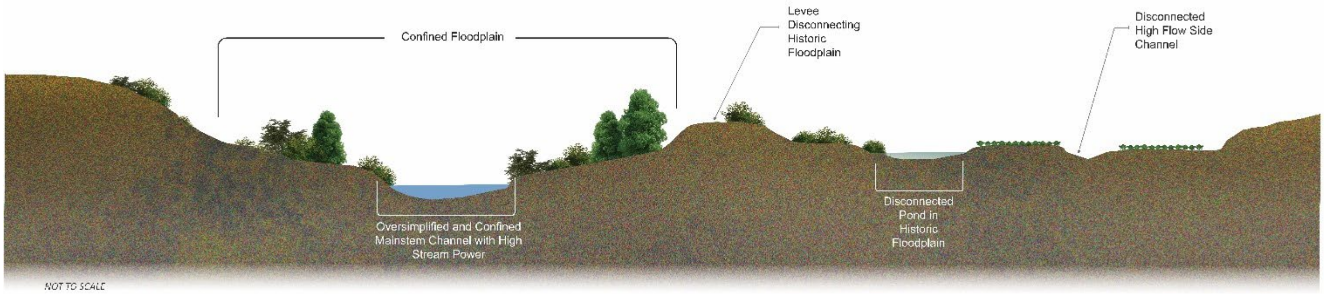


Figure 37. UM 25 – Existing Conditions and Potential Future Conditions

Existing Conditions – Cross-Section



Potential Future Conditions – Cross-Section

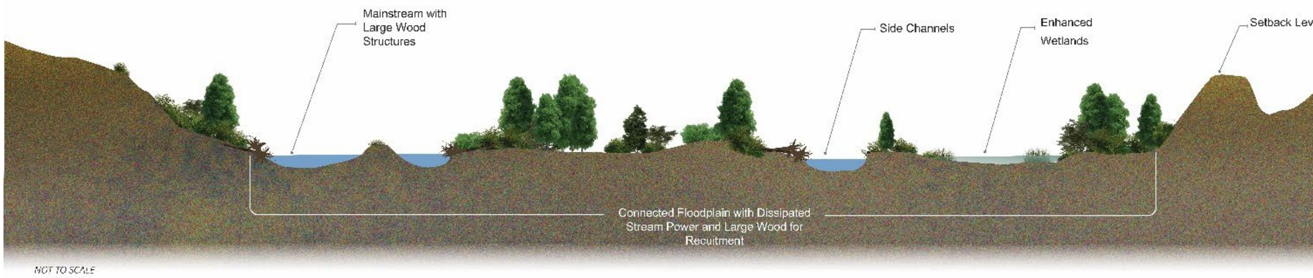


Figure 38. UM 25 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Connectivity touchstones (Figure 39). 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. Based on information provided in the Assessment and the SPP model, 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 (Figure 40).

Potential Habitat

Figure 39. Potential Habitat in Reach UM 25

Potential Smolt Production

Figure 40. 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 (Figure 41), to improve River Vision touchstone function.

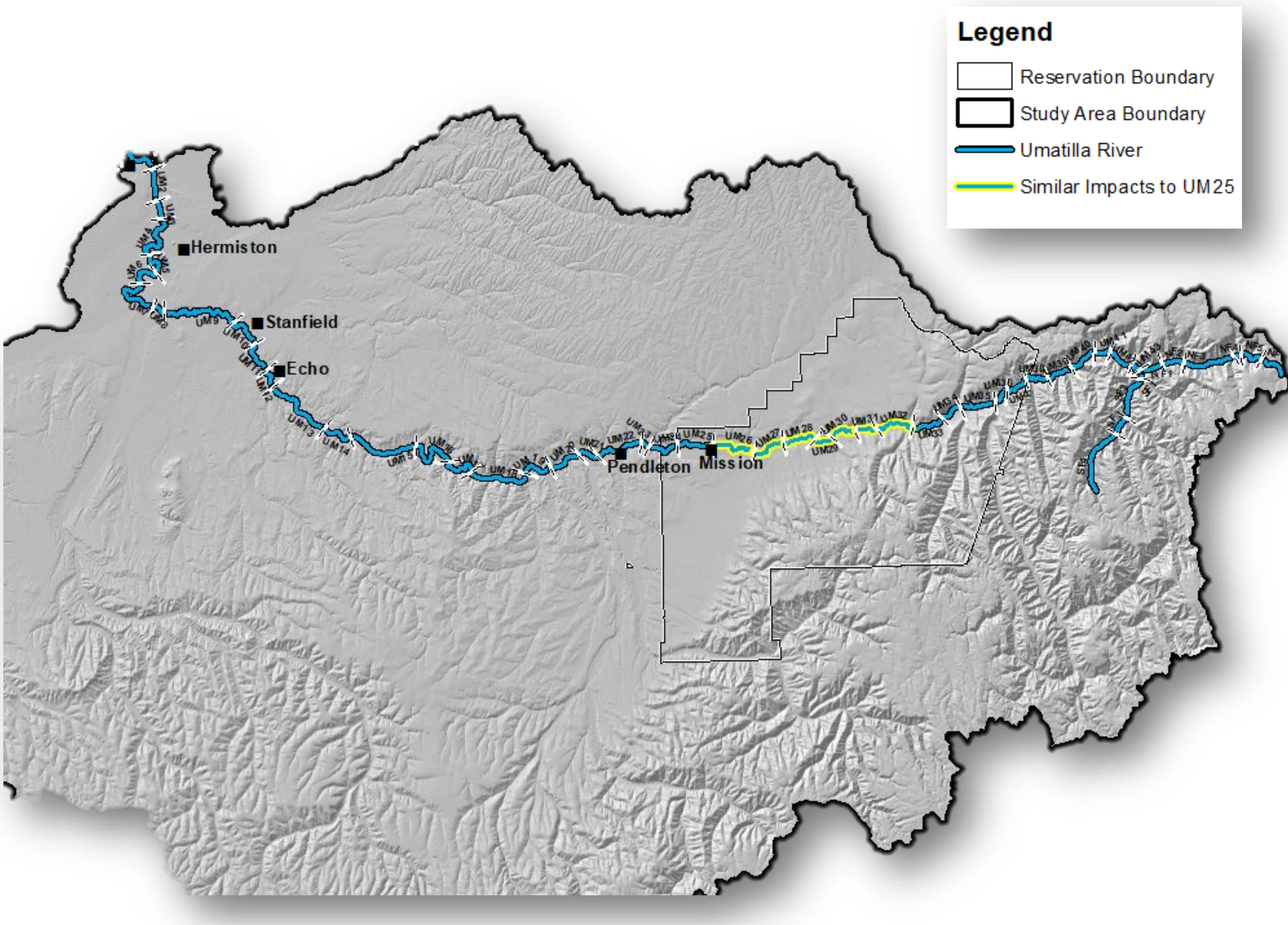


Figure 41. Reaches with Similar Impacts to UM 25

4.5.4 Umatilla River Reach UM 26

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;

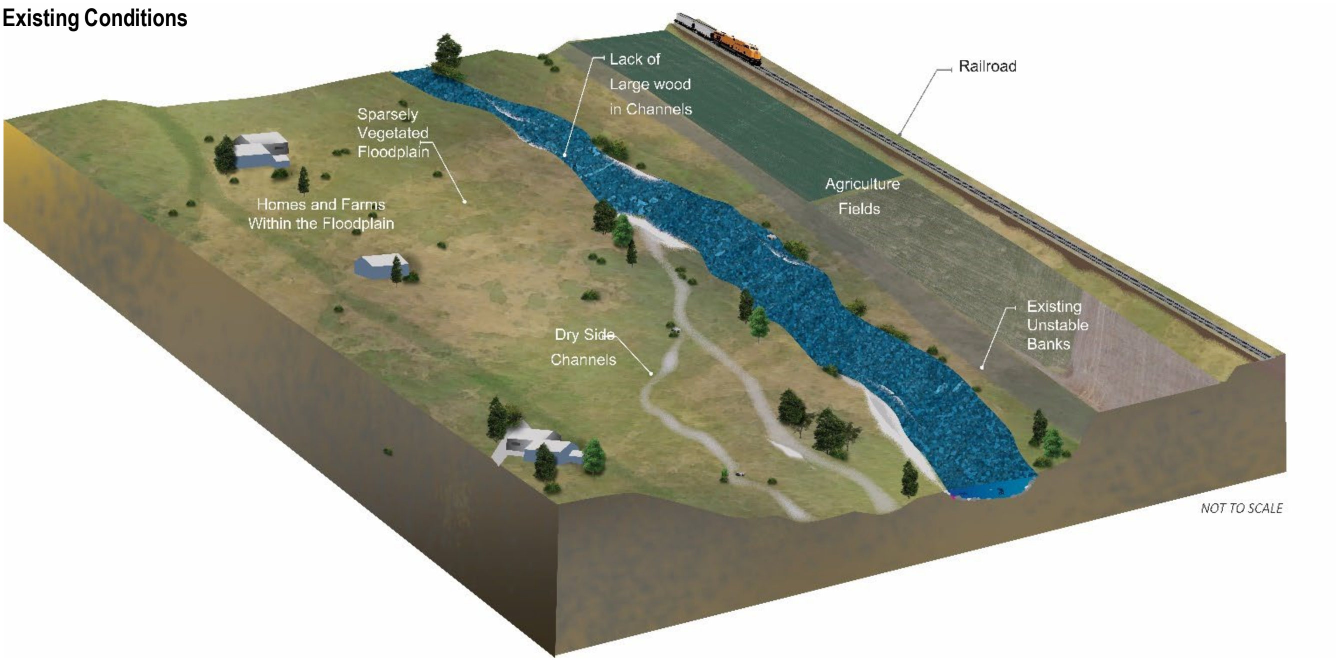
Riparian planting – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species as well as First Foods availability;

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, and hyporheic flow exchange to improve low flow availability and temperatures; 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 Figures 42 and 43 for a comparison of existing conditions and proposed conceptual designs for UM 26.

Existing Conditions



Potential Future Conditions

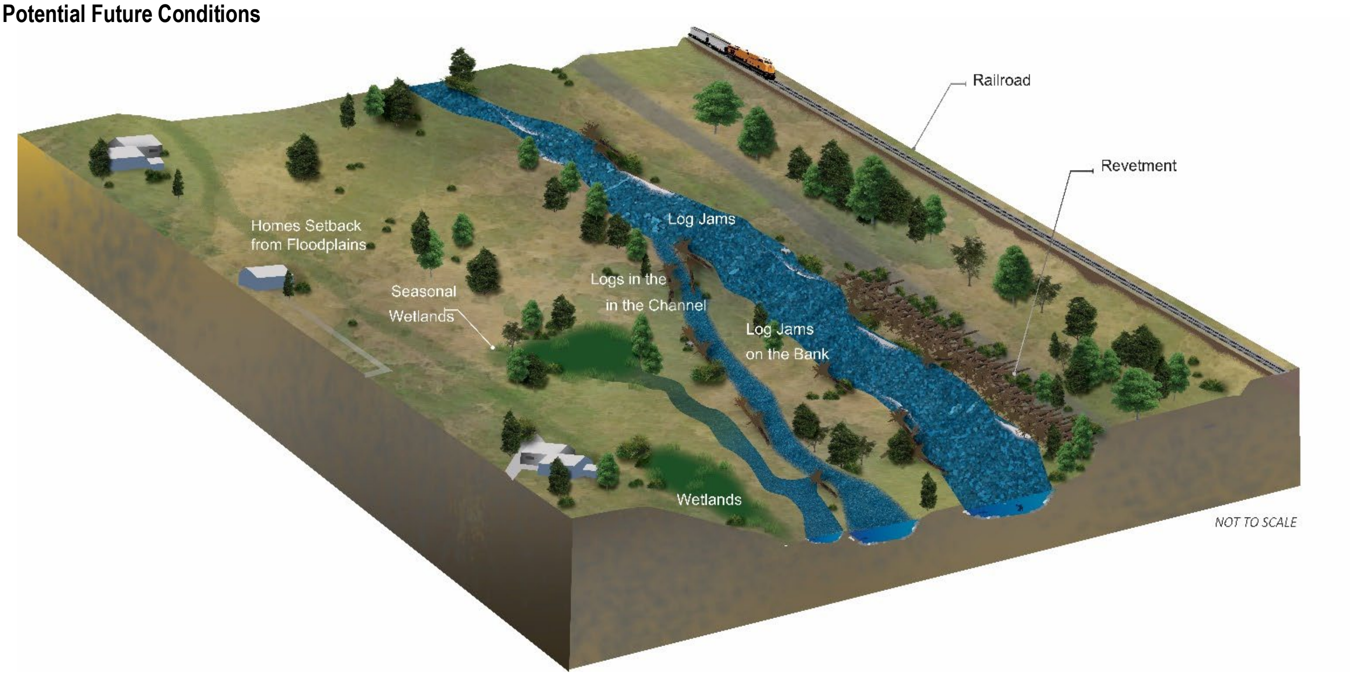


Figure 42. UM 26 – Existing Conditions and Potential Future Conditions

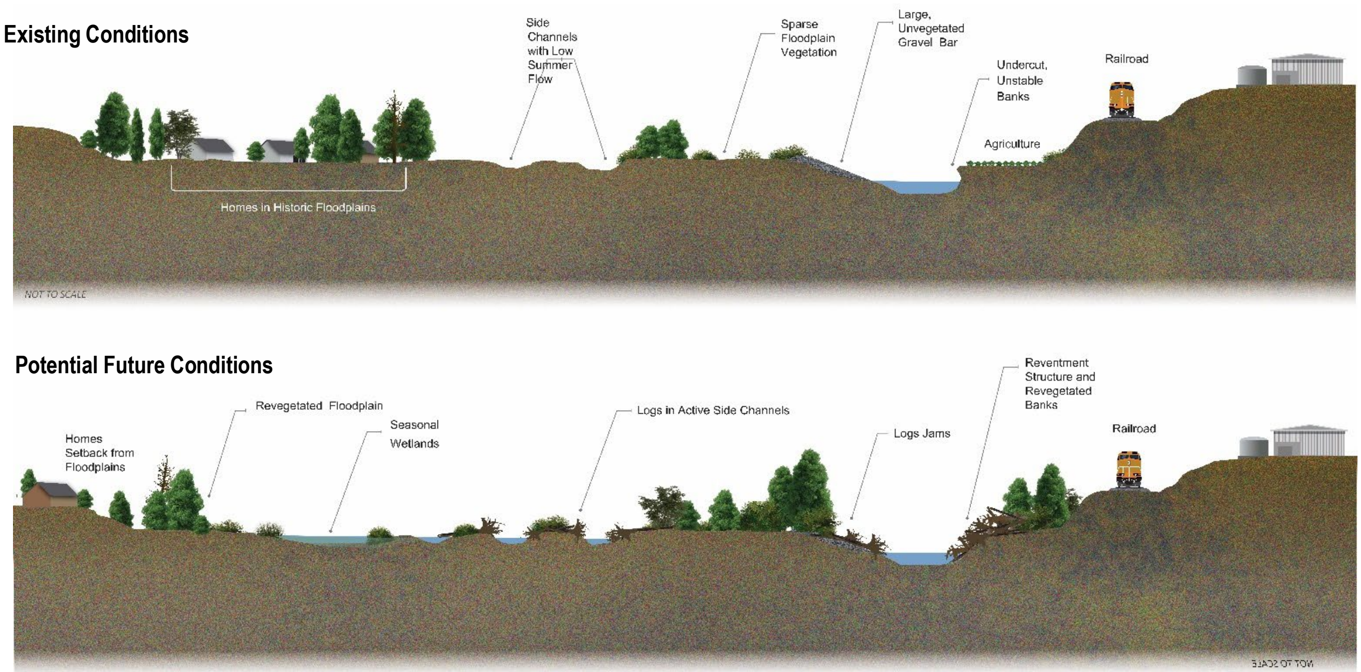


Figure 43. UM 26 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology, Connectivity, Riparian Vegetation, and Aquatic Biota touchstones (Figure 44). 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. Based on information provided in the Assessment and the SPP model, 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 (Figure 45).

Figure 44. Potential Habitat in Reach UM 26

Figure 45. 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 (Figure 46), to improve River Vision touchstone function.

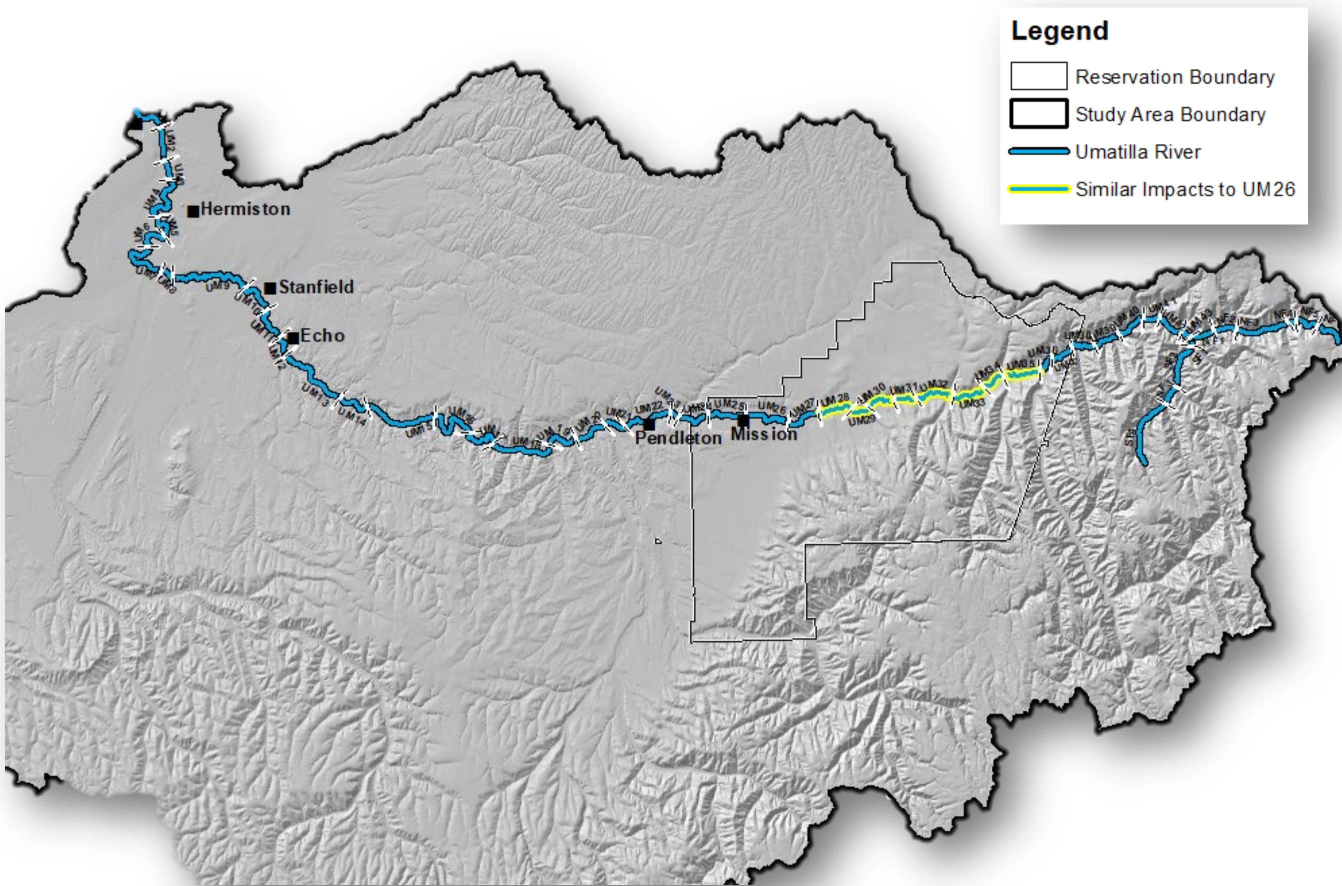


Figure 46. Reaches with Similar Impacts to UM 26

4.5.5 Umatilla River Reach UM 30

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;

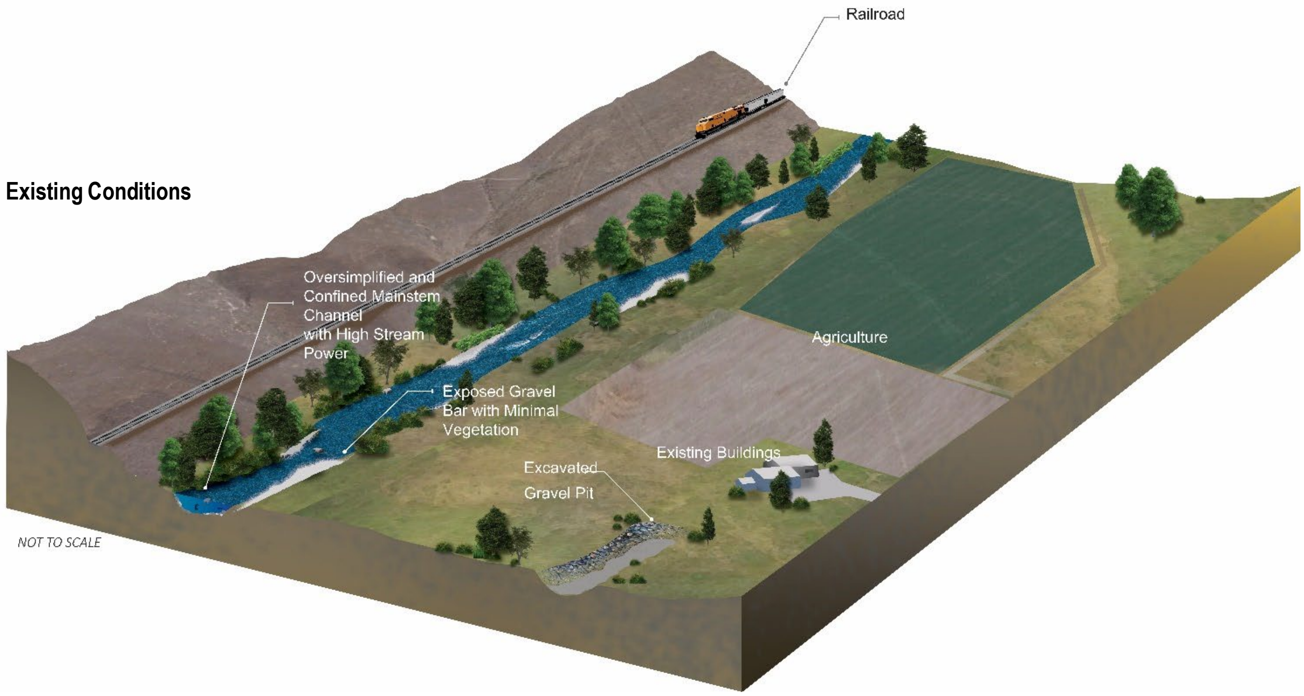
Riparian planting – Planting of floodplain riparian areas improves large wood availability for recruitment by the Umatilla River as channel migration is restored to the floodplain and improves terrestrial habitat for other species as well as First Foods availability;

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, and hyporheic flow exchange to improve low flow availability and temperatures;

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 Figures 47 and 48 for a comparison of existing conditions and proposed conceptual designs for UM 30.



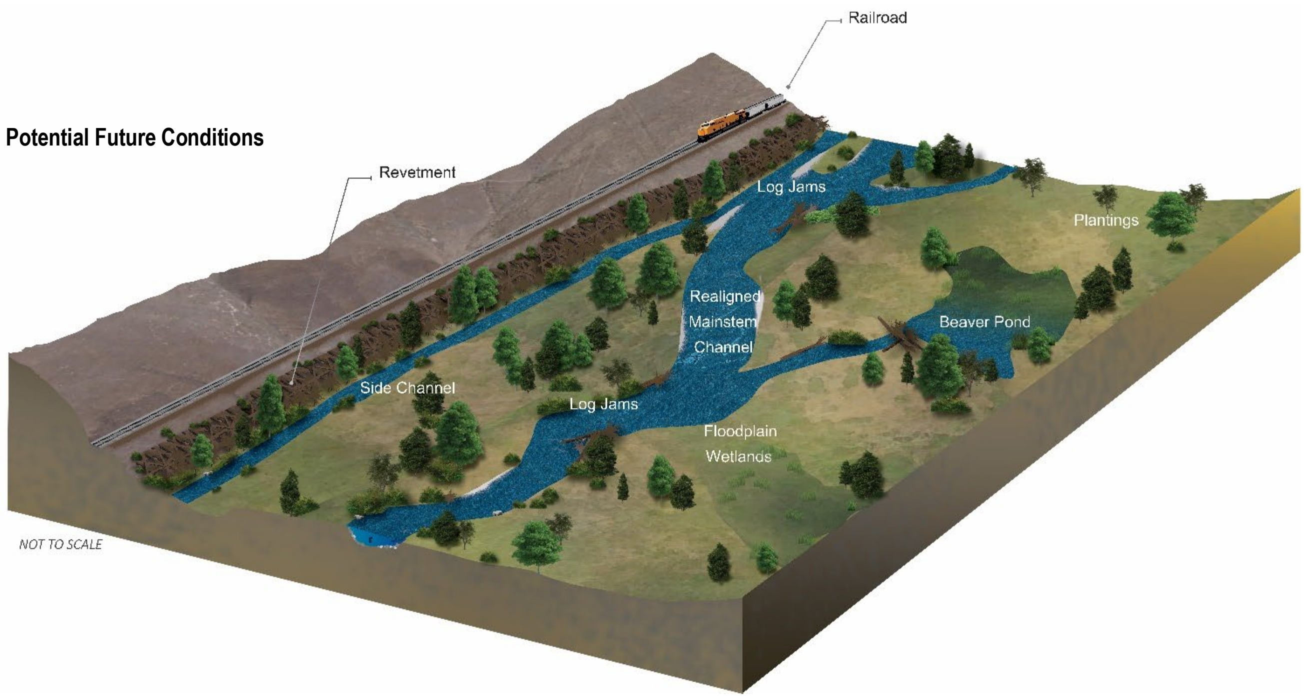


Figure 47. UM 30 – Existing Conditions and Potential Future Conditions

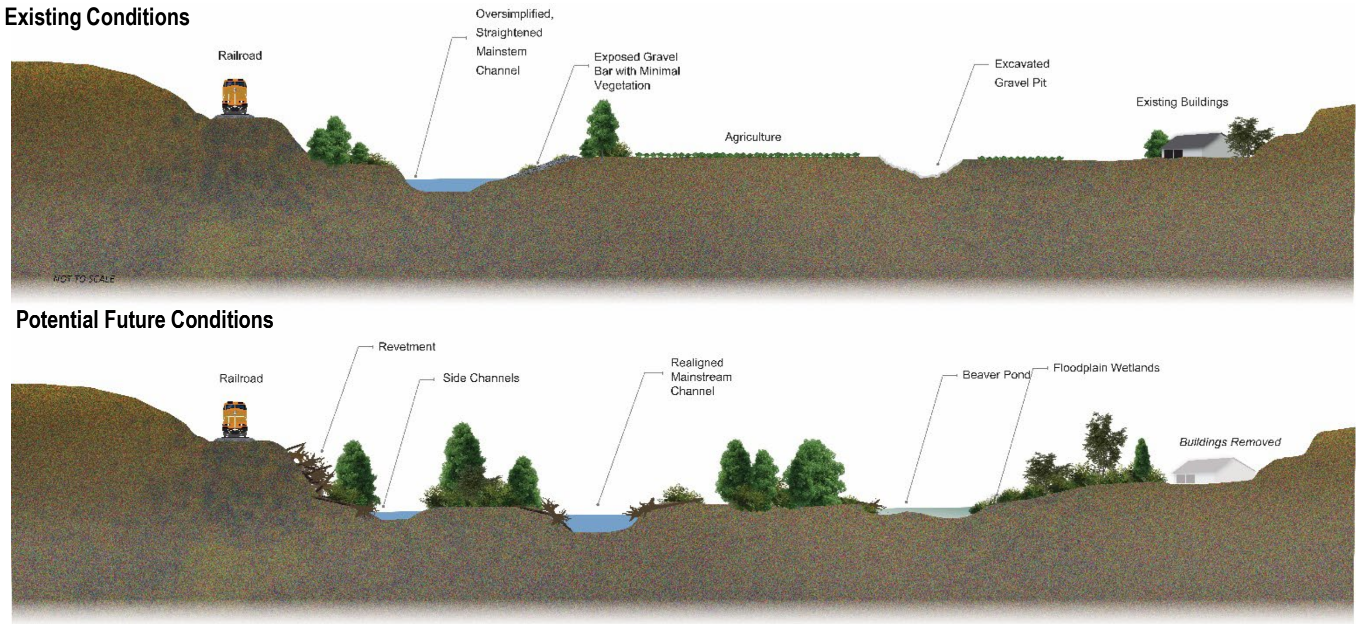


Figure 48. UM 30 – Existing Conditions and Potential Future Conditions – Cross-Section

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Riparian Vegetation touchstones (Figure 49). 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. Based on information provided in the Assessment and the SPP model, 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 smolt production (Figure 50).

Figure 49. Potential Habitat in Reach UM 30

Figure 50. 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 (Figure 51), to improve River Vision touchstone function.

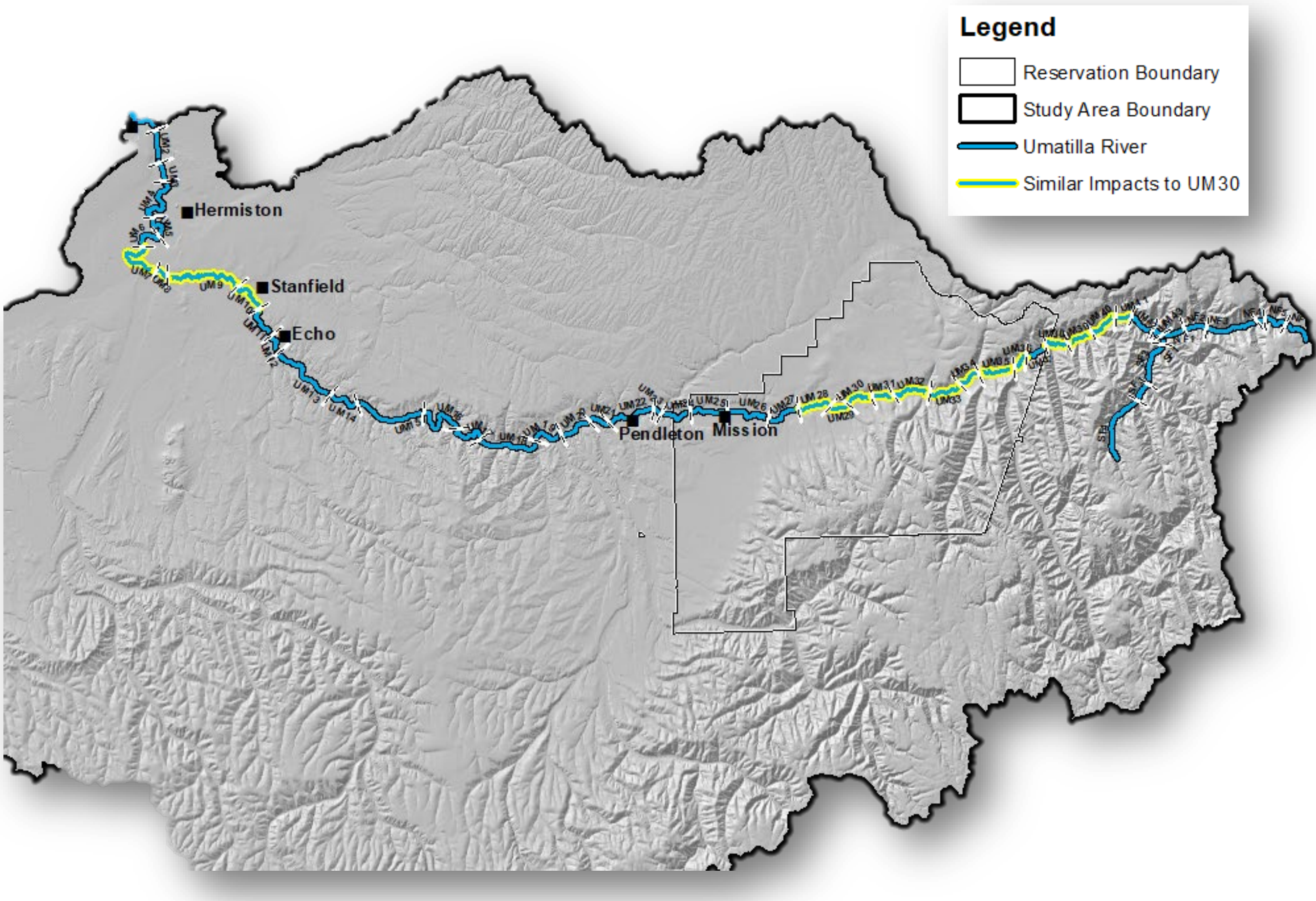


Figure 51. Reaches with Similar Impacts to UM 30

4.5.6 Umatilla River Reach UM 31

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, and hyporheic flow exchange to improve low flow availability and temperatures;

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 Figures 52 and 53 for a comparison of existing conditions and proposed conceptual designs for UM 31.

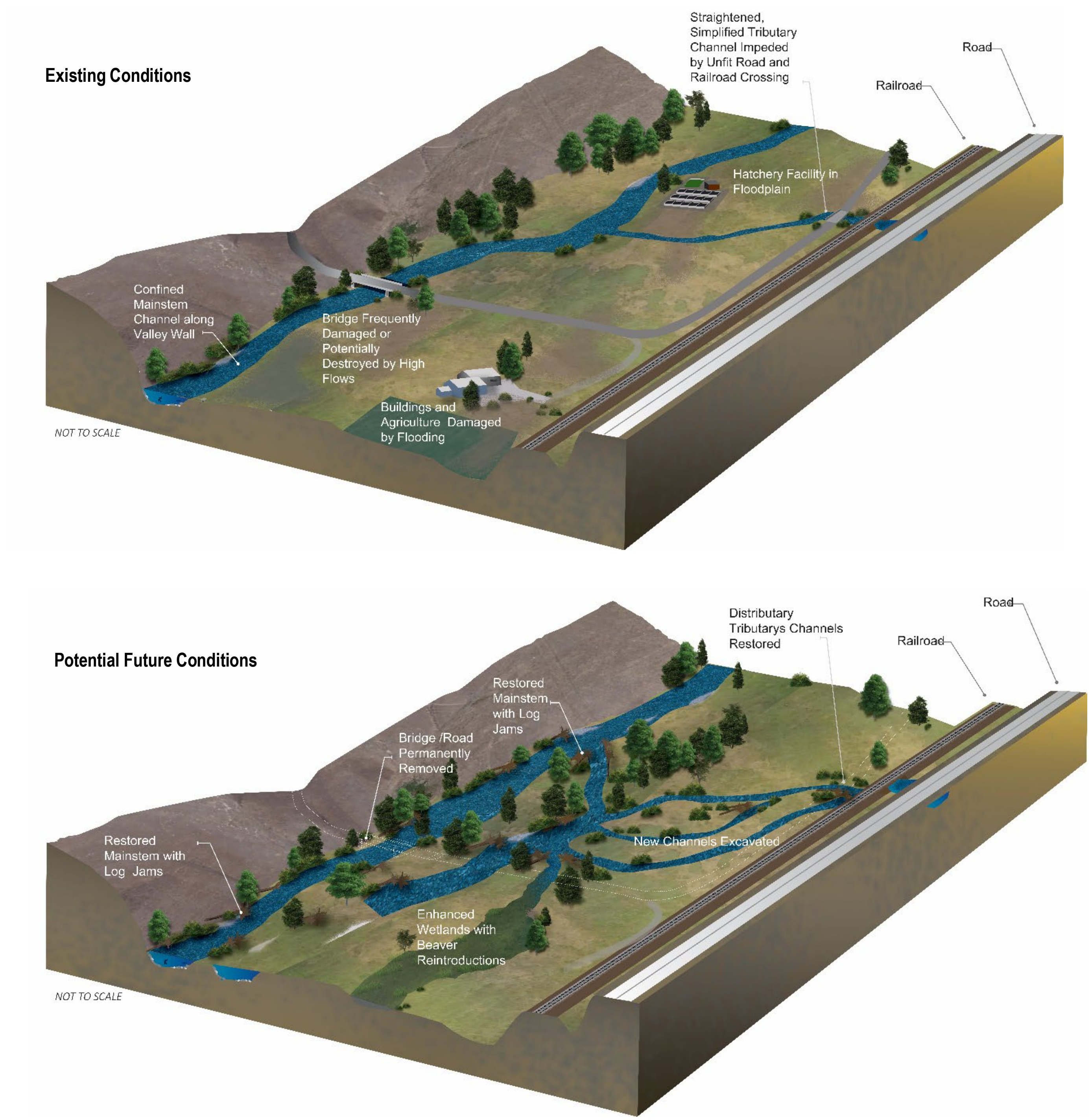


Figure 52. UM 31 – Existing Conditions and Potential Future Conditions

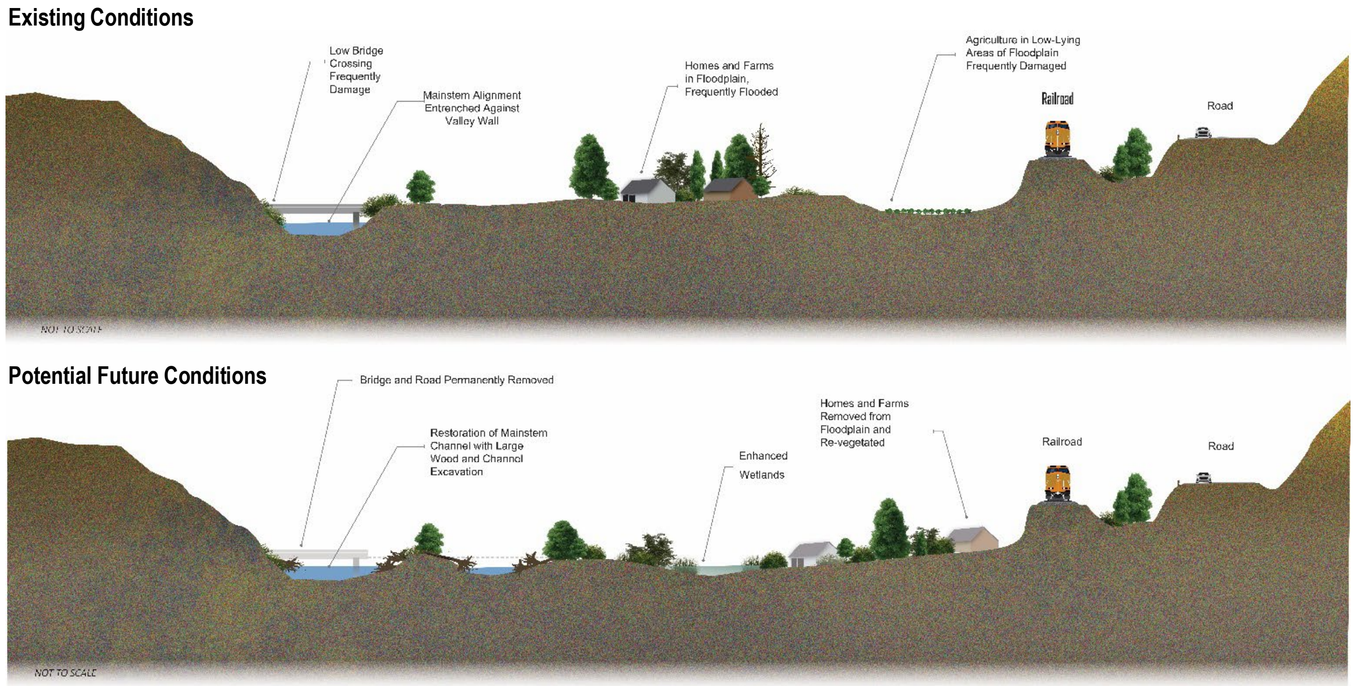


Figure 53. UM 31 – Existing Conditions and Potential Future Conditions – Cross-Sections

The conceptual design elements included are anticipated to have the greatest impact on the Hydrology and Connectivity touchstones (Figure 54). 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. Based on information provided in the Assessment and the SPP model, 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 (Figure 55).

Figure 54. Potential Habitat in Reach UM 31

Figure 55. 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 (Figure 56), to improve River Vision touchstone function.

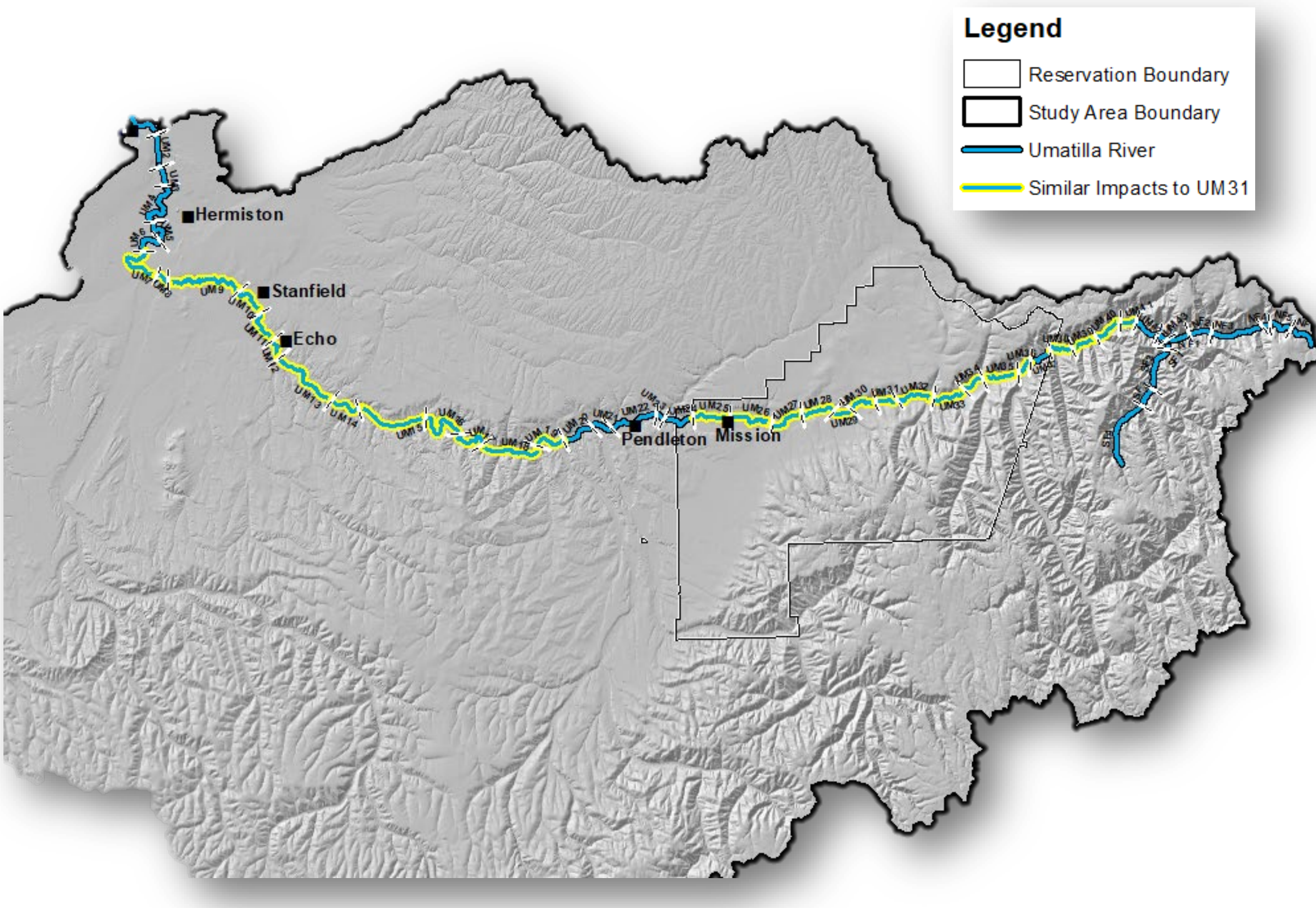


Figure 56. Reaches with Similar Impacts to UM 31

The six conceptual designs in the reaches identified above improve potential smolt production by 58 percent but only increases smolt production to 35 percent of historic potential smolt production (Figure 57). To provide self-sustaining populations of all native First Foods species that will be available for Tribal and non-tribal use, more aggressive, Subbasin-wide planning must be undertaken. A comprehensive Resource Management Plan provides a basis for strategically planning the restoration of the Subbasin (Figure 58).

Figure 57. Combined Potential Habitat for the Conceptual Designs

Figure 58. Combined Potential Smolt Production for the Conceptual Designs

4.6 Strategic Planning Process

Planning for landscape improvements must be strategically executed to incorporate details and nuances associated with uplands and river resource management plans. These plans provide overarching management objectives and restoration prioritizations. Action types are also included within these plans and should be referenced by resource managers during the planning process. Most importantly, planning for the implementation of restoration actions that sustain or improve watershed processes to the benefit of focal biota should guide the process.

Considerations for risk with regards to impacts to infrastructure must also be carefully considered. Resource managers may find that restoration actions are mutually beneficial to infrastructure and focal species. In other circumstances, strategic plans must consider trade-offs between what actions are allowable versus the associated ecological uplift gained from limited restoration actions. In either case, if restoration actions are planned in locations where risks to humans are elevated, then reducing impacts of potential outcomes like flooding and erosion should be incorporated.

Housed within upland and river resource management plans are prescriptive plans that are directed towards specific resource types. The USUMP (Section 4.1) provides prescriptive actions to be taken to improve uplands function throughout the Subbasin, the URMP includes the FpMP (Section 4.2) which provides prescriptive actions to be taken to improve floodplain function on the Umatilla River, as well as the FshMP (Section 4.2) which provides prescriptive actions to be taken to improve aquatic species production in the Umatilla River. Taken as a whole, these plans encompass the Umatilla Subbasin Resource Management Plan (Figure 59).

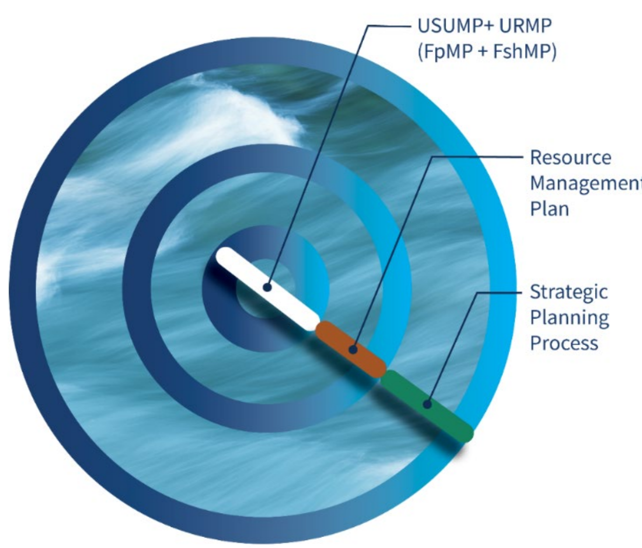


Figure 59. URAP Strategic Plan

4.7 Implementation Pathways and Timeline

As previously described, subwatersheds and reaches that were departed from historic conditions were identified and prioritized. Departure from historic conditions ranges in severity based on the subwatershed, reach and level of anthropogenic influence. Some examples of how subwatersheds may be departed are land conversion to agriculture, reduced soil stability and road development, non-native plant presence, precipitation patterns, fire return intervals and severity, and species age structure. Examples of how reaches of the Umatilla River may be departed are floodplain development, loss of large wood structures, confinement, and channelization of the mainstem, and reduction of beaver populations.

Considering departure from historic conditions, implementation of 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, Figure 60 depicts a generalized pathway and timeline for implementing upland projects. The first step towards a desired future condition is to assess site conditions, this may take one to two years, based on site intricacies. However, the length of this may be aided by the information that this assessment provides. Second, the timeline for subwatershed prioritization is also aided by this assessment. Yet, upland sites may require multiple restoration actions to achieve desired conditions such as fuels reductions, non-native vegetation management, and road removal. Therefore, prioritization for each site may take an additional two years. In most cases, land acquisition is a lengthy process. This step in the implementation pathway may occur simultaneously with site assessments and prioritization of restoration actions and may take up to 10 years complete. 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. Finally, typical post-project monitoring plans are set up for ten 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.

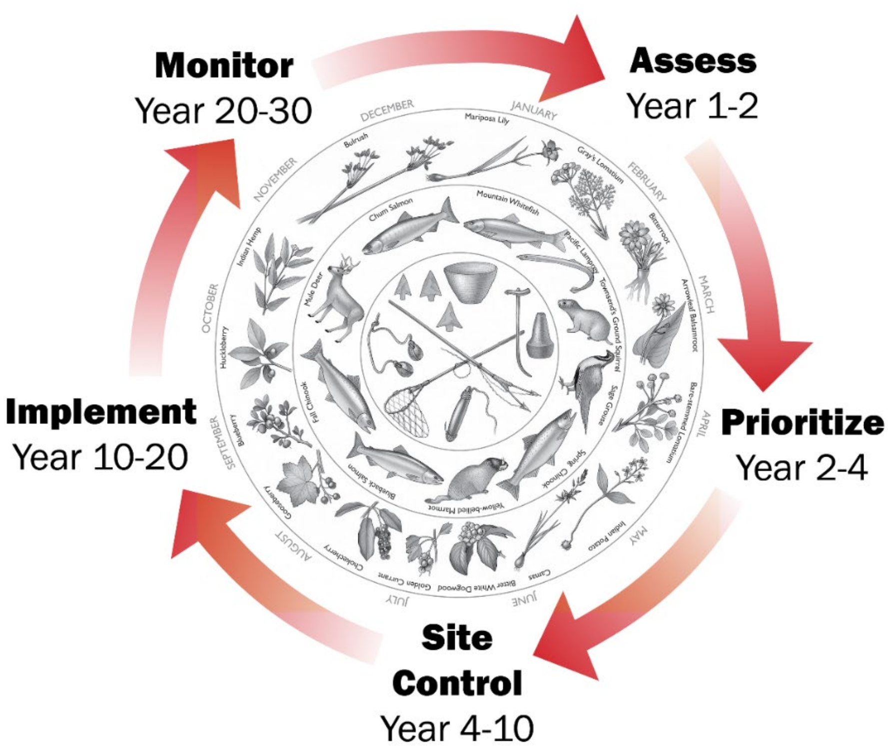
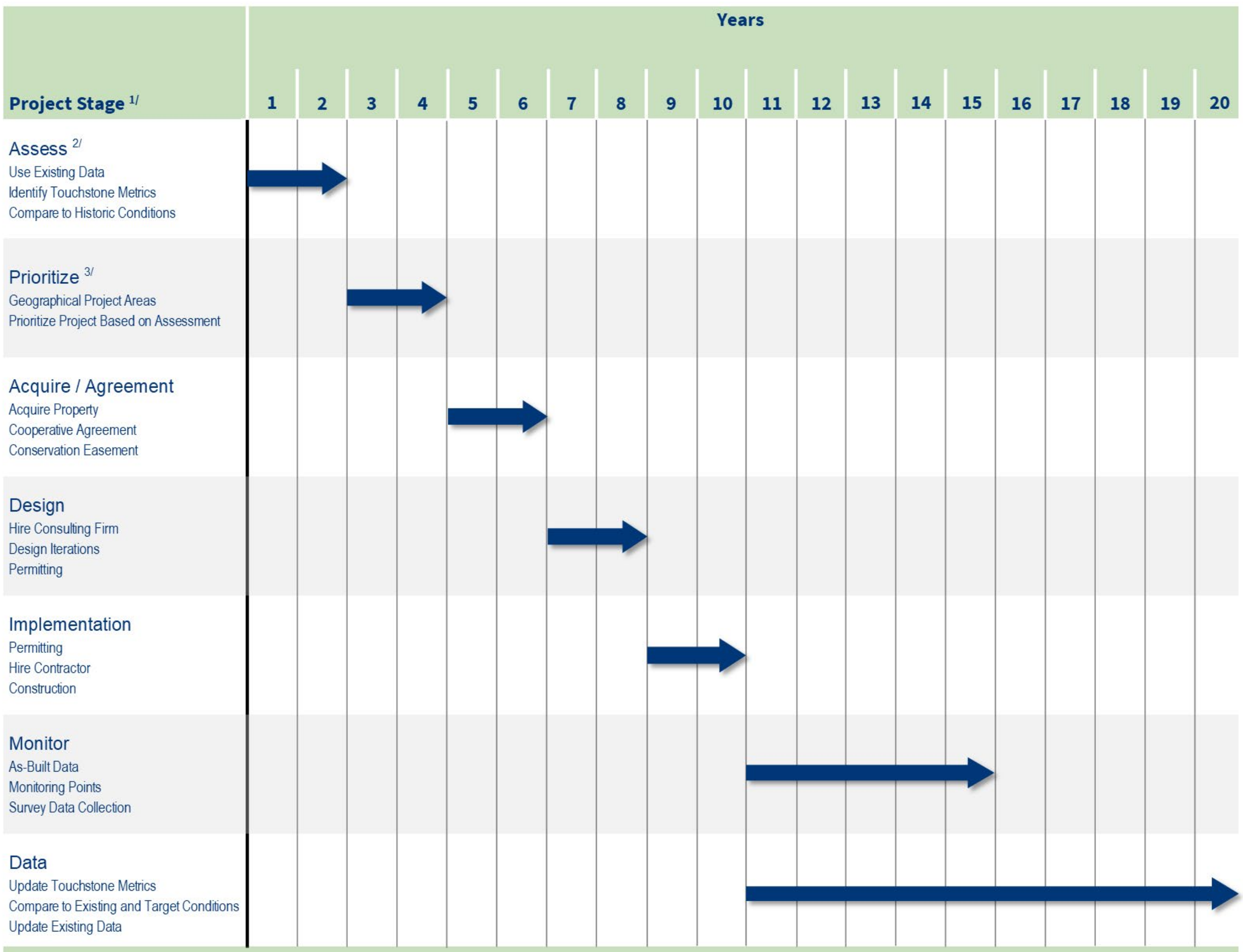


Figure 60. General Uplands Project Implementation Pathway and Timeline

Like uplands projects described above, 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. Figure 61 illustrates a typical pathway and timeline for implementation of a river restoration project utilizing Umatilla River Reach UM 13 as an example. The first step towards a desired future condition is to assess site conditions which is provided by the Assessment. This information can be updated prior to designs. 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 ten years before on-the-ground actions commence. Finally, typical post-project monitoring plans are set up for ten 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.



1/ Because of complexities and difficulties in predicting large-scale projects, timelines may change. 2/ The Assessment already provides existing data for all reaches in the Umatilla River. 3/ The Prioritization provides geographical prioritization of reaches of the Umatilla River.

Figure 61. Typical Restoration Project Implementation Pathway and Timeline

5.0 Next Steps

5.0 Next Steps

The URAP was developed for the CTUIR to evaluate existing biological and physical conditions in order to identify and prioritize potential project areas and restoration and habitat enhancement actions for the Umatilla River and the Umatilla Subbasin. The information presented in the URAP is based on available existing data. Conditions in the Umatilla River and the Umatilla Subbasin may change over time and/or additional data may become available. Changes in site conditions or available future data may be evaluated or incorporated into the results of the URAP in the future utilizing the tools derived from the analyses presented in the Assessment.

Next steps were identified throughout the URAP for moving forward with the Action Plan. These include ongoing research efforts, developing site-specific designs for the conceptual designs, implementing and monitoring new projects, and using newly acquired information to feed back into and revise the Prioritization and Action Plan as needed.

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UMATILLA RIVER Action Plan

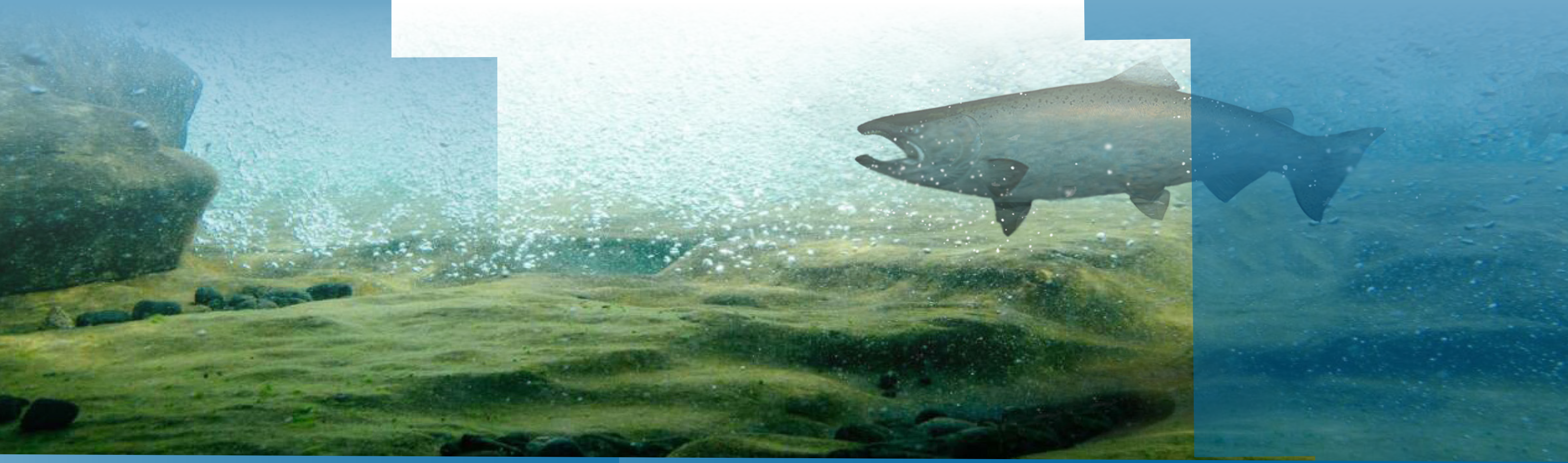
APPENDIX A:
Umatilla Subbasin Subwatersheds Uplands Actions

UMATILLA RIVER Action Plan

APPENDIX B:

Umatilla River Reach by Reach Actions

UMATILLA RIVER Action Plan



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