RECLAMATION

Managing Water in the West

Reclamation's 2016-2017 Tributary Habitat Projects Completed for the 2008/2014 Federal Columbia River Power System Biological Opinion



U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Columbia/Snake Salmon Recovery Office
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Mission Statements

U.S. DEPARTMENT OF THE INTERIOR

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

BUREAU OF RECLAMATION

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

Photograph on front cover: View of newly constructed channel with large woody material and habitat features at West Fork Yankee Fork Habitat Enhancement Project, Idaho.

Acronyms and Abbreviations

Acronym or Abbreviation	Description
BiOp	Biological Opinion
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
cfs	cubic feet per second
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
MCR	Mid-Columbia River
MVID	Methow Valley Irrigation District
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
Reclamation	U.S. Bureau of Reclamation
RM	river mile
RPA	Reasonable and Prudent Alternative
TNC	The Nature Conservancy
UCR	Upper Columbia River
Yakama Nation	Confederated Tribes and Bands of the Yakama Nation

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Introduction

The Bureau of Reclamation (Reclamation), U.S. Army Corps of Engineers, and Bonneville Power Administration (BPA) contribute to the implementation of salmonid habitat improvement projects in Columbia River Basin tributaries to help meet commitments in the 2008 Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) and the 2010 and 2014 Supplemental BiOps.[1] The FCRPS BiOp includes a Reasonable and Prudent Alternative (RPA), or a suite of actions, to protect salmon and steelhead listed under the Endangered Species Act (ESA) across their life cycle. Reclamation's contributions to habitat improvement are meant to be within the framework of the FCRPS RPA or related commitments. This document covers only habitat improvement projects with Reclamation involvement.

ESA-listed fish species present in the Columbia River Basin include Upper Columbia River (UCR) spring Chinook salmon (*Oncorhynchus tshawytscha*) (endangered), UCR steelhead trout (*O. mykiss*) (threatened), Mid-Columbia River (MCR) steelhead (*O. mykiss*) (threatened), Snake River spring/summer Chinook salmon (*O. tshawytscha*) (threatened), Snake River steelhead trout (*O. mykiss*) (threatened), Snake River sockeye salmon (*O. nerka*) (endangered), and Columbia River bull trout (*Salvelinus confluentus*) (threatened).

Habitat improvement actions (projects) in various Columbia River tributaries are one aspect of the 2008 BiOp RPA 35. Rehabilitation or improvement of altered stream habitat and formation of new habitat are generally accepted methods that benefit fish populations. In addition to habitat improvement projects, Reclamation conducts tributary and reach assessments in the river subbasins specified in the FCRPS BiOp to maximize the success of habitat improvement projects benefiting anadromous species listed under the ESA (Figure 1). These assessments analyze the physical and ecological processes at work in the watershed and define environmental baseline conditions that can complement monitoring activities designed to evaluate the physical and biological responses to the improvement projects.

[1] NOAA National Marine Fisheries Service, Supplemental Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program, May 20, 2010, F/NWR/2010/02096. The 2010 BiOp incorporates in whole the 2008 BiOp: *Consultation on Remand For Operations of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program* [Revised and reissued pursuant to court order, *NWF v. NMFS*, Civ No. CV 01-0640-RE (D. Oregon)].



Figure 1. Map of 2008 Federal Columbia River Power System Biological Opinion tributary subbasins with Reclamation involvement.

Reclamation provides technical assistance to states, Tribes, Federal agencies, and other local partners for the identification, design, and construction of stream-habitat improvement projects that primarily address streamflow, access, entrainment, channel complexity, and floodplain conditions. Approximately 20 projects are implemented annually with additional projects in various stages of planning, development, and design during any year. Habitat improvement projects may take up to 3 years or more to implement from conception to completion. Construction activities associated with the more complex and costly projects usually continue across multiple years. Project costs vary depending on the objectives, landowner cooperation, availability of construction funding from project partners, changes in project scopes, and other actions required to meet biological criteria in the FCRPS BiOp for ESA-listed species.

Reclamation does not own, operate, or maintain the habitat improvement projects described in this report. Reclamation's role in these projects is providing technical assistance, project development and planning. This includes habitat assessments, evaluations, concept development, modeling, designs, permitting, and observing construction and implementation, so that the projects are sound from an engineering perspective and perform as intended. For continual improvement of project designs, Reclamation evaluates completed projects to determine if they are functioning as designed and incorporates the findings in future projects.

Projects described in this report are completed with contributions from many partners. Full descriptions of the projects and associated benefits are presented in this report, even if Reclamation did not contribute to a particular project element. Consequently, benefits identified in this report may be more comprehensive than the benefits that were reported by Reclamation in the FCRPS BiOp Annual Progress Reports. Descriptions in this report also include partner objectives that often target rehabilitation goals that are broader than the goals Reclamation addresses to implement the FCRPS BiOp.

Expenditures for the total subbasin costs are included in each subbasin section and repeated for each river in the subbasin. Those totals include the annual budgets spent for development, coordination, financial assistance to partners, contracts for architectural and engineering services, and project-specific activities for 2016-2017. With projects in different stages of development during each year, the development costs will not equal the expenditures for the basin in any given year. The development costs shown for each individual project include all years of project development summarized for the Reclamation contribution. Implementation costs that are given in this report are costs incurred by the partners, including construction of the specific project.

Metrics are reported in the following categories: Channel Access, Entrainment (fish screening), Streamflow, Channel Complexity (including floodplain enhancement), and Riparian Enhancement.

2016-2017 Activities

In calendar years 2016 and 2017, Reclamation and partners completed 28 fish-habitat improvement projects in the following five subbasins of the Columbia River Basin:

- Upper Salmon River Subbasin
  - Lemhi River
  - Pahsimeroi River
  - Upper Salmon River
- Grande Ronde River Subbasin
  - Catherine Creek
  - Upper Grande Ronde River
- John Day River Subbasin
  - Middle Fork John Day River
  - Upper John Day River
- Upper Columbia River
  - Methow River Subbasin
  - Entiat River Subbasin

Goals of the projects included, but were not limited to, removal of fish passage barriers; the redesign of irrigation structures to allow fish passage; and improvement of instream habitat complexity, floodplain connection, and side-channel fish habitat.

Future Projects

Reclamation plans to continue providing technical assistance for habitat improvement projects that enhance tributary spawning and rearing habitat associated with implementing the FCRPS BiOp.

Reclamation will continue to assist non-Federal parties located in Idaho, Oregon, and Washington in complying with environmental and cultural resources regulations and producing engineering designs related to barrier removals, screens, and channel morphology (e.g., blockages, floodplains, and culverts) associated with implementing the FCRPS BiOp.

Acknowledgements

The major credit for the success to date of Reclamation's efforts to implement the FCRPS BiOp is due to the participation and cooperation of many partners, including landowners,

local and state agencies, Tribes, non-profit organizations, interest groups, and other Federal agencies. Reclamation activities undertaken through this program support a larger cooperative process, which is generally controlled by non-Federal partners who secure funding and implement the habitat improvement projects that address water, land, and other resource management challenges. Some provide their resources of time and money for a single project; others support multiple projects throughout the subbasins. In the following sections, partners and sponsors are listed under each subbasin in which they participated.

Upper Salmon River Subbasin

From its headwaters in the Sawtooth Mountains, the Salmon River flows northerly about 180 miles (joined by the North Fork at river mile [RM] 237), and then heads westerly across central Idaho until it enters the Snake River at RM 188. The Salmon River subbasin drains approximately 14,000 square miles from elevations exceeding 10,000 feet to approximately 900 feet at its confluence with the Snake River. The Salmon River is the second longest undammed river in the Columbia River Basin.

Reclamation currently works in four rivers in the Upper Salmon River Subbasin: the Upper Salmon River, Lemhi River, Pahsimeroi River, and Little Salmon River. In 2016-2017, eight projects were completed in the Lemhi River, three projects were completed in the Pahsimeroi River, and three projects were completed in the Upper Salmon River.

ESA-listed fish species present in the Salmon River include Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), Snake River sockeye salmon (endangered), and Columbia River bull trout (threatened).

Table 1. Bureau of Reclamation Total Expenditures for completed projects in subbasin.

Subbasin	Expenditures
Salmon River	$2.7 million

Lemhi River

The Lemhi River (HUC 17060204) is a tributary to the Salmon River, entering it at RM 258.5, and has a drainage area of about 1,270 square miles. In 2016-2017, eights projects were completed in the subbasin that improved channel access, streamflow, and habitat complexity.

ESA-listed fish species present in the river include Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), Snake River sockeye salmon (endangered), and Columbia River bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files may be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Eighteenmile Creek Habitat Enhancement and Hawley Creek Stockwater Improvement Project
- Agency Creek Road Culvert to Bridge
- Lower Lemhi River Rehabilitation – Sub-Reach 2
- Sandy Creek Culvert Replacement and Stockwater Project
- Stokes Large Wood Habitat Project
- Pratt Creek Access and Flow Enhancement Project
- Wimpey Creek Calving/Feedlot Removal
- Wimpey Creek Habitat Project (Skinner)

Sponsors

- Lemhi Soil and Water Conservation District
- Trout Unlimited
- Idaho Department of Fish and Game
- The Nature Conservancy

Partners

- Landowner(s)
- Lemhi Soil and Water Conservation District
- Idaho Governor’s Office of Species Conservation
- Bonneville Power Administration

- Natural Resources Conservation Services
- Bureau of Land Management
- National Marine Fisheries Service
- Upper Salmon Basin Watershed Program
- Idaho Department of Fish and Game
- Snake River Basin Adjudication Habitat Trust Fund
- The Nature Conservancy

Funding Sources

- Bonneville Power Administration
- Snake River Basin Adjudication Habitat Trust Fund
- Landowner(s)

Table 2. Bureau of Reclamation Total Expenditures for completed projects in Lemhi River.

River	Expenditures
Lemhi River	$113,000

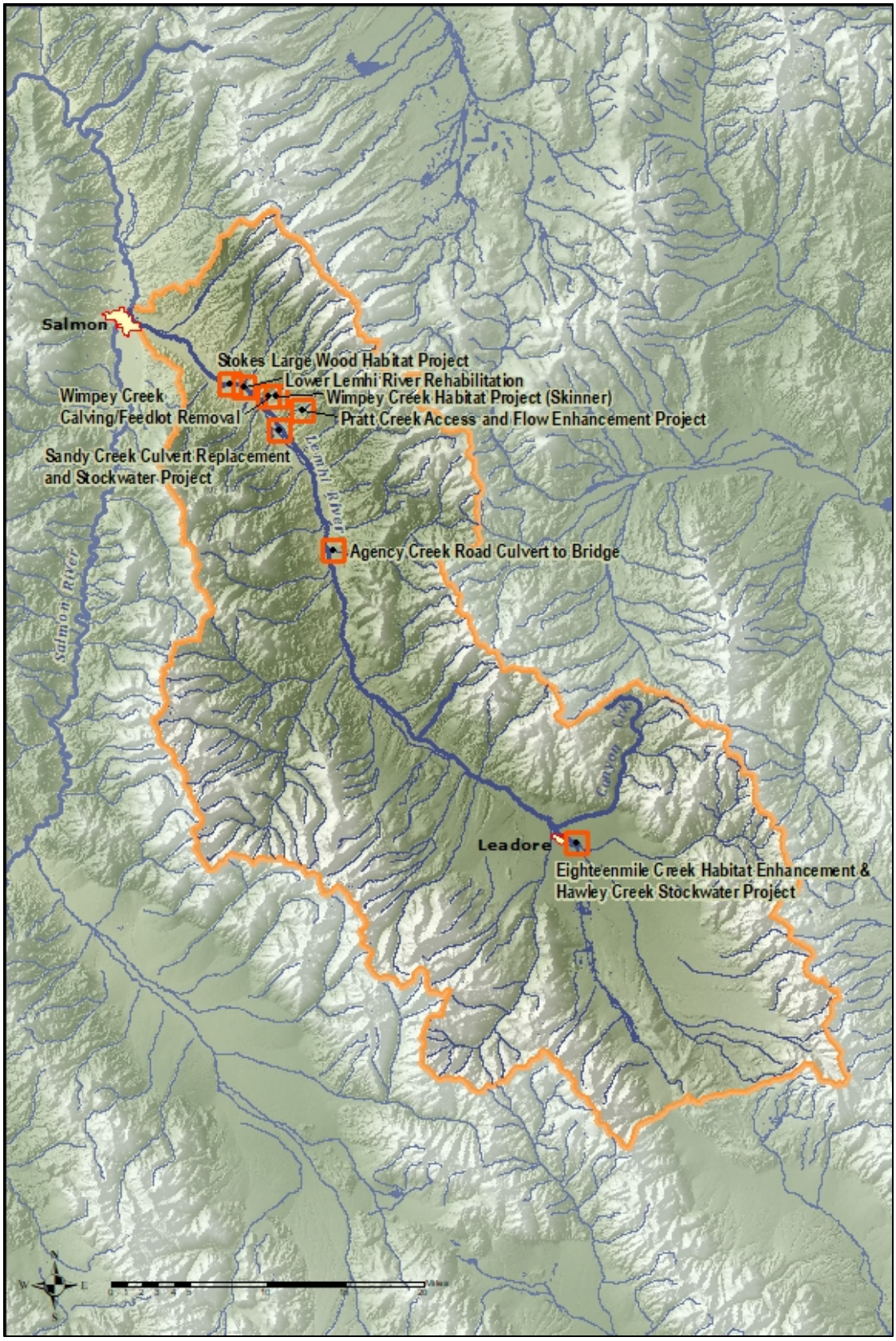


Figure 2. Location map of the projects completed in the Lemhi River in 2016-2017.

Eighteenmile Creek Habitat Enhancement and Hawley Creek Stockwater Improvement Project

Sponsor: Lemhi Soil and Water Conservation District

Partner(s): Lemhi Soil and Water Conservation District, Idaho Governor's Office of Species Conservation, Bonneville Power Administration, Upper Salmon Basin Watershed Program

Project Type: Channel Access, Entrainment, Channel Complexity, Riparian Enhancement

- Channel Access: 1.8 miles made accessible to the next upstream barrier. Eighteenmile cross-ditch structure (next upstream barrier) was removed in 2015. The access upstream from this point has been counted in previous Hawley Creek diversion improvement projects.
- Entrainment: one fish screen installed
- Channel Complexity: 0.34 miles of new stream channel created and improved
- Riparian Enhancement: 0.34 miles of riparian habitat protected with livestock exclusion fencing

Latitude: 44º 40' 33" N

Longitude: 113º 20' 08" W

Funding Source(s): Bonneville Power Administration

National Environmental Policy Act (NEPA) Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $78,000

Implementation Costs: $401,000

Project Description: Historically, the entire flow of lower Eighteenmile Creek at Leadore, Idaho, was diverted into a wide, shallow, ditched channel (0.34-mile long) to allow irrigation water to be diverted into an open ditch without a headgate or fish screen. This project eliminated the diversion dam and moved Eighteenmile Creek back into a habitat channel constructed along the natural historic stream alignment. The new habitat channel contains high-quality fish habitat for the 0.34-mile length. Care was taken in the construction of the new channel to leave riparian vegetation and to follow the historic alignment as closely as possible. A new headgate, point-of-diversion screen, and pipeline were installed to provide irrigation diversion without entraining anadromous fish. The project improved fish habitat and removed a migration barrier, opening 1.8 miles of stream habitat. The new channel alignment will help reduce summer stream temperatures. Off-channel stockwater troughs were installed to provide water for livestock that are now excluded from the stream corridor.



Figure 3. Pre-project view shows Eighteenmile Creek running through a wide, shallow, slow-moving ditched section to provide irrigation water. Water not used for irrigation was returned to the channel through an overflow ditch that inhibited fish passage.

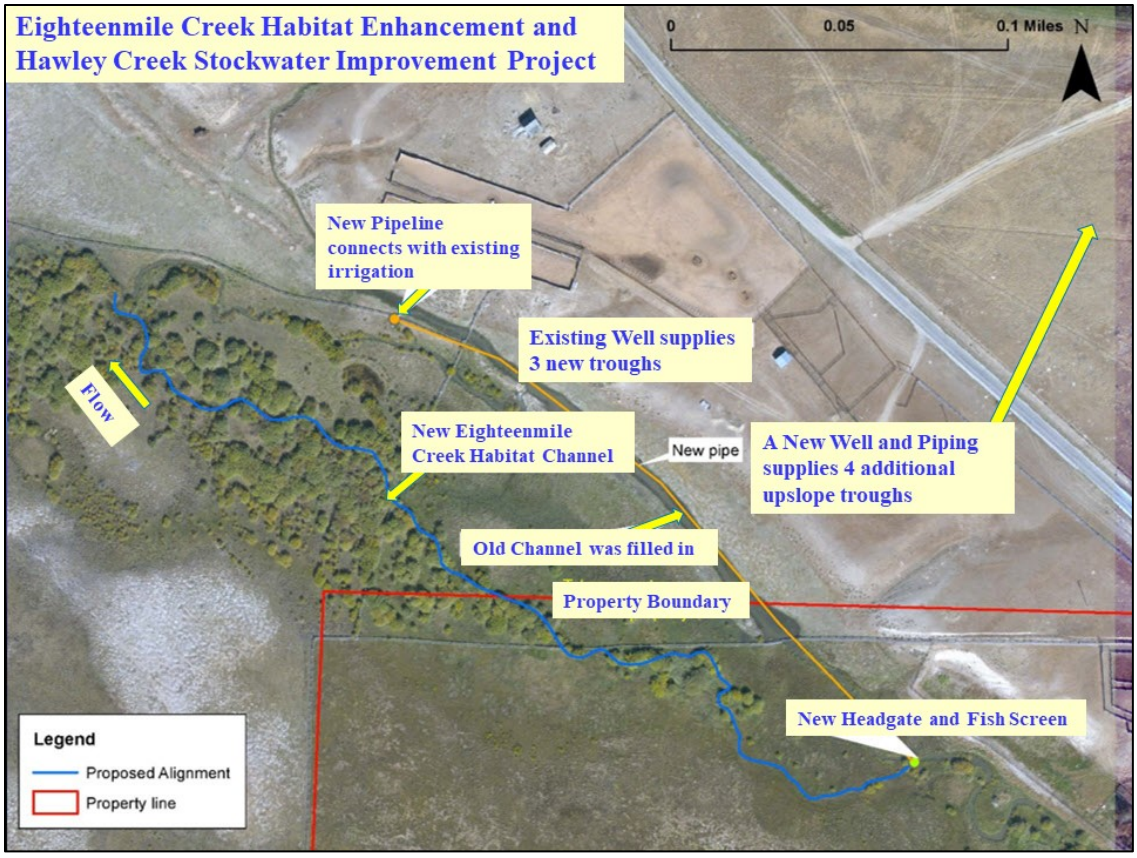


Figure 4. This overview of the project shows various features and the alignment of the new habitat channel constructed through the historic riparian corridor.



Photograph 1. As part of the project, a new habitat channel was constructed along the historic Eighteenmile Creek alignment. The constructed habitat channel created sinuosity and preserved riparian features. Construction took place while the ground was frozen to minimize soil disturbance.



Photograph 2. Post-project view shows the new habitat channel with riffles and pools. Willow clumps were laid horizontally into the channel to provide habitat and cover for juvenile fish. Sod from the channel alignment was salvaged and placed onto the banks of the new channel.

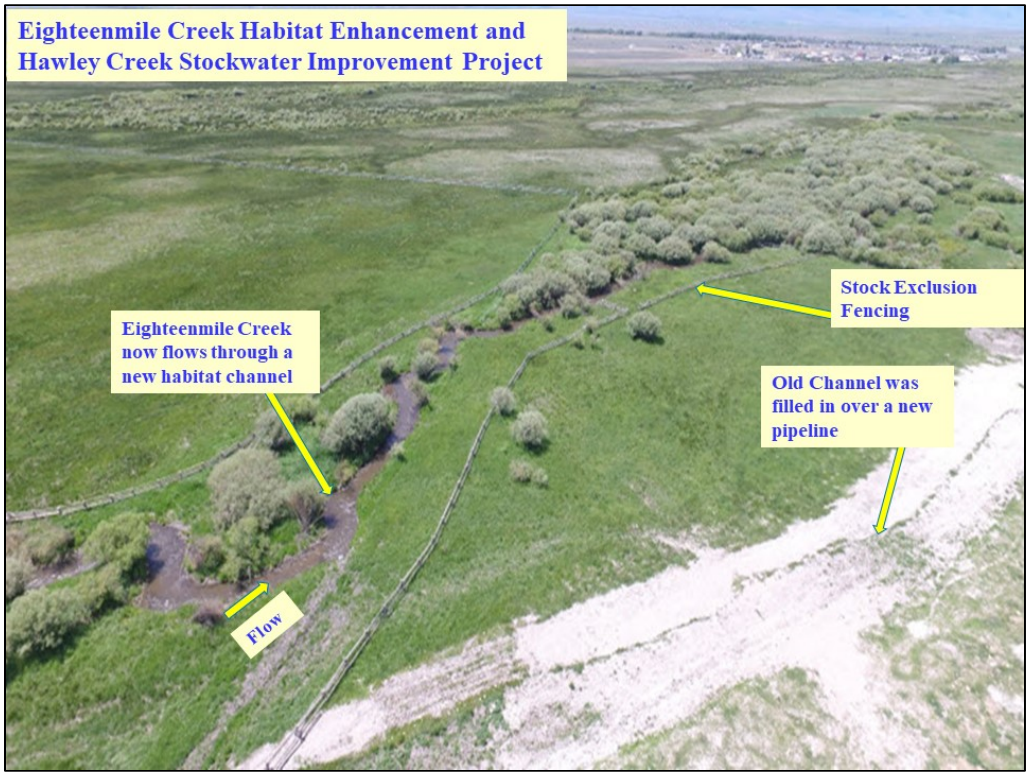


Figure 5. Post-project view shows the Eighteenmile Creek in the new alignment using the existing riparian vegetation. The old channel was filled in as part of the project, as shown on the bottom right of the view. Fencing was installed to exclude livestock from the stream channel.

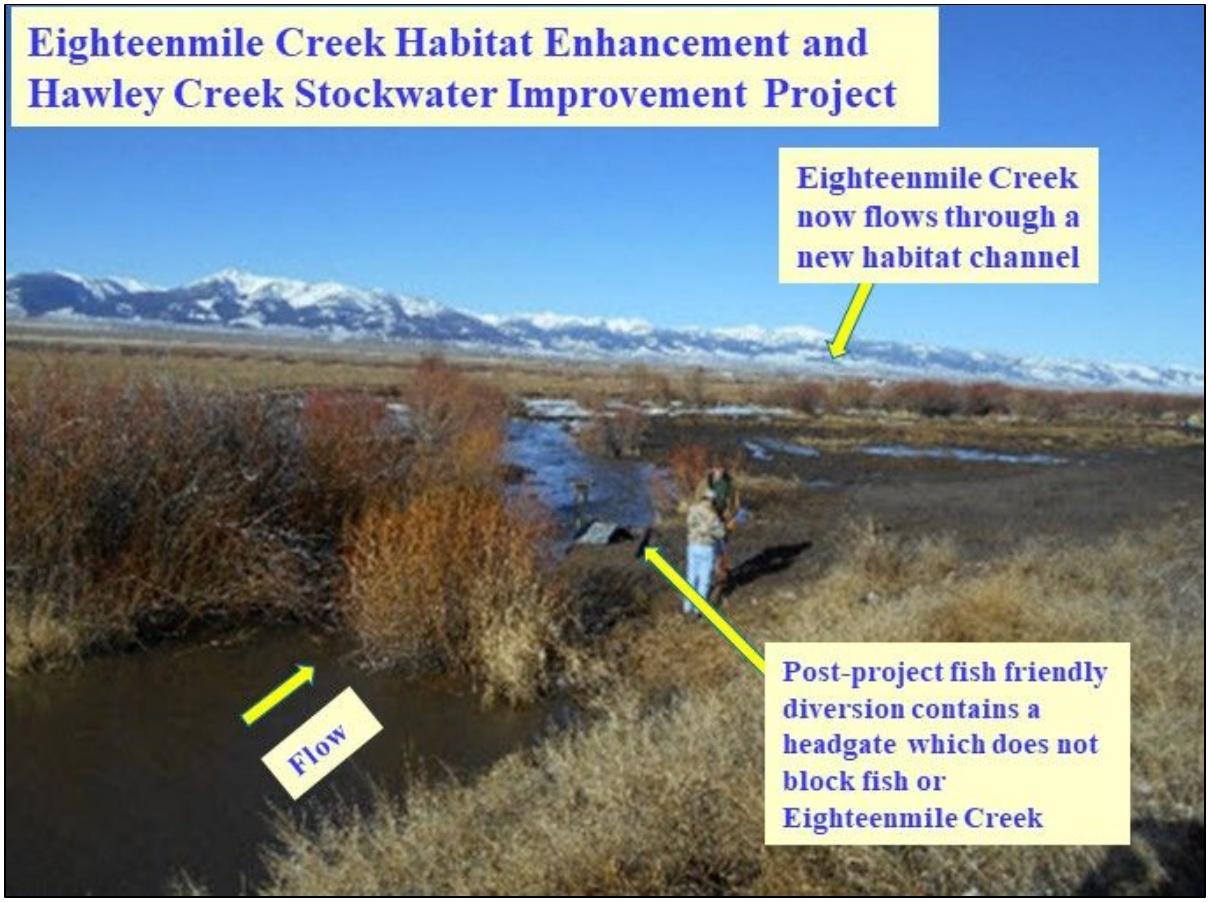


Figure 6. Post-project view shows the new diversion headgate and Eighteenmile Creek in the new alignment using the existing riparian vegetation.

Agency Creek Road Culvert to Bridge

Sponsor: Lemhi Soil and Water Conservation District

Partner(s): Lemhi Soil and Water Conservation District, Idaho Governor's Office of Species Conservation, Bonneville Power Administration, Upper Salmon Basin Watershed Program

Project Type: Channel Access

- Channel Access: Culvert (partial barrier) replaced with bridge; 1.2 miles made accessible to the next upstream barrier

Latitude: 44º 57' 23" N

Longitude: 113º 38' 13" W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $4,000

Implementation Costs: $53,000

Project Description: Agency Creek is a tributary to the Lemhi River near Tendoy, Idaho (about 20 miles upstream from the city of Salmon, Idaho). The project improved access and fish passage in the lower reach of Agency Creek by replacing an undersized corrugated metal pipe (i.e., culvert) with a pre-fabricated steel bridge. The project area is in the lower mile of Agency Creek (0.8 miles from the mouth). Anadromous fish currently use the lower part of Agency Creek for rearing habitat. Replacing the culvert with a bridge allows salmon and steelhead better access to Agency Creek. The next barrier is 1.2 miles upstream.

Reclamation worked with project implementation and provided cultural resources consultation and LiDAR.



Figure 7. The Agency Creek Culvert to Bridge Project site is about 1 mile southeast of Tendoy, Idaho.



Photograph 3. Post-project view looking downstream at the new bridge. With the culvert replaced with this bridge, all life stages of salmon and steelhead can easily move through this section of stream.

Lower Lemhi River Rehabilitation – Sub-Reach 2

Sponsor: Lemhi Soil and Water Conservation District

Partner(s): Idaho Department of Fish and Game, Idaho Governor's Office of Species Conservation, Bonneville Power Administration, Snake River Basin Adjudication Habitat Trust Fund

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.28 miles of main channel enhanced; 0.32 miles of side channel enhanced
- Riparian Enhancement: Enhanced (planted) and protected (livestock excluded via fence) 1,500 feet of main channel and 1,700 feet of side channel

Latitude: 45º 06' 38" N

Longitude: 113º 44' 38" W

Funding Source(s): Bonneville Power Administration and Snake River Basin Adjudication Habitat Trust Fund

NEPA Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $7,000

Implementation Costs: $215,000

Project Description: This multi-phased project is divided into four stream segments or sub-reaches. In 2016-2017, Sub-reach 2 was constructed. The overall goal of the project was to enhance anadromous fish spawning and rearing habitat by re-establishing natural river processes, increasing habitat complexity, re-connecting floodplain function, and adding a side channel. The adjacent riparian habitat was enhanced with vegetation plantings, and livestock have been excluded from the project area with a conservation easement and fencing.

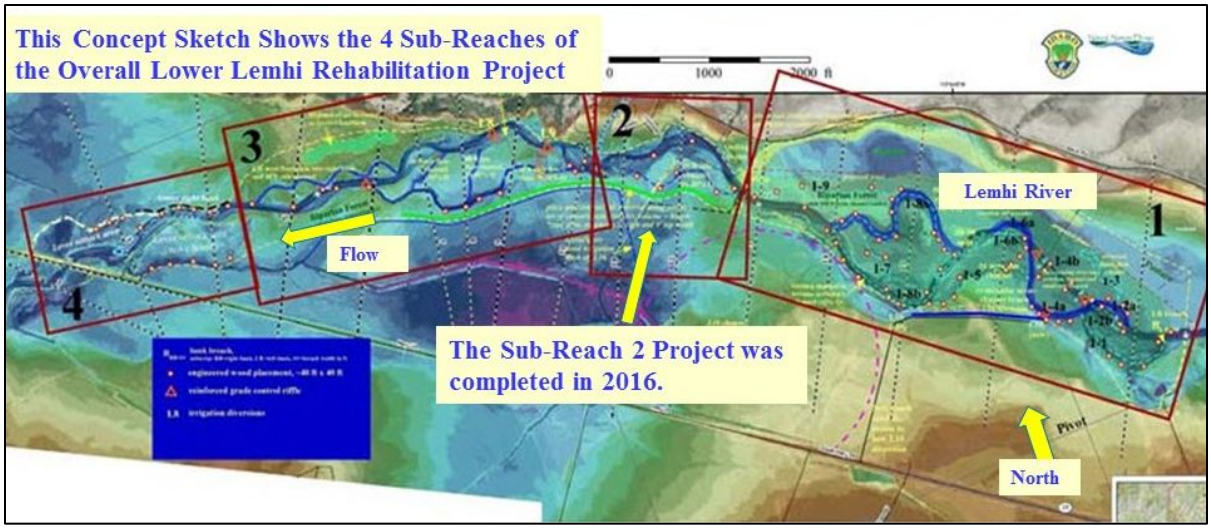


Figure 8. Project concept showing the four sub-reaches of the larger project with the Sub-Reach 2 Project, which was completed in 2016-2017. Other sub-reaches are currently under development.

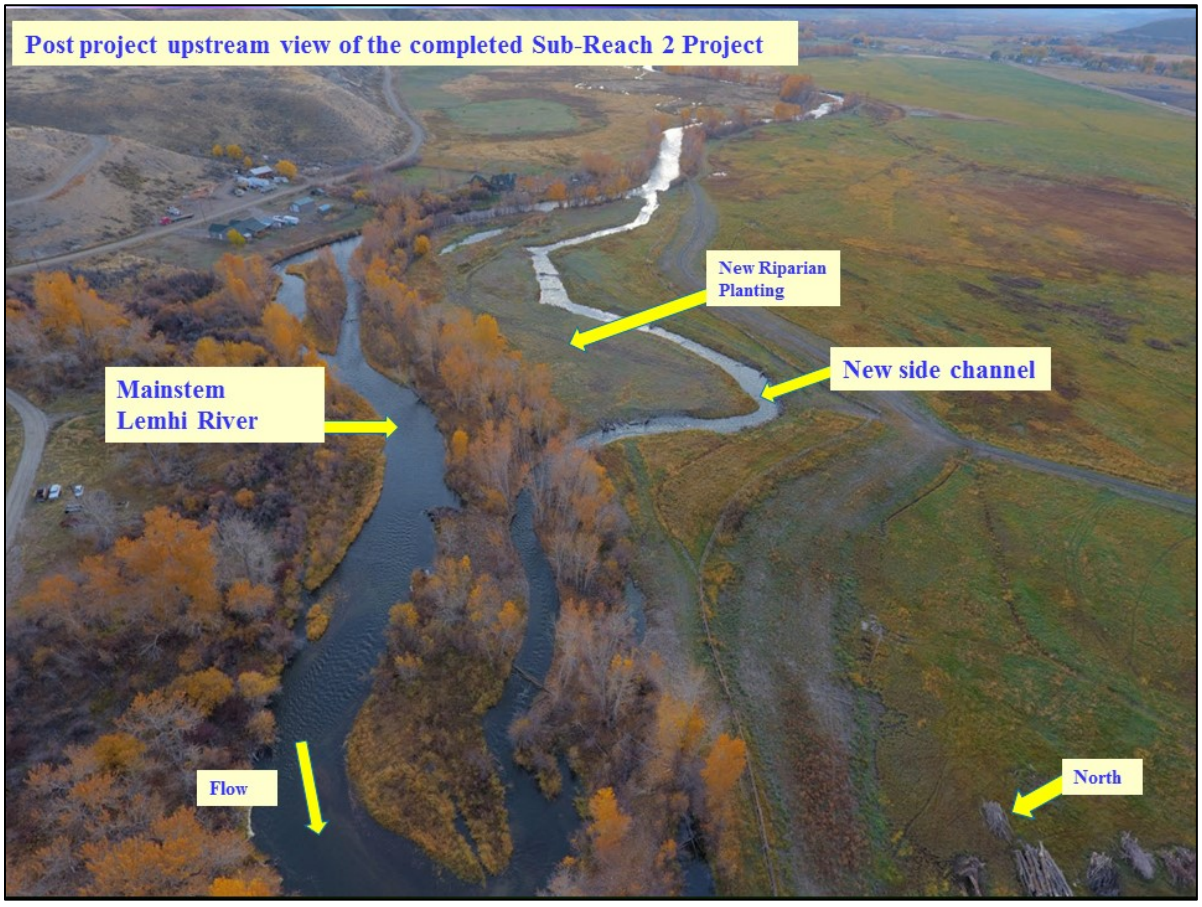


Figure 9. Post-project view of mainstem river (left) and new side channel (right).



Photograph 4. View of the new side channel looking downstream.



Photograph 5. View looking downstream along the mainstem Lemhi River (right) and new side channel inlet (left).

Sandy Creek Culvert Replacement and Stockwater Project

Sponsor: Lemhi Soil and Water Conservation District

Partner(s): Upper Salmon Basin Watershed Program, Idaho Department of Fish and Game, Natural Resources Conservation Services

Project Type: Channel Access

- Channel Access: 0.72 mile made accessible to the next upstream barrier

Latitude: 45º 04' 27" N

Longitude: 113º 42' 11" W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $3000 – Cultural Resources Survey

Implementation Costs: $ 163,000

Project Description: The Sandy Creek Culvert Replacement Project removed three corrugated metal culverts and replaced them with an 18-foot by 55-foot prefabricated steel bridge. One of the existing culverts had become entirely plugged in October 2016, one was mostly eroded, and they were all undersized. The private driveway at this location regularly flooded during high water, washing sediment-laden debris into Sandy Creek. Since October 2016, the road material at the downstream end of the culvert trio had twice washed out into the creek due to a hole in one of the culverts. Numerous irrigation efficiency projects upstream in Pratt Creek (tributary to Sandy Creek) created an increased volume of water in the stream, which compounded the issues with the undersized culverts. The new bridge passes the increased flows from Pratt Creek, eliminates a sediment input (improving water quality), and facilitates fish passage upstream for 0.72 miles.

The project included a stockwater system to accommodate the loss of live water sources for cattle from Pratt and Sandy Creeks, including a spring complex. The landowner agreed to eliminate cattle access to these live watering sources. The stockwater system originates from a new groundwater well and consists of six livestock troughs. Stockwater implementation was completed in September 2017. The riparian metrics will be combined with the Upper Pratt Creek and Lower Pratt Creek enhancements, to be reported in 2018.



Photograph 6. This pre-project view of the Sandy Creek shows the location of the undersized culverts. Water flows from right to left.



Photograph 7. Aerial view during construction. Fish passage is provided through the two culverts to the left of the isolated worksite. The right streambank and bed have already been prepared for the bridge abutment (being carried by the excavator). View is looking upstream.



Photograph 8. Post-project completed bridge. The channel can now handle the additional flows from the upstream habitat projects. The guard rails are removable so that the landowner can move cattle across safely or drive wide farm equipment across.



Photograph 9. Post-project view shows the newly installed stockwater well, with the pumphouse in the background.



Photograph 10. Post-project view shows one of six off-channel stockwater troughs completed as part of the project.

Stokes Large Wood Habitat Project

Sponsor: Idaho Department of Fish and Game

Partner(s): Idaho Department of Fish and Game, Idaho Governor's Office of Species Conservation

Project Type: Channel Complexity

- Channel Complexity: 0.09 miles of main channel enhanced

Latitude: 45° 06' 53.2" N

Longitude: 113° 45' 44.3" W

Funding Source(s): Snake River Basin Adjudication Habitat Trust Fund

NEPA Compliance: BOA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $3,000

Implementation Costs: $38,000

Project Description: This is a small project along the lower reach of the Lemhi River, which added large wood to create fish habitat and improved channel conditions through placement of logs with rootwads and large boulders. The project reduced bank erosion and improved water quality.



Photograph 11. This pre-project image of the Stokes Large Wood Habitat Project shows the bank erosion in the project area.



Photograph 12. Post-project upstream view shows the placement of rootwads and boulders that create habitat in the project area.



Photograph 13. Post-project downstream view shows habitat features created in the project area.

Pratt Creek Access and Flow Enhancement Project

Sponsor: Lemhi Soil and Water Conservation District

Partner(s): Landowners, Upper Salmon Basin Watershed Program, Natural Resources Conservation Services (NRCS), Idaho Department of Fish and Game, Bureau of Land Management, and The Nature Conservancy

Project Type: Channel Access, Entrainment, Streamflow

- Channel Access: 3.3 miles from the removal of 10 barriers
- Entrainment: two screens installed
- Streamflow: 1.5 cfs added through agreement (upstream to mouth) plus spring runoff remains instream

Latitude: 45° 05’ 41” N

Longitude: 113° 40’ 13” W

Funding Source(s): Bonneville Power Administration, Pacific Coastal Salmon Recovery Funds, Environmental Quality Incentive Funds, NRCS

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $9,000

Implementation Costs: $666,000

Project Description: The goal of the Middle and Upper Pratt Creek Access and Flow Enhancement Project is to allow anadromous fish to gain access to suitable habitat for spawning and rearing in Pratt Creek. This was accomplished through the collaboration of several entities, agencies, and the land owners. Ten separate diversions from Pratt Creek were consolidated into two diversions with fish screens. Increased flows in Pratt Creek were accomplished through efficiencies created by installing pipe and sprinkler systems on the water-righted lands. The seasonal diversion dams in Pratt Creek that blocked fish migration and reduced instream flows were removed. A separate flow agreement provides a minimum flow of 1.5 cfs in Pratt Creek that carries through to the mouth. In addition, high-flow spring runoff now remains in Pratt Creek due to irrigation piping, which uses less water.

The participating agencies provided design and coordination expertise to allow the project to move forward. Several funding partners participated in areas where their funding was applicable. The landowners were forward-thinking and cooperative in seeking ways to allow flows to remain instream and still irrigate their crop lands.

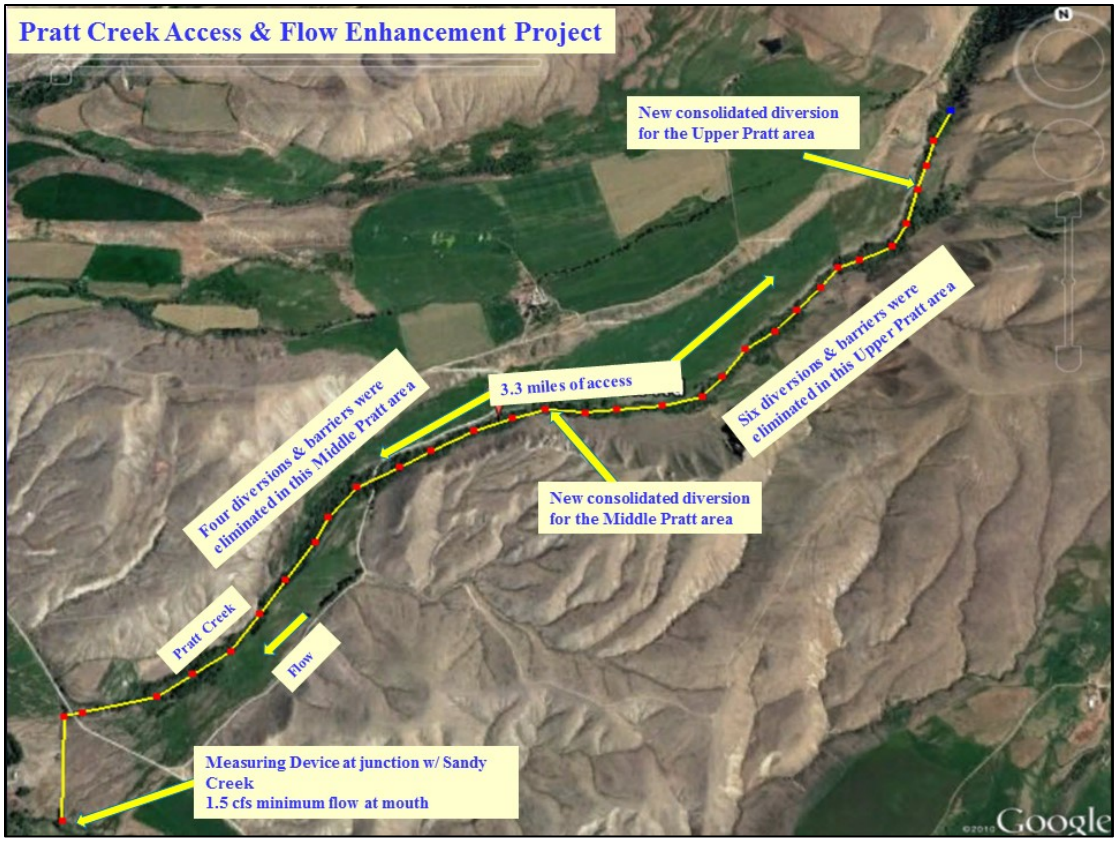


Figure 10. This project overview shows the location of the newly consolidated diversions for Pratt Creek and the areas where diversions were eliminated.



Photograph 14. This pre-project view shows one of the diversions from Pratt Creek, which takes almost the entire flow of the creek into the irrigation ditch. This diversion and ditch were eliminated through consolidation, and flow was added to the creek through agreement and irrigation efficiencies.



Photograph 15. View shows the new consolidated headgate for the Middle Pratt reach. The new headgate eliminated four other diversions and provides water to an irrigation pipe, which is sized appropriately for the water right. The new point of diversion was engineered to allow diversion without the need for a dam across the creek.

Wimpey Creek Calving/Feedlot Removal

Sponsor: The Nature Conservancy

Partner(s): The Nature Conservancy, Landowner

Project Type: Riparian Enhancement

- Riparian: 0.22 miles protected (livestock excluded via fence)

Latitude: 45º 06’ 02” N

Longitude: 113º 42’ 47” W

Funding Source(s): Landowner

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $6,000

Implementation Costs: $10,000

Project Description: A former livestock feeding and calving facility on Wimpey Creek, a tributary to the Lemhi River, was removed. The segment of stream was rehabilitated by excluding livestock with fencing, removing the building structures out of the floodplain, and planting vegetation. For many years, concentrated cattle use and large volumes of accumulated livestock waste near the stream channels resulted in an absence of riparian vegetation and degraded water quality in Wimpey Creek. The completion of this project improved water quality and stream and riparian habitat. The landowner completed the work in part with EPA (CWA Section 319) funding provided in conjunction with The Nature Conservancy (TNC) to assist with the cost of cleanup.

The removal of the calving/confined feeding facility was the first of several fish habitat enhancement projects planned for completion on Wimpey Creek.

Reclamation worked with the implementation team by providing cultural resources consultation.



Figure 11. Pre-project view of the project area where the feedlot was located along the banks of Wimpey Creek.



Photograph 16. Pre-project view of the feedlot next to the banks of Wimpey Creek.

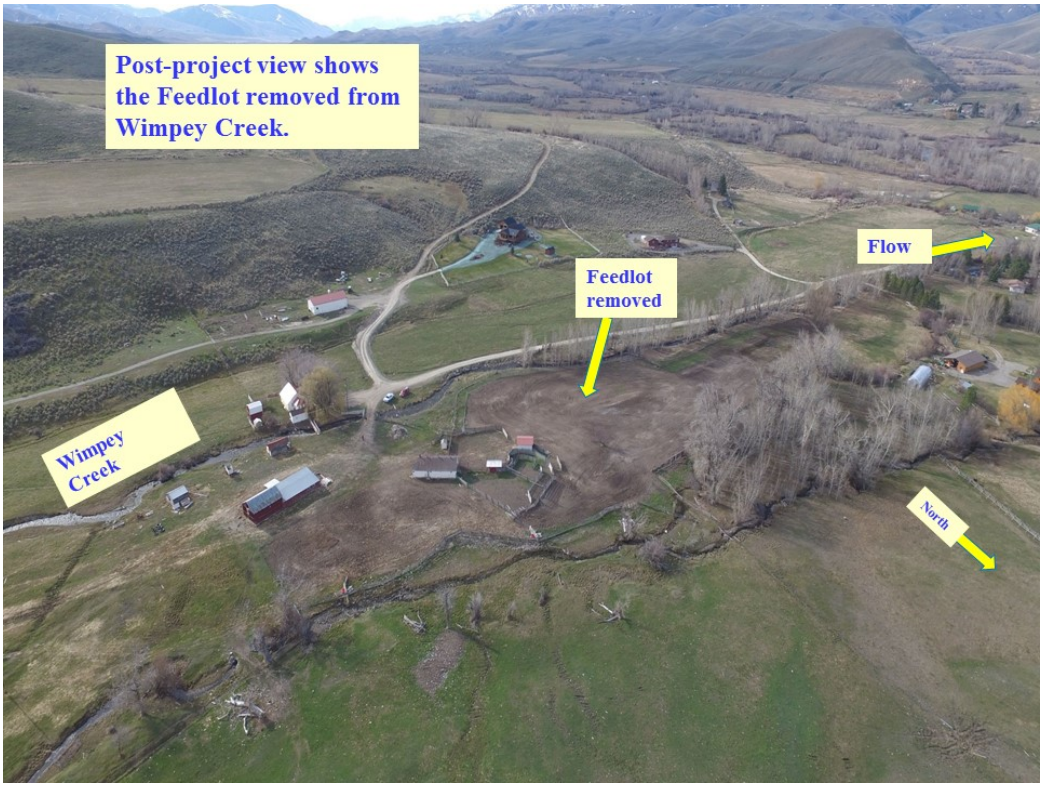


Figure 12. Post-project view of the area where the feedlot was removed from Wimpey Creek.

Wimpey Creek Habitat Project (Skinner)

Sponsor: Trout Unlimited

Partner(s): Upper Salmon Basin Watershed Project, Idaho Department of Fish and Game, Landowner, National Oceanic and Atmospheric Administration National Marine Fisheries Service (NOAA Fisheries)

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.9 miles of complexity; 4 acres of floodplain enhancement
- Riparian Enhancement: 0.9 miles riparian enhanced (planted)

Latitude: 45º 06’ 14” N

Longitude: 113º 42’ 27” W

Funding Source(s): Bonneville Power Administration, USDA Natural Resources Conservation Service (Environmental Quality Incentives Program), NOAA Fisheries (Pacific Coastal Salmon Recovery Fund), Idaho Department of Environmental Quality (319)

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $3,000 – Cultural Resources Survey

Implementation Costs: $295,000

Project Description: The goal of the Wimpey Creek Habitat Project (Skinner) was to improve stream function and aquatic resources in the lower reach of Wimpey Creek and Warm Springs Creek (tributary to Wimpey Creek). Channel complexity improvements resulted in 4,830 linear feet of enhanced aquatic habitat and was accompanied by 4 acres of selective floodplain grading. The Wimpey Creek and Warm Springs Creek channels received a combination of channel enhancement (through channel shaping and streambank treatment), channel re-alignment, and new channel construction. Streambanks were treated in selected locations with woody debris, brush and sod streambank structures, and large wood structures. Constructed floodplain surfaces were lowered to enable more frequent inundation during bankfull events. The floodplain was also enhanced with topographic diversity and woody debris placement. Former stream channels were plugged with excavated gravel and soil and converted to floodplain. New highwater side channels were developed throughout the project area. Newly constructed floodplains and streambanks were seeded with native riparian species. The project included wildlife exclusion fencing, riparian plantings, and off-channel stockwater development.



Photograph 17. Post-project view looking downstream along Wimpey Creek. The wood and brush treatments created habitat and cover for salmonids.



Photograph 18. Post-project view of large wood that was installed in Wimpey Creek.



Photograph 19. Post-project view of the lower portion of Warm Springs Creek, which also received channel improvements and woody materials.

Pahsimeroi River

The Pahsimeroi River (HUC 17060202) is a tributary to the Salmon River, entering it at RM 304, and has a drainage area of about 825 square miles. In 2016-2017, three projects were completed in this subbasin that improved channel access, streamflow, and channel complexity.

The focus of Reclamation's actions in the subbasin includes Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), and Columbia River bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records, are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Burstaedt Lane Habitat Improvement
- Pahsimeroi River Habitat Enhancement (Page)
- Pahsimeroi River Habitat Enhancement on BLM Property Downstream of the P-16 Diversion

Sponsors

- Trout Unlimited
- Idaho Department of Fish and Game

Partners

- Idaho Department of Fish and Game
- Trout Unlimited
- Upper Salmon Basin Watershed Program
- Landowner
- Natural Resources Conservation Service
- Bonneville Power Administration
- Bureau of Land Management

Funding Sources

- Bonneville Power Administration

Table 3. Bureau of Reclamation Total Expenditures for completed projects in the Pahsimeroi River.

River	Expenditures
Pahsimeroi River	$543,000

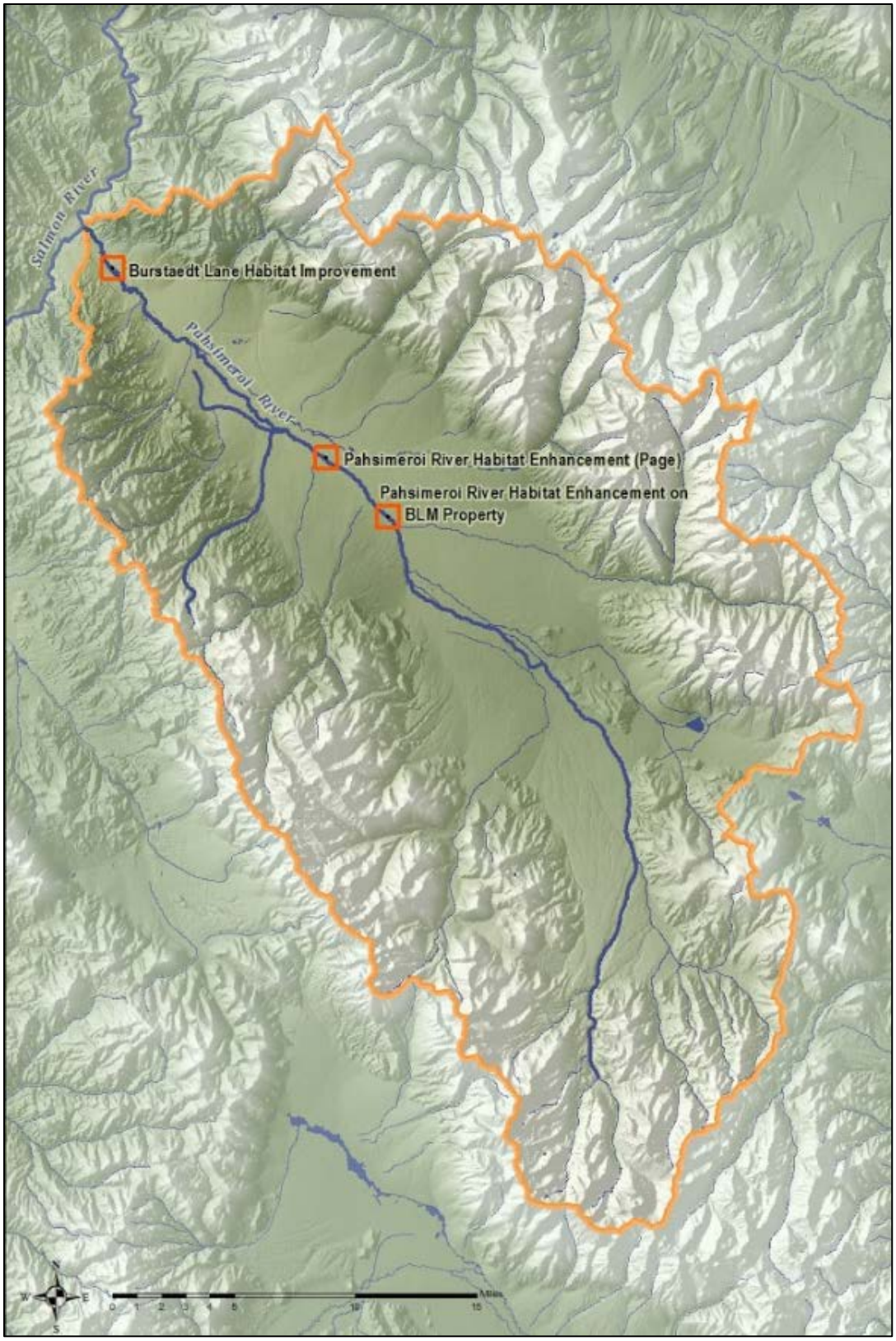


Figure 13. Location map of the projects completed in the Pahsimeroi River Subbasin in 2016-2017.

Burstaedt Lane Habitat Improvement

Sponsor: Trout Unlimited

Partner(s): Idaho Department of Fish and Game, Trout Unlimited, Upper Salmon Basin Watershed Program, Landowner, Natural Resources Conservation Service, Bonneville Power Administration

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.05 miles of main channel enhanced; seven large wood bank structures added
- Riparian Enhancement: 0.05 miles enhanced (planted), 0.11 miles protected (livestock excluded via fence)

Latitude: 44° 39’ 55” N

Longitude: 114° 01’ 43” W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $49,000

Implementation Costs: $178,500

Project Description: At the project location, a sharp bend in the river was eroding, which brought additional fine sediments into the lower Pahsimeroi River, where anadromous fish spawn and rear. The project installed seven rootwad structures along 200 feet of bank to reduce fine sediment to the stream and add habitat for anadromous fish. Livestock exclusion fencing was installed along 850 feet of the Pahsimeroi River in the project area. A new well was drilled away from the stream to provide flow to stockwater troughs, which allows livestock watering without impacting the river.



Photograph 20. Pre-project view looking downstream along the Pahsimeroi River at the eroding bank in the project area.



Photograph 21. Post-project view looking downstream along the same bank as above, with multiple rootwad structures installed along the bank to provide fish habitat and reduce erosion.

Pahsimeroi River Habitat Enhancement (Page)

Sponsor: Idaho Department of Fish and Game

Partner(s): Trout Unlimited, Landowner, Bonneville Power Administration

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 1.3 miles of complexity and floodplain enhancement
- Riparian Enhancement: 1.3 miles of riparian enhanced (planted)

Latitude: 44° 32’ 22” N

Longitude: 113° 52’ 12” W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $420,000

Implementation Costs: $530,000

Project Description: The Pahsimeroi River below the P-16 diversion has been dewatered seasonally by irrigation withdrawals. Recent conservation projects have reduced the amount of irrigation water diverted from the river, and additional projects are slated that will further enhance flows. The Page Project focused on enhancing channel and floodplain habitat along the 1.3-mile-long section of the Pahsimeroi River. The pre-project channel conditions along the Page property were over-widened and incised and lacked floodplain connection and large wood. This project was designed to jump-start the habitat and channel rehabilitation along this reach.

The project consisted of excavating floodplains, building riffles to elevate the water surface, and installing large woody materials and engineered log jams. New riparian vegetation was planted along this 1.3-mile channel.



Figure 14. During construction, the Pahsimeroi River was diverted around the project area while small floodplains were excavated along the river. Riffles were built to raise the water surface, allowing the floodplains to activate during 1.5- to 2-year flood events.



Figure 15. This view shows the addition of riffle material and floodplain excavation during construction.



Photograph 22. More than 300 large trees with rootwads were installed in the channel along the project area. Engineered log jams, such as this one, were installed in the dry areas, with the river diverted around the project site.



Photograph 23. Post-project view shows the addition of single trees with rootwads installed in key locations along the Pahsimeroi channel. Some of these were pinned in place with wooden posts.



Photograph 24. Post-project view looking upstream along an engineered log jam. The exposed gravel in the upper left corner of the photograph is a natural floodplain, similar in size and elevation to the ones constructed during the project.



Photograph 25. Post-project view shows woody materials scattered around on the excavated floodplains. The floodplains were densely planted with riparian vegetation.



Photograph 26. Post-project image shows an engineered log jam constructed at a sharp bend in the river. This log jam creates a deep pool and cover for adult and juvenile salmon and steelhead.

Pahsimeroi River Habitat Enhancement on BLM Property Downstream of the P-16 Diversion

Sponsor: Idaho Department of Fish and Game

Partner(s): Bureau of Land Management, Idaho Department of Fish and Game, Trout Unlimited, Upper Salmon Basin Watershed Program, Bonneville Power Administration

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.83 miles of main channel enhanced; 70 large wood instream and floodplain structures added
- Riparian Enhancement: 0.83 miles enhanced (planted)

Latitude: 44° 30 04" N

Longitude: 113° 49' 27" W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: Bureau of Land Management's **(**BLM's) project-specific NEPA and BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $74,000

Implementation Costs: $117,000

Project Description: The segment of the Pahsimeroi River on BLM land downstream of the P-16 diversion was historically dewatered during much of the irrigation season, heavily impacting instream and riparian habitat function. In 2015, an irrigation conversion project at P-16 was completed just upstream of the project area, resulting in increased instream flow in this river segment.

The BLM Enhancement Project placed more than 90 trees both in the channel and on the adjacent floodplain, addressing approximately 4,400 feet of the Pahsimeroi River. Riparian habitat was enhanced by planting multiple species of trees and shrubs.



Photograph 27. Trees placed in the Pahsimeroi River for fish habitat. The rootwad on one of these trees diverts a small amount of flow into a side channel, shown on the left side of the photograph.



Photograph 28. Trees were placed in the stream channel and on the floodplain.



Photograph 29. Photograph shows a tree placement that causes a split flow condition, creating a small island at this flow level.



Photograph 30. Trees placed into the channel help provide fish habitat. Six-inch-diameter vertical posts were driven into the substrate at key points to anchor most of the wood structures.



Photograph 31. Trees were installed on several low floodplains to provide habitat during high water conditions.



Photograph 32. Numerous species of potted plants were planted throughout the reach to improve the riparian condition of the channel.

Upper Salmon River

The Upper Salmon River (HUC 17060201) extends from its headwaters in the Sawtooth Mountains to its confluence with the Middle Fork Salmon River, excluding the Lemhi and Pahsimeroi Rivers. The river basin has a drainage area of approximately 2,425 square miles. In 2016-2017, three projects were completed in the Upper Salmon River.

The focus of Reclamation's actions in the subbasin includes Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), and Snake River sockeye salmon (endangered), and Columbia River bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records, are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Garden Creek Siphon and Barrier Removal
- Pole Creek Meadow Channel Reconnection Project
- West Fork Yankee Fork Confluence Habitat Project (Phases 1 and 2)

Sponsors

- Custer Soil and Water Conservation District
- Trout Unlimited

Partners

- Custer Soil and Water Conservation District
- Idaho Department of Fish and Game
- The Shoshone-Bannock Tribes
- Sawtooth National Recreation Area
- Upper Salmon Basin Program Watershed Program
- Trout Unlimited
- U.S. Forest Service
- Idaho Governor's Office of Species Conservation
- U.S. Fish and Wildlife Service
- Bonneville Power Administration

Funding Sources

- Bonneville Power Administration

- Trout Unlimited
- U.S. Forest Service

Table 4. Bureau of Reclamation Total Expenditures for completed projects in the Upper Salmon River.

River	Expenditures
Upper Salmon River	$2.1 million

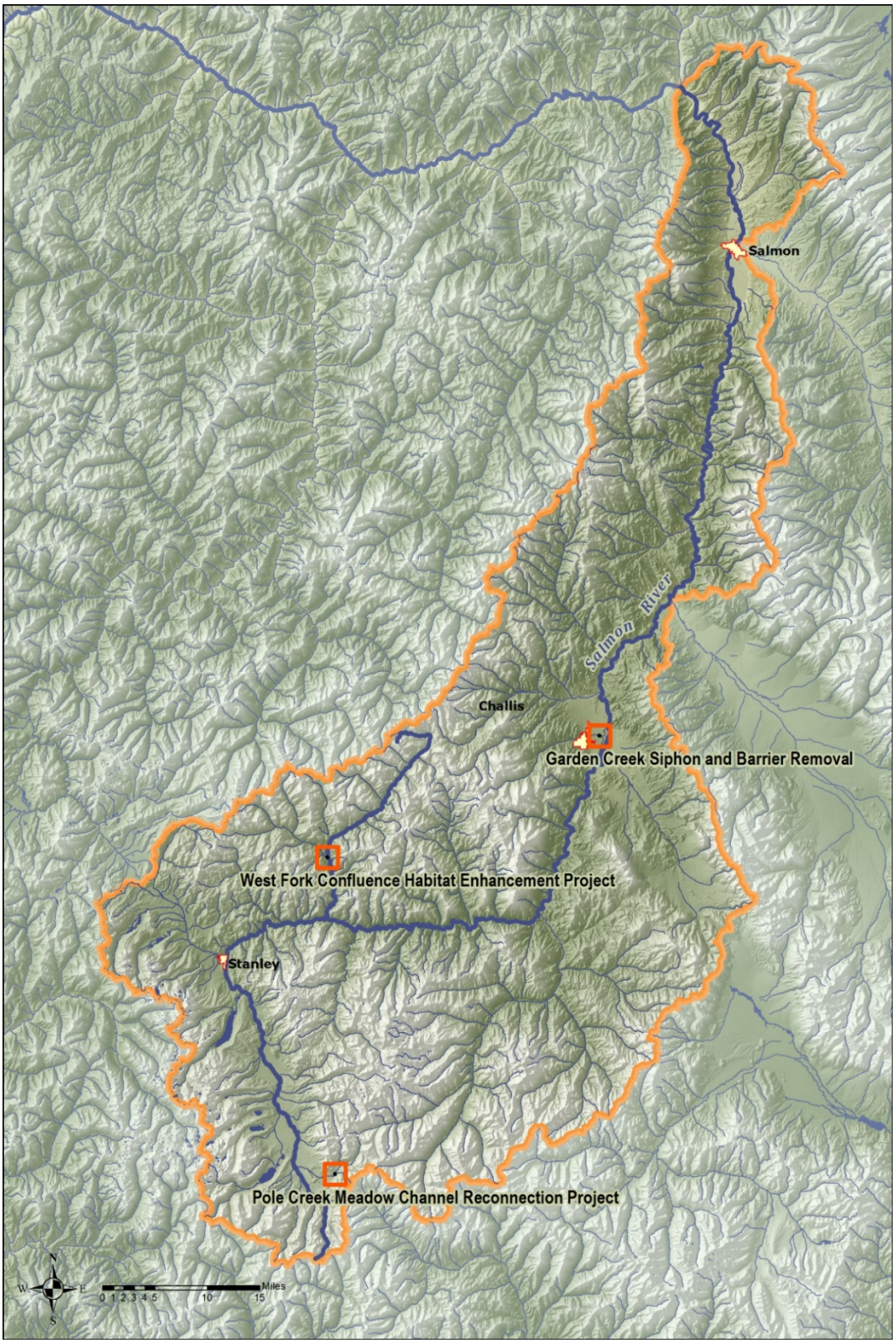


Figure 16. Location map of the projects completed in the Upper Salmon River Subbasin in 2016-2017.

Garden Creek Siphon and Barrier Removal

Sponsor: Custer Soil and Water Conservation District

Partner(s): Custer Soil and Water Conservation District, Idaho Department of Fish and Game

Project Type: Channel Access

- Channel Access: Removed a partial fish barrier diversion structure in Garden Creek; 0.3 miles made accessible to the next upstream diversion

Latitude: 44^{o} 30’ 35.1” N

Longitude: 114^{o} 11’ 49.2” W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $48,000

Implementation Costs: $45,000

Project Description: At the project location, a ditch running Salmon River water perpendicular to Garden Creek crossed the stream. A pre-project wooden diversion structure had been in place to allow the ditch water to cross Garden Creek, capture its flow, and created a fish barrier.

Completion of this project resulted in the removal of the diversion structure and installation of an underground siphon to carry the Salmon River irrigation water under Garden Creek. The irrigation ditch water is now separate from Garden Creek, and the barrier has been eliminated. One hundred feet of the Garden Creek channel was re-graded and re-shaped. Anadromous fish have full access to 0.3 miles of upstream habitat.



Photograph 33. Pre-project diversion structure in Garden Creek with vertical check boards in place. The diversion was a complete barrier to fish movement within the stream when the check boards were in place. Streamflow is from right to left.



Photograph 34. Installation of the 24-inch-diameter siphon that now carries irrigation water under the stream. Garden Creek was bypassed around the construction site while the old diversion was removed and the siphon installed.



Photograph 35. Post-project view looking across Garden Creek along the siphon alignment. The old diversion structure was located near the center of this photograph.



Photograph 36. Post-project view looking downstream along the reshaped section of Garden Creek. The old diversion structure is now eliminated, and the siphon carries the ditch water under Garden Creek.

Pole Creek Meadow Channel Reconnection Project

Sponsor: Custer Soil and Water Conservation District

Partner(s): Custer Soil and Water Conservation District, Idaho Department of Fish and Game, the Shoshone-Bannock Tribes, Sawtooth National Recreation Area, Upper Salmon Basin Watershed Program

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.4 miles of main channel enhanced
- Riparian Enhancement: 0.4 miles enhanced (planted)

Latitude: 43º 54’ 48” N

Longitude: 114º 43’ 56” W

Funding Source(s): Bonneville Power Administration

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $205,000

Implementation Costs: $43,500

Project Description: A portion of the Pole Creek channel upstream from the Hensley Ranch was disconnected from previous land use practices, reducing fish habitat. The project involved re-establishing Pole Creek in its historic channel with existing beaver ponds and healthy stream habitat. This was achieved by excavating 270 feet of new channel to reconnect the stream to the historic Pole Creek channel. Pole Creek now flows through 0.4 miles of excellent riparian habitat with thick willow complexes and several beaver dams. The project enhances several recently completed habitat enhancements downstream that removed passage barriers and increased streamflow in Pole Creek.



Photograph 37. Excavating the new channel to reconnect to the historic Pole Creek.



Photograph 38. Post-project view of the excavated, connected channel.



Photograph 39. Large wood was used to plug the upper end of the pre-project channel.

West Fork Yankee Fork Confluence Habitat Enhancement Project (Phases 1 and 2)

Sponsor: Trout Unlimited

Partner(s): Trout Unlimited, The Shoshone-Bannock Tribes, U. S. Forest Service, Idaho Governor's Office of Species Conservation, U. S. Fish and Wildlife Service, Bonneville Power Administration

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity:
  - 0.5 miles of constructed main channel
  - 0.7 miles of constructed side channels and alcoves
  - 148 engineered large wood structures using 640 logs (most with rootwads) added to the main channel and side channels
  - Connected and improved 554 feet of a ground water spring to the main Yankee Fork
  - Construction of 29 riffles, 27 glides, and nine point bars
  - Confluence of the West Fork and the main Yankee Fork was moved upstream 0.4 miles to allow floodplain interaction and dynamic wetland, spring, and alcove interaction
- Riparian Enhancement
  - Extensive earthwork to grade tailings for floodplain and cover riparian areas with soils. A total of 50,800 cubic yards was moved.
  - 6.2 acres of wetland creation and enhancement
  - Extensive vegetative planting/transplanting including 1,882 containerized plants, 1,300 pole cuttings, 350 seedlings, and 17.6 acres seeded

Latitude: 44^{o} 21' 10" N

Longitude: 114^{o} 43' 50" W

Funding Source(s): Bonneville Power Administration (Shoshone-Bannock Tribes Accord), Trout Unlimited, Reclamation, U.S. Forest Service

NEPA Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $1.8 million

Implementation Costs: $1.1 million

Project Description: The gold dredging operations in the mid-1900s moved, straightened, and channelized the main Yankee Fork River. The traditional confluence with the West Fork

was moved downstream and important side-channel rearing habitats were isolated by the dredge piles left from the mining operations. In recent years, the anadromous fish have used this area mostly as migration habitat. Historically, the West Fork confluence area created complex rearing and spawning opportunities for salmon and steelhead, which were substantially altered or lost due to mining activities.

The West Fork Confluence Habitat Enhancement Project was designed to restore natural river processes by creating complexity habitat. Dredge tailings were removed and the channel was altered to allow the main Yankee Fork River to flow in its historic channel and access its floodplain. The new main Yankee Fork channel was constructed with deep pools, riffles, meanders, and natural-looking large wood structures. This new channel alignment also allowed for the construction of side channels, alcoves, connecting groundwater spring areas, and the addition of large wood. Juvenile fish immediately moved into this complex habitat, and anadromous fish spawned in the new channel shortly after construction. In addition, the abandoned portion of the main Yankee Fork channel was enhanced and turned into a narrow side channel with complexity features such as pools, riffles, and large wood structures.

The project was constructed in two phases over a 2-year period. The completed project is now considered a great success in creating sustainable high-value habitat for both rearing and spawning.



Figure 17. Pre-project overview of the West Fork Yankee Fork River, looking downstream.

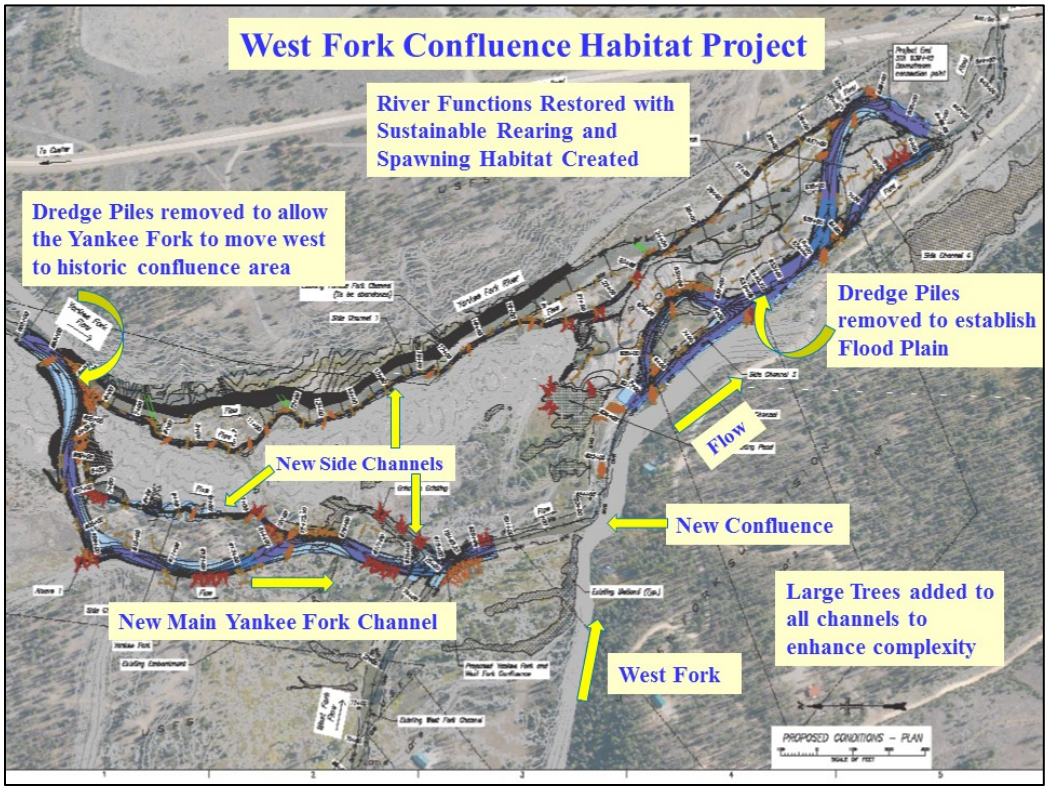


Figure 18. Project plan sheet showing features of the West Fork Yankee Fork River completed project.

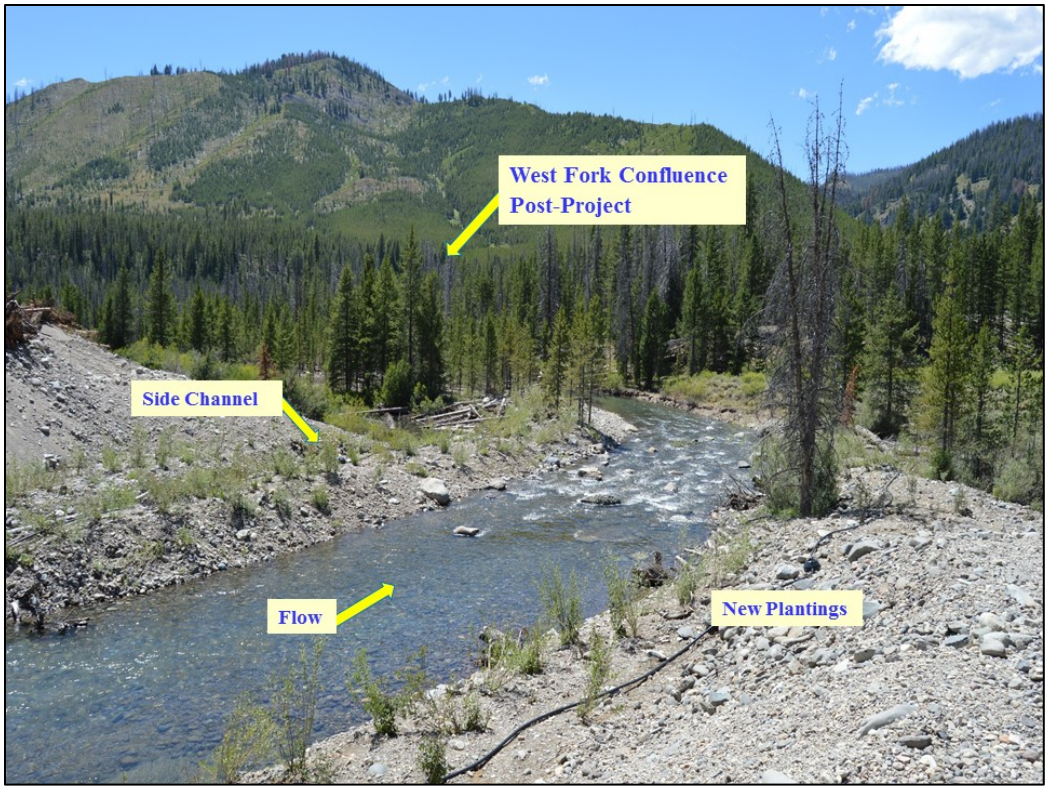


Figure 19. View shows the new Yankee Fork channel flowing through the dredge piles (foreground) toward the historic confluence with the West Fork (note the constructed riffle). There is also a new side channel flowing (on the left side in the photograph) between the Yankee Fork and the toe of the dredge pile. Container plantings line each side of the new channel through the dredge pile area. These plantings will be irrigated for the first few years.



Photograph 40. Post-project view looking upstream along the new Yankee Fork channel. Note the channel complexity and the volume of large wood. This combination creates a variety of quality rearing habitats for juvenile salmon and steelhead.



Photograph 41. Post-project constructed side channel as it re-enters the new Yankee Fork channel. These are designed to be self-sustaining and create natural river processes.



Photograph 42. Post-project: Deep pools were formed in the new Yankee Fork channel, with cover and habitat for both adult and juvenile anadromous fish.



Photograph 43. Post-project view looking downstream at the new confluence with the West Fork. The confluence area contains groundwater springs and alcoves, which are now connected.



Photograph 44. The added wood will collect additional wood over time, which will continue to create instream complexity. As riparian areas are re-established, wood will be recruited to the Yankee Fork in a more natural system.

Grande Ronde River Subbasin

From its headwaters in the Blue Mountains, the Grande Ronde River flows northeast about 212 miles to its confluence with the Snake River at RM 169 about 20 miles upstream of Asotin, Washington. The Grande Ronde River drains approximately 4,000 square miles. Its major tributaries include the Wallowa River (RM 81) and Catherine Creek (RM 144).

Within the Grande Ronde River subbasin, Reclamation currently works in the Upper Grande Ronde River, Catherine Creek, and the Wallowa River. In 2016-2017, two projects were completed in Catherine Creek and one project was completed in the Upper Grande Ronde River.

The focus of Reclamation's actions in the basin includes habitat improvements for Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), and Columbia River bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records, are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Table 5. Bureau of Reclamation Total Expenditures for completed projects in subbasin.

Subbasin	Expenditures
Grande Ronde River	$4.26 million

Catherine Creek

Catherine Creek is a large tributary of the Grande Ronde River that drains 402 square miles of the Wallowa Mountains in northeast Oregon. From peaks above 9,000 feet, Catherine Creek flows northwest through the town of Union, Oregon. Near Union, Catherine Creek turns north and flows through the Grande Ronde Valley, where it meets the Grande Ronde River at approximately RM 144.

Anadromous species present in the river include Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), and Columbia River bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records, are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Catherine Creek RM-44 Phase III (Southern Cross)
- Catherine Creek RM-44 Phase IV

Sponsors

- Confederated Tribes of the Umatilla Indian Reservation
- Union Soil and Water Conservation District

Partners

- Union Soil and Water Conservation District
- Bonneville Power Administration
- Grande Ronde Model Watershed
- Oregon Watershed Enhancement Board
- Oregon Department of Fish and Wildlife
- Confederated Tribes of the Umatilla Indian Reservation

Funding Sources

- Bonneville Power Administration
- Confederated Tribes of the Umatilla Indian Reservation (Tribes)
- Union Soil and Water Conservation District
- Oregon Watershed Enhancement Board

Table 6. Bureau of Reclamation Total Expenditures for completed projects in Catherine Creek.

Subbasin	Expenditures
Catherine Creek	$4.25 million

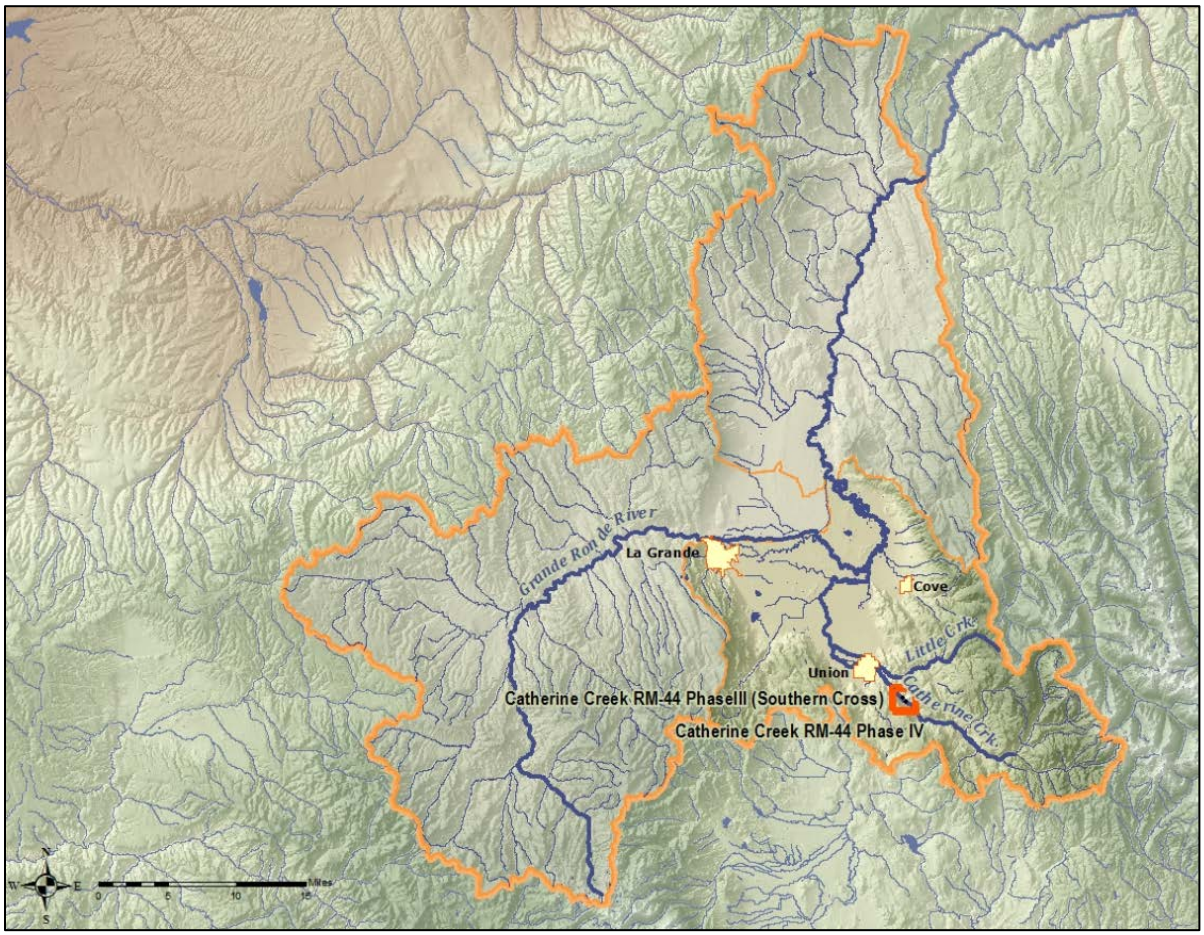


Figure 20. Location map of the projects completed in Catherine Creek in 2016-2017.

Catherine Creek RM-44 Phase III (Southern Cross)

Sponsor: Confederated Tribes of the Umatilla Indian Reservation

Partner(s): Union Soil and Water Conservation District, Bonneville Power Administration, Grande Ronde Model Watershed, Oregon Watershed Enhancement Board, Oregon Department of Fish and Wildlife

Project Type: Channel Access, Entrainment, Streamflow, Channel Complexity, Riparian Enhancement

- Channel Access: Side channel culvert (partial barrier) replaced with a bridge and 0.5 miles made accessible; three diversions consolidated into one, resulting in the elimination of two diversions, which removed three partial barrier structures; and 2.25 miles made accessible
- Entrainment: one fish screen installed
- Streamflow: Approximately 1.4 cfs permanently added to stream base flow for 2.25 miles
- Channel Complexity
  - 0.8 miles of main channel enhanced, 142 structures added, 595 feet of large woody material edge roughness features, 18 pools and 15 riffles constructed
  - 0.5 miles of side channel enhanced, 374 in-channel and floodplain structures added
  - 0.27 miles of alcoves created
  - 1.74 miles of floodplain and wetland habitat created
- Riparian Enhancement
  - 64 acres and 1 mile of riparian protected via conservation easement and livestock exclusion fencing
  - Installation of 14,289 containerized trees and shrubs, 5,700 live willow cuttings, 2,200 sedge/rush plugs and 800 lbs. native grass seed
  - Salvaged and transplanted woody riparian vegetation, and sod/sedge mats

Latitude: 45º 10’ 41” N

Longitude: 117º 48’ 45” W

Funding Source(s): Bonneville Power Administration, Confederated Tribes of the Umatilla Indian Reservation (Tribes), Union Soil and Water Conservation District

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $2.8 million

Implementation Costs: $2 million

Project Description: The Catherine Creek – RM 44 Phase III (Southern Cross) project was constructed over two seasons as part of a multi-phase fish habitat complexity enhancement. The Phase III work focused on completely rebuilding most of the main channel with complex habitat structure, channel realignment, side channels and alcoves, groundwater connections to the channel, floodplain connection, large wood features, and extensive riparian habitat enhancements. Construction began in the fall of 2015 with new side channels and floodplain features. The final in-channel work connecting the new side channels and alcoves to the newly constructed channel was completed in 2016-2017.

The goal of Phase III was to address critical habitat-limiting factors in Catherine Creek to benefit spawning and rearing habitat for spring-run Chinook salmon, summer steelhead, and bull trout that use the upper Grande Ronde River basin. The post-project conditions have greatly enhanced the habitat to a more natural character and function in this critical stream reach.

Before construction, the Tribes were able to purchase the Southern Cross property. This purchase allowed the project to more fully develop additional side channels, alcoves, and main channel alignment adjustments, creating substantial habitat benefits. The designs were intended to optimize habitat using channel reconstruction, side channels, and large wood structures and features.

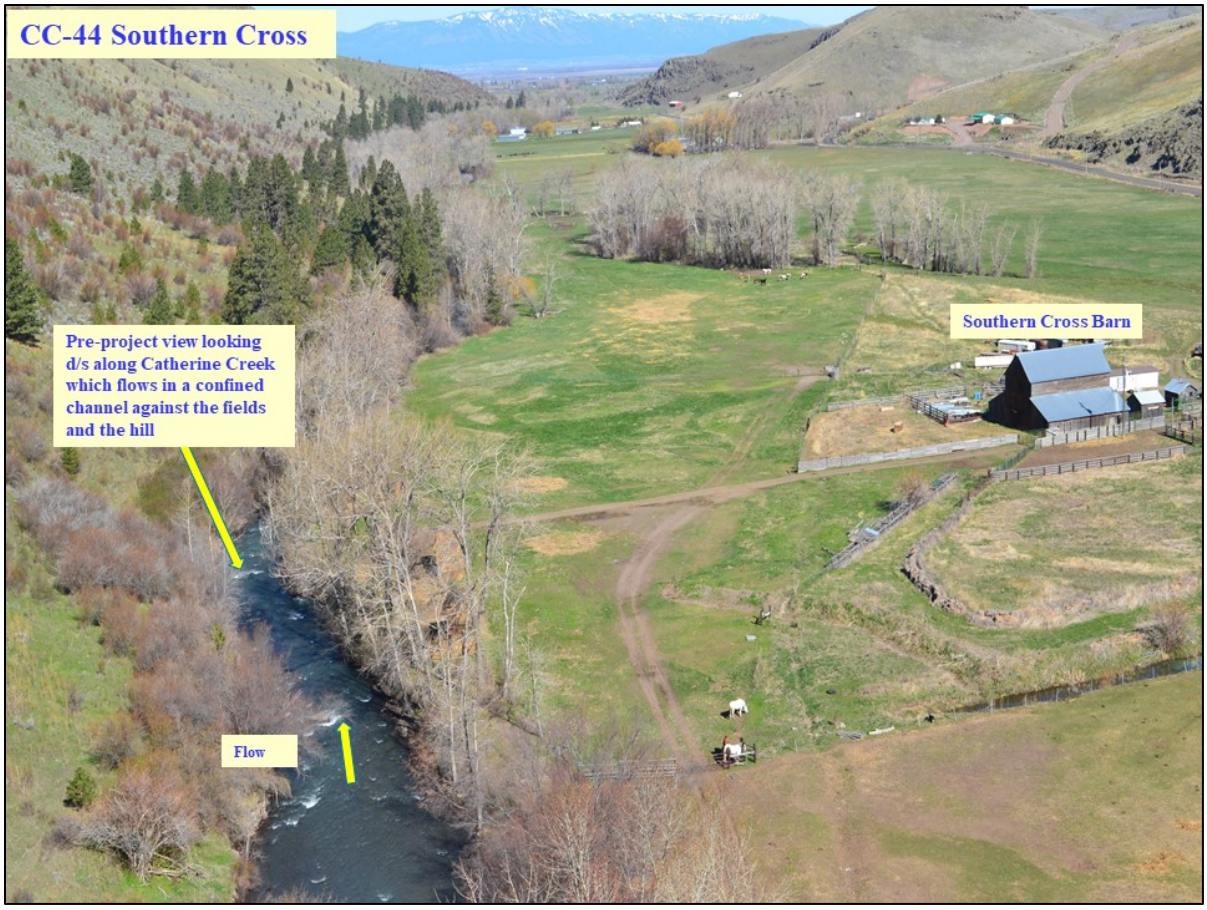


Figure 21. Pre-project view of the CC-44 Southern Cross project area. View is looking downstream along the confined channel of Catherine Creek.



Figure 22. This image was taken during construction of the CC-44 Southern Cross Project. The view shows the many different features of the project, including the new channel alignment, side channels, alcoves, and large wood structures being constructed within the project area.

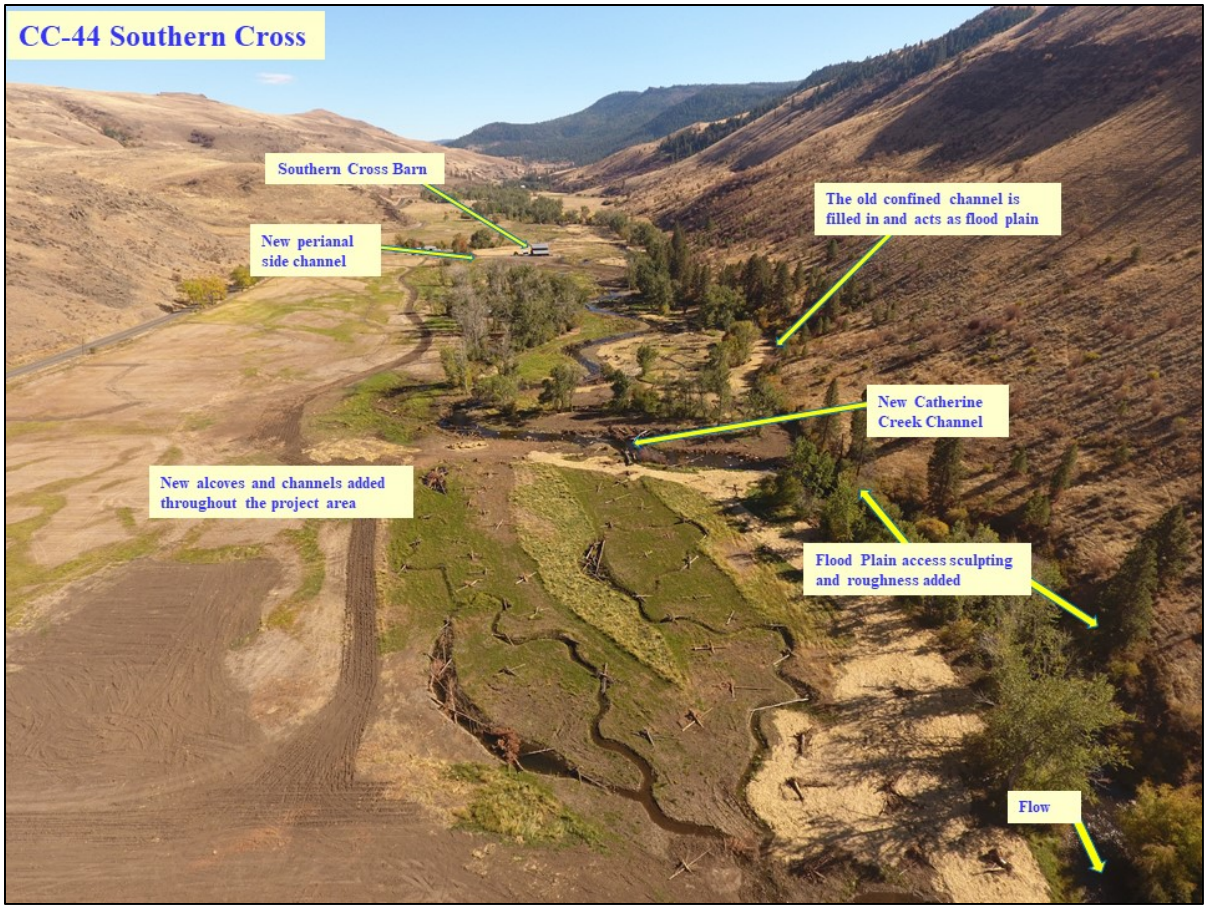


Figure 23. Post-project view looking upstream at the newly constructed project features of CC-44 Southern Cross.

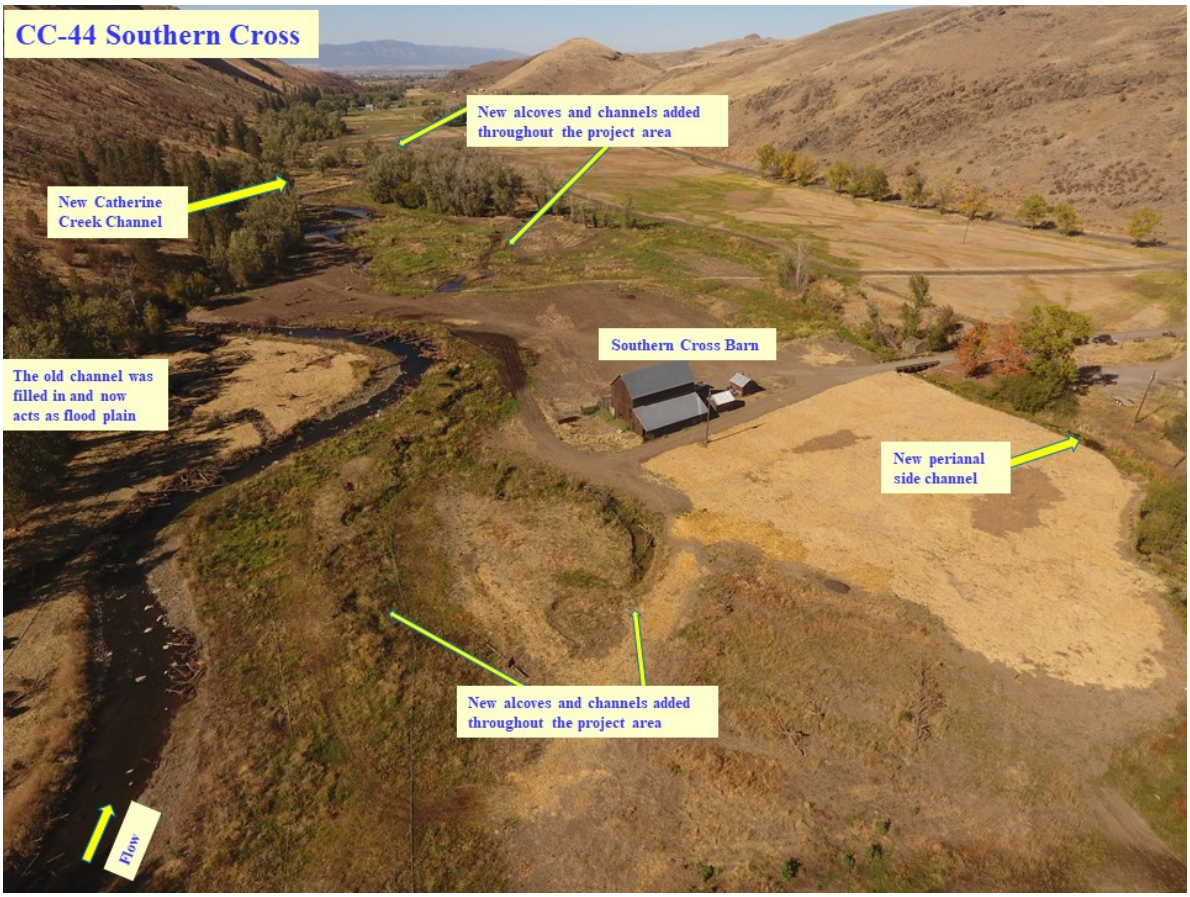


Figure 24. Post-project view looking downstream along the new Catherine Creek Channel. This view was taken during low flow but still shows the new channel, alcoves, and side channels providing flows and diverse habitat function.



Photograph 45. Post-project view of newly constructed main channel showing a 90-degree corner with zero-velocity pool and complex habitat.



Photograph 46. Post-project view of newly constructed Catherine Creek main channel showing the inlet to an alcove with complex habitat.



Photograph 47. Large wood features were added to the newly constructed main channel.



Photograph 48. Post-project view of the main channel showing complexity resulting from the additions of large wood.



Photograph 49. Post-project view showing floodplain activation and floodplain roughness interaction during a high-water event.



Photograph 50. Post-project view of the newly constructed main channel during a high-water event. Note the structure and flow diversity within the channel, which provides several different habitat options for juvenile salmon and steelhead to take refuge.



Photograph 51. Disturbed project areas were planted with native vegetation. For the first few years, several of the planted areas will be irrigated with sprinklers for better plant survival.

Catherine Creek RM-44 Phase IV

Sponsor: Union Soil and Water Conservation District

Partner(s): Bonneville Power Administration, Grande Ronde Model Watershed, Oregon Watershed Enhancement Board, Confederated Tribes of the Umatilla Indian Reservation, Oregon Department of Fish and Wildlife

Project Type: Channel Access, Entrainment, Streamflow, Channel Complexity, Riparian Enhancement

- Channel Access: Benefits to channel access are included in the RM-44 Phase III (Southern Cross) project metrics.
- Entrainment: Benefits to entrainment are included in the RM-44 Phase III (Southern Cross) project metrics.
- Streamflow: Approximately 1.28 cfs permanently added to stream base flow.
- Channel Complexity:
  - 0.61 miles of main channel enhanced, 11 large woody material structures added
  - 0.14 miles of side channel enhanced, 21 pieces of large wood placed along the channel
  - 0.02 miles of alcove enhanced, one large wood structure added
  - Boulder placement to provide habitat and break up ice during high event flows
- Riparian Enhancement: 3 acres and 0.61 miles enhanced with riparian plantings and protected with livestock exclusion fencing

Latitude: 45º 10’ 25” N

Longitude: 117º 48’ 27” W

Funding Source(s): Bonneville Power Administration, Oregon Watershed Enhancement Board

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $1.4 million

Implementation Costs: $315,000

Project Description: Catherine Creek RM 44 Phase IV was constructed as part of a multi-phase fish habitat complexity project that started in 2013 and focused on channel, floodplain, and riparian habitat enhancements. Phase IV work was completed during the 2016-2017 instream work window.

The goal of Phase IV was to address critical habitat-limiting factors for Chinook salmon and steelhead in Catherine Creek, including:

- Protecting stream and riparian habitat through a conservation easement and livestock exclusion fencing.
- Enhancing riparian habitat conditions through planting, seeding, and natural recruitment.
- Enhancing floodplain connectivity through removing channel confinement structures and adding a side channel.
- Enhancing instream structural diversity and complexity and reducing excessive bank erosion.
- Increasing the number of pools, decreasing the width of the stream channel, and enhancing riparian vegetation/shade to decrease summer water temperatures.



Photograph 52. Pre-project view of Catherine Creek shows an over-widened and habitat-limited channel.



Photograph 53. Post-project view of the constructed main channel routed against the existing riparian canopy. The mature trees provide shade and cooling for the stream. The placement of large woody material provides additional habitat for anadromous fish.

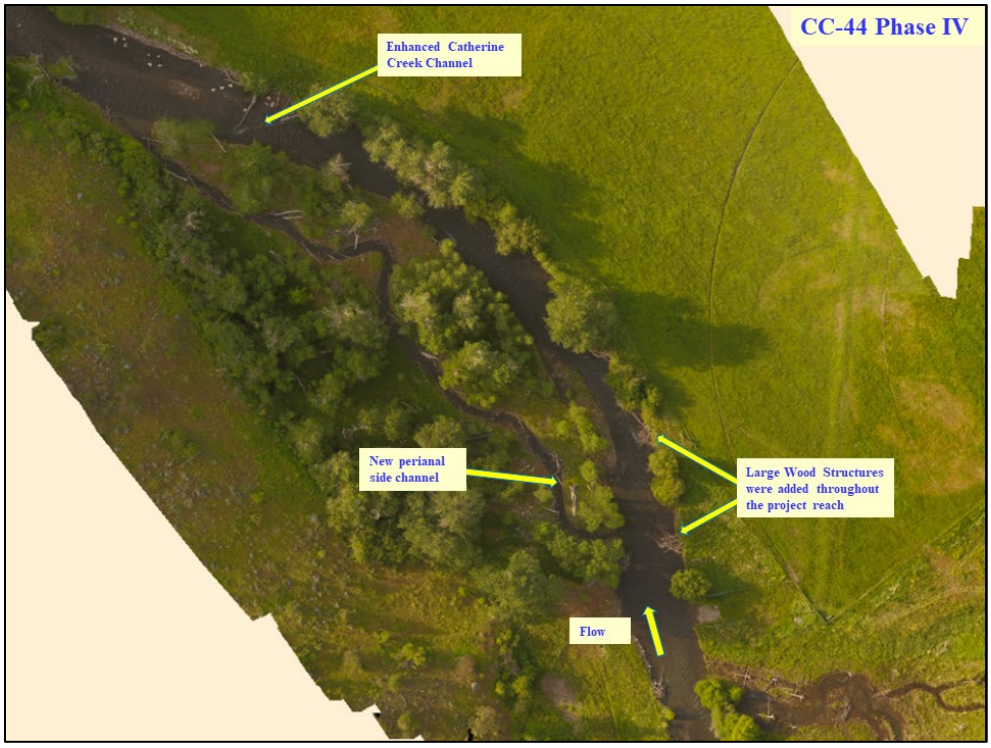


Figure 25. This post-project aerial view shows a portion of the enhanced Catherine Creek channel along with a new side channel.

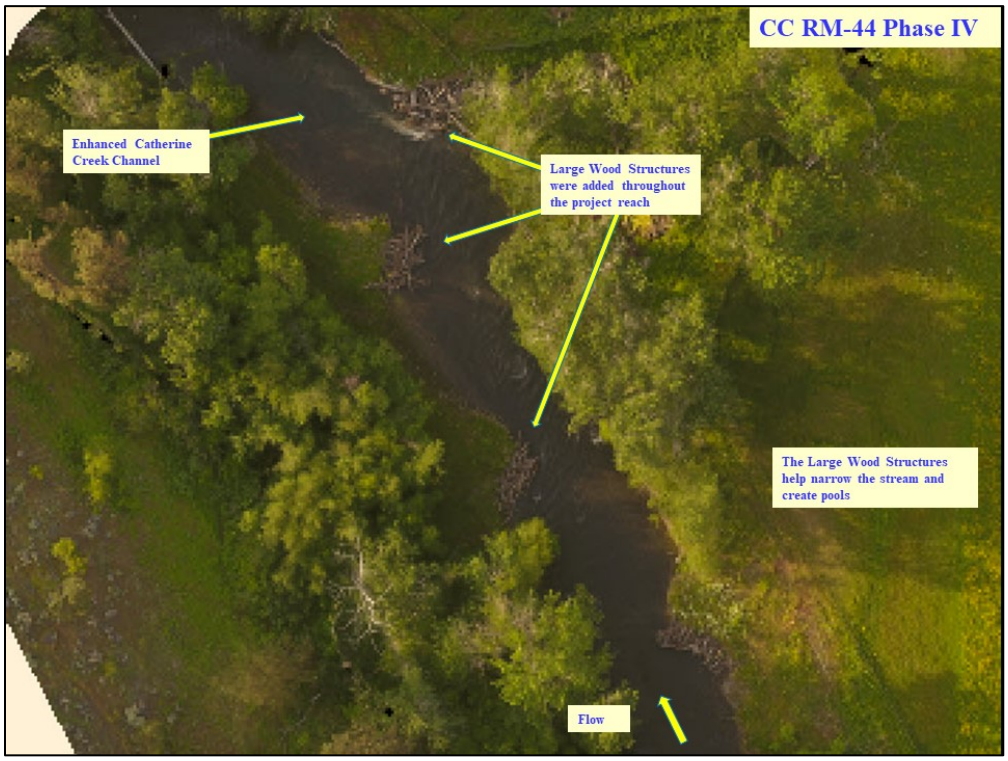


Figure 26. This post-project aerial view shows a portion of the enhanced Catherine Creek channel in which large wood structures were used to narrow the channel and create sustainable pools.



Photograph 54. Pre-project condition near the lower portion of the project.



Photograph 55. Post-project view of the above location showing a narrower channel with large woody material features installed. The photograph also shows an example of bank zone planting, which will provide instream and riparian benefits, and floodplain grading, which allows the stream to interact with the floodplain.



Photograph 56. Pre-project condition at the proposed large wood structure and side channel 3 inlet.



Photograph 57. Post-project view of the above location with large wood structure at the inlet to side channel 3. Note the variety of complex habitat even during late-season, lower-flow conditions.



Photograph 58. Post-project view of a constructed alcove provides complex habitat for juvenile salmonids.

Upper Grande Ronde River

The Upper Grande Ronde River begins in the southwest portion of the Blue Mountains with mountain peaks above 7,000 feet. The river flows north, then northeast, through the city of La Grande, Oregon (RM 157). As the river reaches the Grande Ronde Valley, it slows and meanders along the low-gradient valley floor north-northeast to the confluence with Catherine Creek (RM 144). In 2016-2017, one project was completed in the Upper Grande Ronde River, which improved channel complexity.

Anadromous species present in the river include Snake River spring/summer Chinook salmon (threatened), Snake River steelhead trout (threatened), and Columbia River bull trout (threatened).

Project documentation including permits, as-built drawings, GIS files, additional photos, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Limber Jim Stream Rehabilitation Project

Sponsors

- Wallowa Whitman National Forest

Partners

- Bonneville Power Administration
- Grande Ronde Model Watershed

Funding Sources

- Bonneville Power Administration

Table 7. Bureau of Reclamation Total Expenditures for completed projects in the Upper Grande Ronde River.

Subbasin	Expenditures
Upper Grande Ronde River	$7,000

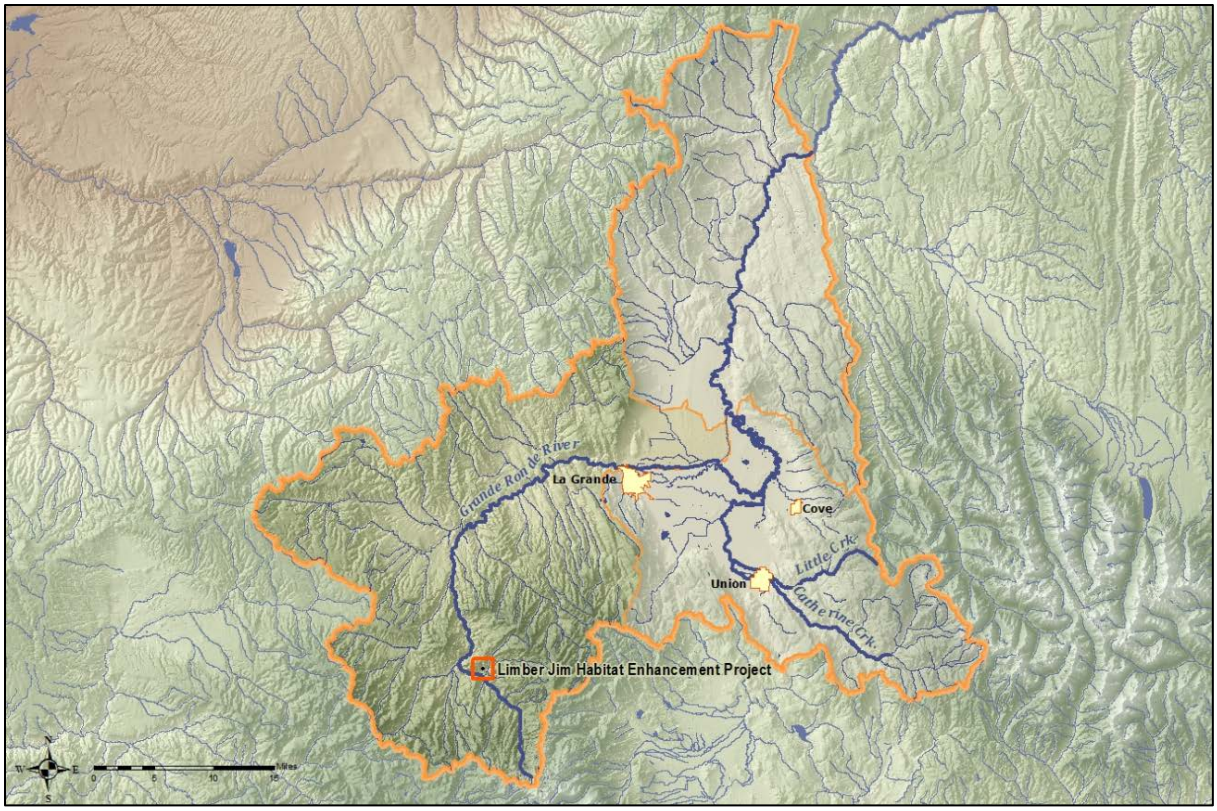


Figure 27. Location map of the projects completed in the Upper Grande Ronde River in 2016-2017.

Limber Jim Stream Rehabilitation Project

Sponsor: Wallowa Whitman National Forest

Partner(s): Bonneville Power Administration, Grande Ronde Model Watershed

Project Type: Channel Access, Channel Complexity, Riparian Enhancement

- Channel Access:
  - Culvert (partial barrier) replaced with bridge
  - Culvert (partial barrier) replaced with hardened crossing
  - 10 miles made accessible to the next upstream barrier
- Channel Complexity
  - 3.1 miles of complexity from large wood being added to the channel and floodplain
  - 7 acres of floodplain enhancement
- Riparian Enhancement: 3.1 miles riparian enhanced (planted)

Latitude: 45 05’ 49” N

Longitude: 118 20’ 29” W

Funding (S): Bonneville Power Administration

NEPA Compliance: U.S. Forest Service NEPA

Reclamation’s Development Costs: $7,000, provided LIDAR

Implementation Costs: $277,000

Project Description:

The project is in Union County, Oregon, on the North and South Forks of Limber Jim Creek, which is a headwater tributary to the Grande Ronde River. Work took place on Federally owned land managed by the U.S. Forest Service (USFS). Fish passage improvements include the replacement of two USFS road culverts with open-bottom structures. An additional culvert was removed and replaced with a hardened stream crossing (i.e., rock ford). All culverts were identified as partial barriers to fish migration. Fish habitat enhancements include the placement of large wood structures in the stream channel to increase floodplain inundation, complexity, and refuge habitat.

The project included restricting vehicular access near the stream, along with recontouring and seeding of removed roadways. Riparian vegetation was enhanced with the planting of 11,000 seedlings and cuttings consisting of native tree and shrub species. Disturbed soils were seeded with native grasses.



Photograph 59. Post-project view of the large wood placed in the stream to provide cover and habitat refuge and encourage floodplain reconnection.



Photograph 60. Post-project view of the large wood interacting with higher spring flows. Note the connection with the floodplain.



Photograph 61. Post-project view of the culvert replaced by a bridge. The bridge span allows a more natural stream to flow beneath it.

John Day River Subbasin

The John Day River is a tributary to the Columbia River at RM 204, entering about 13 miles upstream from the John Day Dam, and drains nearly 8,000 square miles. Its diverse landscape covers parts of the Deschutes-Umatilla Plateau through the Blue Mountains, with elevations ranging from 150 to 9,000 feet. Within the John Day River subbasin (HUC 17060209), Reclamation works in the Upper John Day River, North Fork John Day River, and the Middle Fork John Day River. In 2016-2017, two projects were completed in the Middle Fork John Day River, and two projects were completed in the Upper John Day River.

Anadromous species present in the river include Mid-Columbia River (MCR) steelhead trout (ESA-listed as threatened), MCR spring-run Chinook salmon (not ESA-listed), and Columbia River bull trout (threatened). Pacific lamprey are also present.

Table 8. Bureau of Reclamation Total Expenditures for completed projects in subbasin.

Subbasin	Expenditures
John Day River	$2.6 million

Middle Fork John Day River

The Middle Fork John Day River (HUC 17070203) is a tributary to the North Fork John Day River, entering it at RM 32, and has a drainage area of about 785 square miles. In 2016-2017, two projects were completed in the Middle Fork that improved channel access and channel complexity.

Anadromous species present in the river include MCR steelhead trout (ESA-listed as threatened) and MCR spring-run Chinook salmon (not ESA-listed) and Columbia River bull trout (threatened). Pacific lamprey are also present.

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Middle Fork Forrest Conservation Area Rock Removal Project Phase 1
- Oxbow Conservation Area Tailings Restoration Project Phase 4 and 5

Sponsors

- Confederated Tribes of the Warm Springs Reservation of Oregon

Partners

- Bonneville Power Administration
- U.S. Fish and Wildlife Service
- Oregon Department of Fish and Wildlife
- U.S. Forest Service

Funding Sources

- Bonneville Power Administration
- Pacific Coast Salmon Recovery Fund
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- Bureau of Indian Affairs
- Confederation Tribes of the Warm Springs Reservation of Oregon
- Oregon Watershed Enhancement Board

Table 9. Bureau of Reclamation Total Expenditures for completed projects in Middle Fork John Day River.

Subbasin	Expenditures
Middle Fork John Day River	$2.5 million

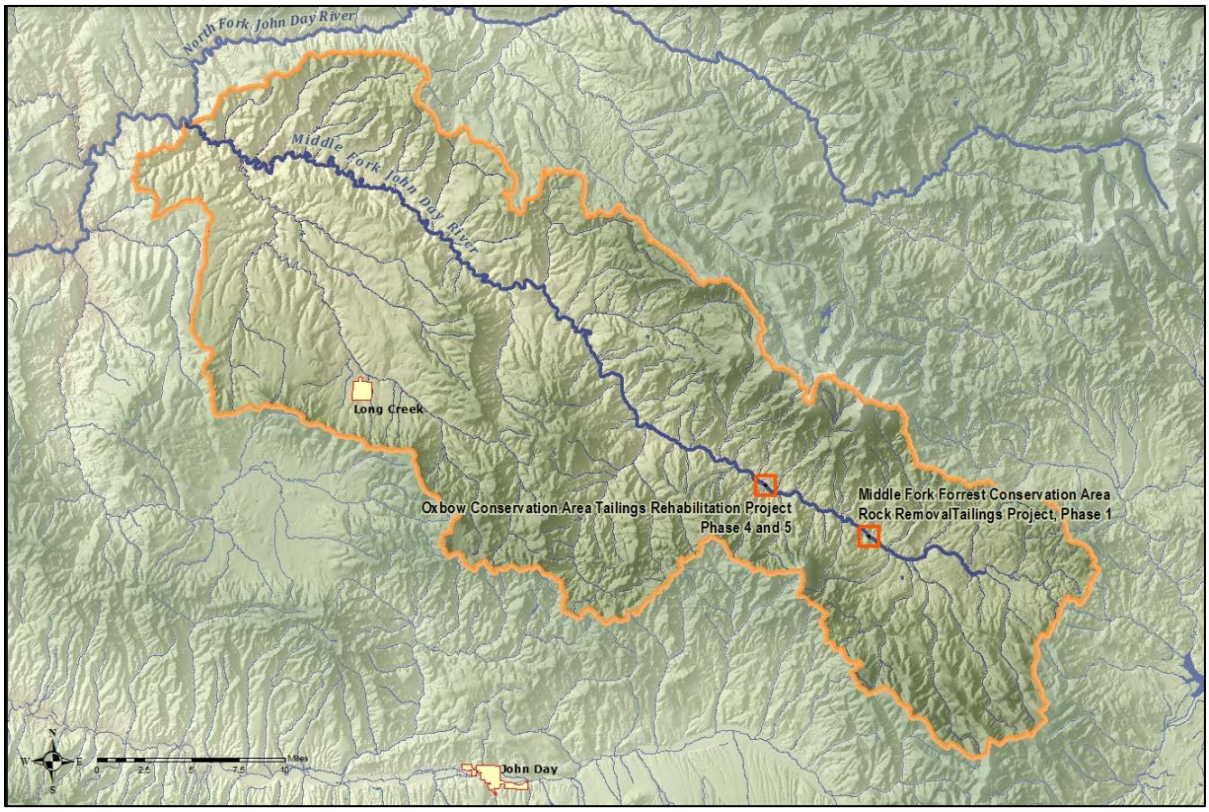


Figure 28. Location map of the projects completed in the Middle Fork John Day River Subbasin in 2016-2017.

Middle Fork Forrest Conservation Area Rock Removal Project Phase 1

Sponsor: Confederated Tribes of the Warm Springs Reservation of Oregon (CTWS)

Partner(s): Bonneville Power Administration, U.S. Fish and Wildlife Service

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 1.4 miles of complexity, 4 acres of floodplain enhancement
- Riparian Enhancement: 1.4 miles riparian enhanced (planted)

Latitude: 44º 36' 37" N

Longitude: 118º 33' 12" W

Funding Source(s): Bonneville Power Administration, U.S. Fish and Wildlife Service

NEPA Compliance: BPA's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: $262,000

Implementation Costs: $339,000

Project Description: The Forrest Conservation Area is owned and managed by CTWS for the purposes of conservation of fish and wildlife habitat and is located 2.5 miles west of Bates, Oregon, in Grant County.

Hundreds of previously placed rock barbs and many rip rap meander bends are located on the Forrest Conservation Area and throughout the Middle Fork John Day River. In the project reach, there are approximately 81 rock barbs and 11 bends armored with riprap. For years, the rock effectively locked the channel in place in many locations, reducing lateral channel movement along with a reduction in the natural recruitment of gravel to the river system. Phase 1 of the project removed the rock barbs and riprap sections from the first 1.4 miles of the project reach.

The overall project goal was to increase juvenile rearing habitat through improvement of natural river functions (rip rap removal), increase floodplain connection, increase instream complexity, and narrow streams to reduce maximum summer water temperatures. Project features included these eight major actions:

1. Removal of 59 rock barbs to allow lateral migration of the river channel and allow vegetation recovery along the banks. Thirteen of the rock barbs were replaced with engineered log jams designed to enhance and maintain existing scour pools.
2. Removal of rip rap along seven meander bends, including construction of engineered log jams in tight bends. River gravels (2-inch minus) were placed to rebuild the banks where the rip rap was removed. The gravel was placed with the intent that it would erode over time and would be redistributed in the river channel. Approximately 350 yards of gravel were placed.

3. Placement of 53 multiple-log and single-log structures. The log placements were designed to dissipate stream energy, improve deposition of gravels, create/maintain scour pools, create complex velocity breaks for emergent fry during high flows, provide overhead cover, and increase overall channel roughness to encourage overbank flooding.
4. Placement of three rows of beaver dam analog-type post structures to enhance floodplain connectivity, trap sediment, and raise the water table as a test to see how the beaver dam analogs would function.
5. Excavation and enhancement of seven alcoves where natural side channels and/or historic channel scars were present.
6. Placement of picket baffles with live willow whips, which are a concentration of small posts driven into the streambed with woody debris woven in. Posts are driven along and perpendicular to the streamflow to create a velocity break to encourage deposition of gravel and fine sediments, with the goal of narrowing the stream channel.
7. Placement of 50 cubic yards of large gravel (4-inch to 1-inch clean gravel) in a location to enhance point bar development and narrow river channel.
8. Seeding of native grass species, willow cuttings, and containerized plants.

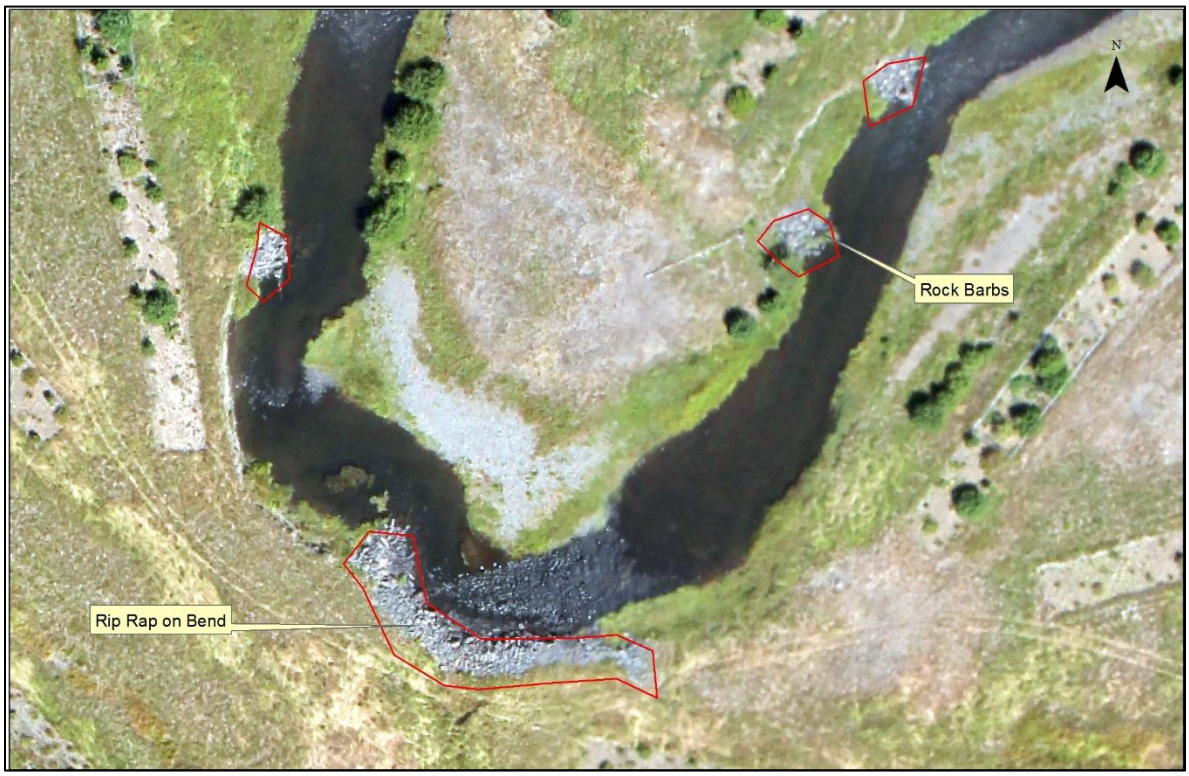


Figure 29. Pre-project examples of rock barbs and rip rap that were locking the channel in place. These barbs and rip rap were removed during project implementation.

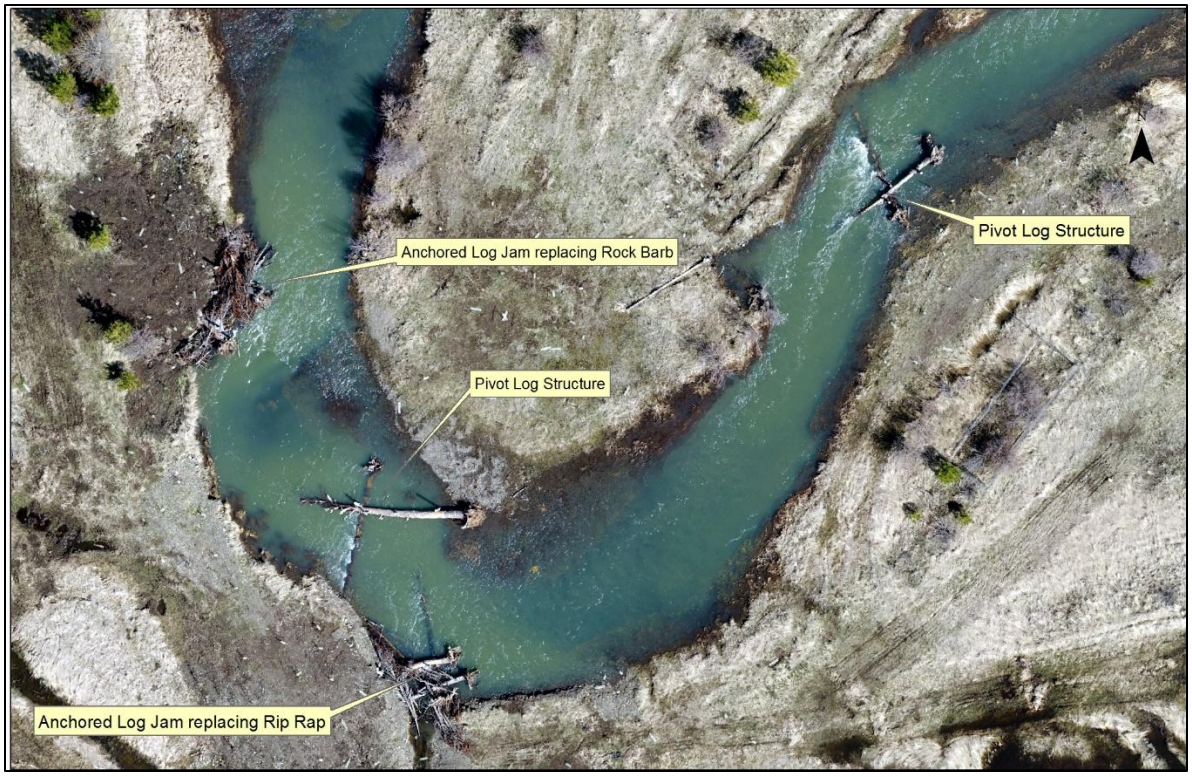


Figure 30. Post-project view of the same area as the above photograph, with rock barbs and rip rap removed and large wood added.



Photograph 62. Post-project view of an alcove constructed to add off-channel habitat.



Photograph 63. Post-project view of a log jam with a sweeper log. A deep pool was developed along the log jam.



Photograph 64. Post-project view shows a pocket log structure in sharp bend next to the hill slope.



Photograph 65. Post-project view looking upstream at an apex log structure in a long, wide, and shallow section. Logs are ballasted with imported large gravel.

Oxbow Conservation Area Tailings Rehabilitation Project Phase 4 and 5

Sponsor: Confederated Tribes of the Warm Springs Reservation of Oregon

Partner(s): Bonneville Power Administration, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife

Project Type: Channel Access, Channel Complexity, Riparian Enhancement

- Channel Access: Dredge mining, partial, 3.3 miles made accessible. Ruby Creek was intercepted by mining related ditch
- Channel Complexity:
  - 0.78 miles of constructed main channel (old straightened channel abandoned), 93 structures added using 1,370 logs with rootwads
  - 0.38 miles of constructed alcoves and side channels
  - Ruby Creek was narrowed, and habitat complexity was improved on 0.08 miles; five structures added
  - Construction of 14 riffles, glides, and point bars
  - Extensive earthwork to grade tailings and cover with soils totaling 100,000 to 150,000 cubic yards of earth moved.
  - Riparian Enhancement: 0.78 miles enhanced including 10,000 containerized plants; construction of almost 2 miles of 8-foot-tall fence to exclude deer, elk, and cattle impacts to vegetation.

Latitude: 44º 38’ 53” N

Longitude: 118º 39’ 58” W

Funding Source(s): Bonneville Power Administration, Pacific Coast Salmon Recovery Fund, U.S. Fish and Wildlife Service, Oregon Watershed Enhancement Board, Bureau of Indian Affairs, U.S. Forest Service

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $2.3 million

Implementation Costs: $1.9 million

Project Description: From 1939 to 1943, 200 acres of the DeWitt Ranch, now known as the Oxbow Conservation Area, was dredge mined for gold. Dredge mining straightened and channelized the river between RM 58.0 and RM 55.6, limiting the river’s connectivity to its floodplain in most areas of the dredged zones. In the decades following the dredging, the tailings were leveled to improve grazing conditions, but this leveling did little to enhance hydraulic conditions, floodplain connectivity, or instream fish habitat. The dredged area

impacted 4 miles of the Middle Fork John Day River and altered the confluences of Butte Creek, Granite Boulder Creek, Ruby Creek, and Beaver Creek. The connectivity of Ruby and Granite Boulder Creeks were the most affected. In 2001, the Tribes acquired the 1,022-acre Oxbow Conservation Area with funding from BPA. Among the first habitat enhancement goals for the property was the rehabilitation of the dredge-mined areas. The development of this current Oxbow Tailings Restoration Project began in 2005 with a partnership with Reclamation. Most of the design effort has focused on rehabilitating the site to natural conditions. The scale of the project involved more than 2 miles of river channel work and up to 1,500 feet of tributary habitat. The project was split into multiple phases to ease construction and acquisition of funding for project implementation. Phases 1 and 2 were completed in 2011 and 2012. Phase 3 was completed in 2014, along with partial construction of Phase 4. The remainder of Phase 4 was completed and remained dry in 2015. In 2016-2017, Phase 5 was completed, along with putting water in the Phase 4 channel and completing all the floodplain grading, alcove construction, and side channels associated with Phases 4 and 5.

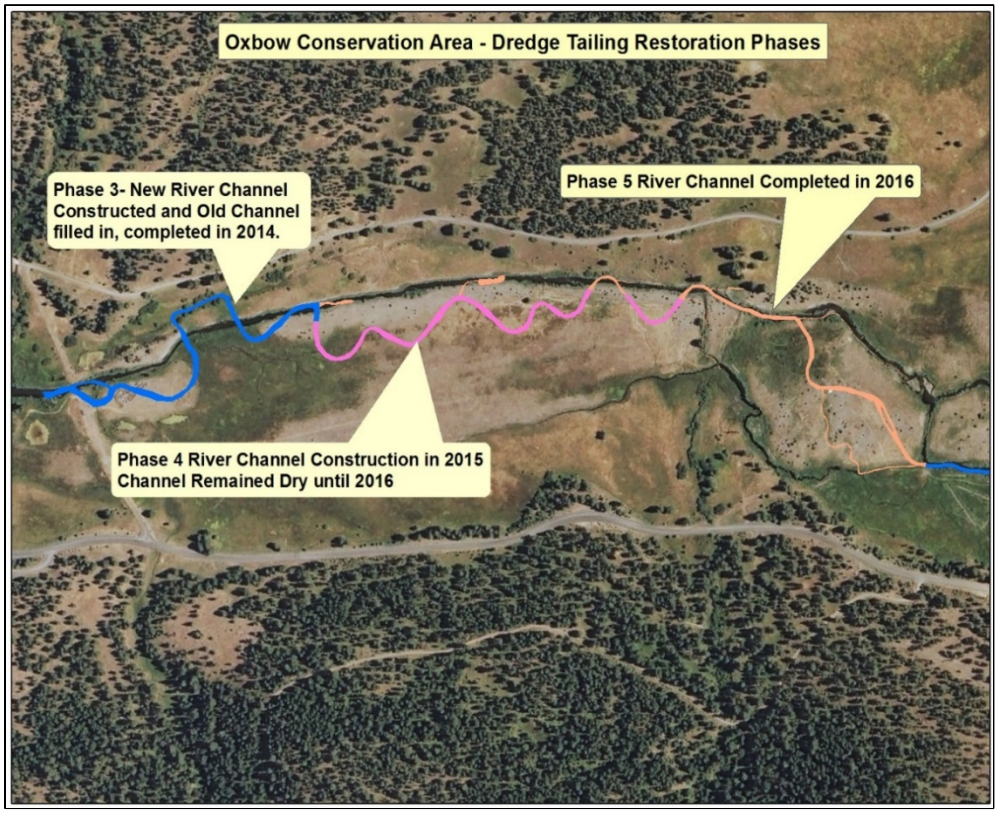


Figure 31. Pre-project photograph showing the location of the completed project phases. Prior to construction, most of the Middle Fork John Day River had been channelized and pushed against the hill in the project area.



Photograph 66. Post-project view of constructed Phase 4 channel. View is looking upstream at the new channel and alcove #5 (lower left).



Photograph 67. Post-project upstream view shows portions of the completed Phase 4 and Phase 5 channels.



Photograph 68. Post-project phase 5 channel looking upstream. Note the side channel on the right side of the photograph and the wetland complex and alcove #1 on the left side of the photograph.



Photograph 69. Post-project view of the constructed channel, which was designed to interact with the large rock outcropping to form a deep pool.



Photograph 70. Post-project constructed riffle showing transplanted torrent sedge mid-channel and on each edge of channel.



Photograph 71. Post-project constructed river channel at downstream end of an island feature, showing transplanted torrent sedge balls and large wood placements that enhance the habitat of the new Middle Fork John Day channel.

Upper John Day River

The Upper John Day River originates in the Blue Mountains and generally flows in a northwesterly direction to its confluence with the North Fork John Day River at Kimberly, Oregon. The terrain is characterized by gently sloping valley bottoms bounded by steep valley walls and mountains. The Upper John Day watershed drains 1,070 square miles, with elevations ranging between 2,000 feet to 9,000 feet in the Strawberry Mountain Range. The South Fork John Day River, a major tributary, joins the Upper John Day in Dayville, Oregon.

Projects

- Larson Irrigation System Consolidation – Berry/Canyon Creek
- McHaley Diversion Consolidation

Sponsors

- Grant Soil and Water Conservation District
- Confederated Tribes of the Warm Springs Reservation of Oregon

Partners

- Confederated Tribes of Warm Springs Reservation of Oregon
- Bonneville Power Administration
- Grand Soil and Water Conservation District

Funding Sources

- Confederated Tribes of the Warm Springs Reservation of Oregon
- Bonneville Power Administration

Table 10. Bureau of Reclamation Total Expenditures for completed projects in Upper John Day River.

Subbasin	Expenditures
Upper John Day River	$71,000

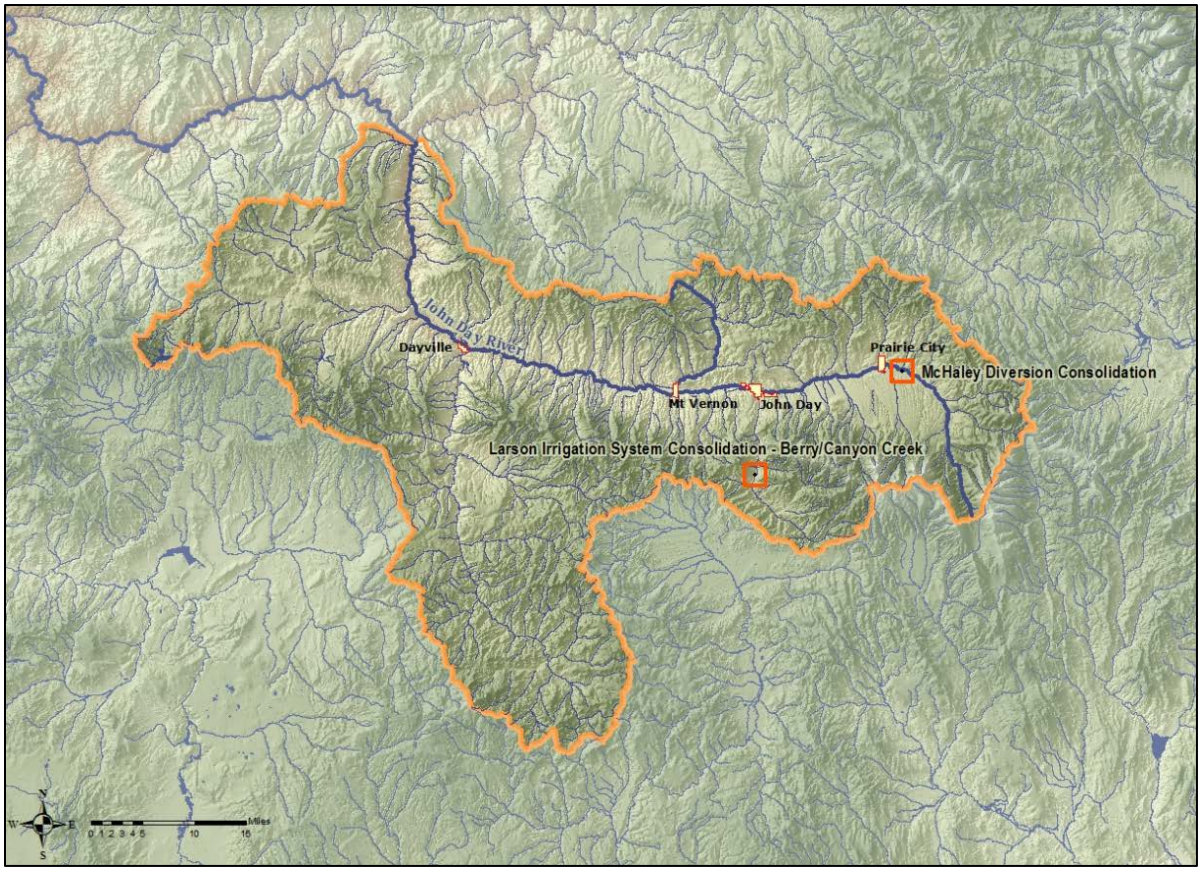


Figure 32. Location map of the projects completed in the Upper John Day in 2016-2017.

Larson Irrigation System Consolidation – Berry/Canyon Creek

Sponsor: Grant Soil and Water Conservation District

Partner(s): Confederated Tribes of Warm Springs, Bonneville Power Administration

Project Type: Channel Access, Entrainment, Streamflow

- Channel Access:
  - Four diversions eliminated (partial barriers) and replaced with a downstream screened pump station
  - 3.7 miles made accessible to the upstream steelhead habitat extent in Berry Creek
  - 0.8 miles made accessible to the next upstream barrier in Canyon Creek.
- Entrainment: two fish screens installed
- Streamflow: 1.1 cfs in 0.7 miles of Berry Creek in April-May and 0.56 cfs in June-September, 0.12 cfs along 0.7 miles of Canyon Creek in April-May and 0.08 cfs in June-September

Latitude: 44º 18’ 45.9” N

Longitude: 118º 57’ 9.2” W

Funding Source(s): Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)/ Bonneville Power Administration

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $36,000

Implementation Costs: $233,000

Project Description: Berry Creek Ranch had one diversion from Canyon Creek and three diversions on Berry Creek, a tributary to Canyon Creek. Canyon Creek flows into the Upper John Day River at John Day, Oregon. The project is located about 7.5 miles upstream of the mouth of Canyon Creek. Berry Creek is a small, steep stream originating in the Strawberry Wilderness; almost the entire watershed was burned in 2016.

The pre-project diversions consisted of large rocks, boards, and/or tarps, which were difficult for fish to pass, especially in low-flow conditions. Typical low flow in Berry Creek is 1 to 2 cfs during late summer, and low flows in Canyon Creek are about 4 cfs at the project location. Fish use in both streams include summer steelhead, redband trout, and westslope cutthroat trout. Juvenile spring Chinook also use Canyon Creek.

The project permanently moved all the diversion points downstream to the mouth of Berry Creek. At that location, a pump station was established for all the diversions. The pump station provides pressurized irrigation water via closed pipe to the irrigated fields. The pump station was set up with separate variable-speed pumps and flow measurement devices. The

pump station withdraws water from Berry Creek and Canyon Creek so that water right regulation between the two sources and their respective places of use could be maintained. Instream work involved installing a pump intake in the scour hole of each stream and removing the diversions.

Project design, implementation, and point-of-diversion transfer process were completed by the Grant Soil and Water Conservation District with funding from Reclamation and the CTWS/BPA. The project resulted in the removal of four diversion dams and their associated fish screens, along with restoring stream flow to 0.7 miles of Berry Creek and improving flows in 0.67 miles of Canyon Creek.



Photograph 72. Pre-project view looking upstream at the gravity diversion dam on Canyon Creek.



Photograph 73. Post-project view looking downstream at the pump scour hole in Berry Creek. Fish can now easily pass this consolidated diversion, even in low flows.



Photograph 74. Post-project view of the pump scour hole in Canyon Creek with the diversion dam removed.



Photograph 75. Post-project view of the completed pump station, which contains variable-speed pumps and water meters.

McHaley Diversion Consolidation

Sponsor: Confederated Tribes of the Warm Springs Reservation of Oregon

Partner(s): Grant Soil and Water Conservation District, Bonneville Power Administration

Project Type: Channel Access, Entrainment, Streamflow

- Channel Access: two diversions eliminated (partial barriers) and replaced with a screened pump station; 0.4 miles made accessible to the next upstream barrier on the John Day River, where passage was addressed for fish access in a previous project. The access upstream from this point has been counted in previous John Day River diversion improvement projects.
- Entrainment: one fish screen installed
- Streamflow: 2 cfs in 0.7 miles of the Upper John Day River

Latitude: 44° 27’ 23.4” N

Longitude: 118° 40’ 47.4” W

Funding Source(s): Bonneville Power Administration, Confederated Tribes of Warm Springs

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $35,000

Implementation Costs: $85,000

Project Description: The McHaley Diversion Consolidation Project eliminates the Lower McHaley Diversion on the Upper John Day River. The project is located on the Warm Springs Tribes’ Forrest Conservation Area. The pre-project diversion was a gravel push-up dam and was located next to an active floodplain, resulting in the ditch filling with sediment annually. The diversion was also located in a complex wetland/floodplain type habitat. Annual maintenance required heavy equipment to access this wetland to reconstruct the ditch as well as the push up dam.

Surveys of the diversion site were completed by both the Tribe and the Grant SWCD. Grant SWCD, other water users, Reclamation, ODFW, and Oregon Water Resources Department worked together to combine the diversion with the upstream Upper McHaley ditch. This combined diversion site is stable, is not a passage barrier, and had the capacity to handle the additional flow with minor improvements to the headgate.

A pipeline was designed to replace the open ditch for the Upper McHaley Ditch. The pipeline also delivers water to the Lower McHaley Ditch. The project included flow measurement devices and valves at the intake of the pipe and at the two delivery points, to fully manage flows entering the two ditches. The Upper McHaley Ditch delivery pipe was fitted with flood risers to facilitate flood irrigation and maintain the ability to extend the

pipeline in the future. Adding habitat complexity to the abandoned Lower McHaley Diversion area will be a portion of a future habitat enhancement project being planned along the John Day River.

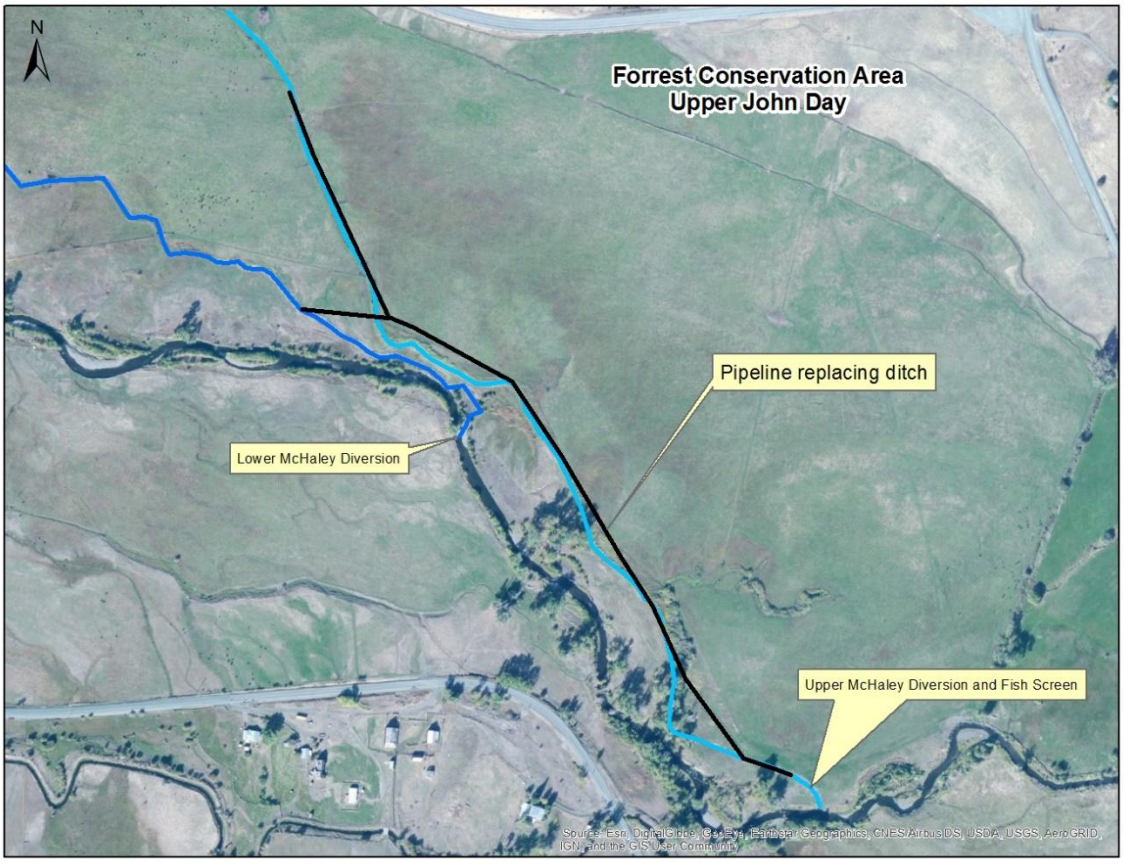


Figure 33. The project overview shows the location of the Lower McHaley Diversion, which was eliminated by the project. The diversions were consolidated to the Upper McHaley Diversion location and a pipeline with water measurement and valving was installed.



Photograph 76. Construction photograph showing the new pipeline intake and ramp flume water measurement device.



Photograph 77. During construction, the flood risers were tested.



Photograph 78. Post-project view of flow measurement ramp flume on Lower McHaley Ditch

Upper Columbia River

The Upper Columbia River has a drainage area of about 74,100 square miles, including approximately 39,000 square miles that extend into Canada. Reclamation works in three Upper Columbia River subbasins: the Entiat River Subbasin, the Methow River Subbasin, and the Wenatchee River Subbasin. In 2016-2017, four projects were completed in the Methow River Subbasin, and three projects were completed in the Entiat River Subbasin.

ESA-listed anadromous fish species present in this part of the UCR basin include UCR spring-run Chinook salmon (endangered), UCR steelhead trout (threatened), and Columbia River bull trout (threatened). Also present are UCR summer/fall-run Chinook salmon (not listed). The Yakama Nation has a Coho salmon reintroduction program in the Methow River and Wenatchee River Subbasins.

Table 11. Bureau of Reclamation Total Expenditures for completed projects in Upper Columbia River.

Subbasin	Expenditures
Upper Columbia River	$926,000

Methow River Subbasin

The Methow River Subbasin (HUC 17020008) is a tributary to the Columbia River at RM 523.9 and has a drainage area of about 1,820 square miles. In 2016-2017, four projects were completed in the subbasin.

The focus of Reclamation's actions in the subbasin includes UCR spring run Chinook salmon (endangered) and UCR steelhead trout (threatened). Also present are UCR summer run Chinook salmon (not listed) and CR bull trout (threatened).

Project documentation, including permits, as-built drawings, GIS files, additional photos, and other technical records, are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Frazer Creek Post Fire
- Methow Beaver Project
- Silver Side Channel Habitat Enhancement Project – Phase 1
- Twisp River Floodplain Enhancement Project

Sponsors

- Methow Salmon Recovery Foundation
- Cascade Columbia Fisheries Enhancement Group

Partners

- Methow Salmon Recovery Foundation
- U.S. Fish and Wildlife Service
- The Confederated Tribes of the Colville Reservation
- U.S. Forest Service
- Washington Department of Fish and Wildlife
- Methow Conservancy
- Woodsmith Watershed Consulting
- Bonneville Power Administration
- Washington Department of Natural Resources
- Upper Columbia Salmon Recovery Board
- Trout Unlimited

Funding Sources

- Washington Department of Ecology
- Washington Recreation and Conservation Office
- Salmon Recovery Funding Board
- U.S. Fish and Wildlife Service
- Wells HCP Tributary Committee
- Wildlife Conservation Society
- Washington Department of Natural Resources
- Washington Department of Fish and Wildlife
- Washington Department of Transportation
- The Confederated Tribes of the Colville Reservation (BPA Fish Accords)
- Bonneville Environmental Foundation
- U.S. Forest Service
- The Family Forest Fish Passage Program
- The Confederated Tribes of the Colville Reservation
- Priest Rapids Coordinating Committee and Salmon Recovery Funding Board

Table 12. Bureau of Reclamation Total Expenditures for completed projects in subbasin.

Subbasin	Expenditures
Methow River	$869,000



Figure 34. Location map of the projects completed in the Methow River Subbasin in 2016-2017.

Frazer Creek Post Fire Project

Sponsor: Methow Salmon Recovery Foundation

Partner(s): Methow Salmon Recovery Foundation, U.S. Fish and Wildlife Service, The Confederated Tribes of the Colville Reservation

Project Type: Channel Access

- Channel Access: culverts (partial barriers) replaced with bridges; 2.3 miles made accessible to the next upstream barrier (natural falls)

Latitude: 48° 22’ 15.6” N

Longitude: 119° 58’ 11.9994” W

Funding Source(s): Salmon Recovery Funding Board, The Family Forest Fish Passage Program (Washington Department of Natural Resources), The Colville Tribes, U.S. Fish and Wildlife Service, Washington Department of Ecology, Washington Department of Fish and Wildlife, Washington Department of Transportation

NEPA Compliance: BPA completed NEPA under the Fish and Wildlife Implementation Plan EIS for the Frazer Creek Bridges (Parker and Worthington).

Reclamation’s Development Costs: $9,000

Implementation Costs: $187,000

Project Description: This project action was a component of a larger effort to address undersized and failed culvert/road crossings on Frazer Creek, post-fire and flood. Frazer Creek is a tributary to Beaver Creek in the Methow River Watershed. After the 2014 flooding, two failed, undersized culverts in Frazer Creek were replaced with clear span bridges in 2016-2017, enhancing fish passage, sediment transport capacity, and reducing the risk of future flooding impacts downstream. Flash-flooding following the 2014 Carlton Complex Fire highlighted the risks of undersized culverts on Frazer Creek. Most of the culverts on the creek plugged or overtopped, causing avulsions and sending excessive sediment downstream into spawning and rearing habitat in Beaver Creek and the Methow River. As part of a larger effort to improve fish passage and sediment transport conditions in Frazer Creek, Reclamation worked with the Methow Salmon Recovery Foundation and the Confederated Tribes of the Colville Reservation to replace failed and undersized culverts. The larger effort repaired eight crossings, addressing a series of fish passage barriers that would otherwise have prevented re-colonization of the stream.



Photograph 79. The pre-project undersized culvert (shown) was replaced with a clear span bridge.



Photograph 80. Post-project: The new bridge will pass sediment and flood flows, reducing the chance of failure. The new crossing is accessible to fish at all flows.



Photograph 81. This undersized culvert failed during post-fire flooding in 2014.



Photograph 82. The new bridge is located at a better alignment approximately 200 feet upstream and will pass sediment and flood flows. The new crossing is accessible to fish at all flows.

Methow Beaver Project

Sponsor: Methow Salmon Recovery Foundation

Partner(s): Methow Salmon Recovery Foundation, U.S. Fish and Wildlife Service, U.S. Forest Service, Washington Department of Fish and Wildlife, Woodsmith Watershed Consulting, Bonneville Power Administration

Project Type: Channel Complexity and Riparian Enhancement, (improvements based on 0.1 miles of benefit for each residual beaver complex established)

- Channel Complexity: 16 beaver establishments persisted for at least 1 year, totaling 1.6 miles of complexity and floodplain enhancement (2015-2017)
- Riparian Enhancement: 16 beaver establishments persisted for at least 1 year, totaling 1.6 miles riparian enhanced (2015-2017)

Latitude: 48° 28’ 25” N

Longitude: 120° 11’ 21” W

Funding Source(s): Washington Department of Ecology, Washington Recreation and Conservation Office, Salmon Recovery Funding Board, U.S. Fish and Wildlife Service, Wells HCP Tributary Committee, Wildlife Conservation Society, Washington Department of Natural Resources, the Confederated Tribes of the Colville Reservation (BPA Fish Accords), Bonneville Environmental Foundation, U.S. Forest Service

NEPA Compliance: BPA completed NEPA under the Fish and Wildlife Implementation Plan EIS

Reclamation’s Development Costs: $20,000

Implementation Costs: $216,000

Project Description: The goals of the Methow Beaver Project Partnership include enhancing water quality and storing water; collecting, evaluating, and sharing information about beavers and the critical role they play in the watershed; developing and sharing methods for working with beavers; and educational outreach that promotes the benefits of beaver reintroduction. The project also aims to better identify the benefits to listed salmonids that may be associated with wider distribution of beavers across the landscape. The overall project was initiated in 2008, was expanded in 2014, and plans to continue as long as funding is available.

This project works to re-establish active beaver colonies to tributary streams in the Methow River Subbasin, enhancing key watershed processes that have been missing for as long as 200 years. This effort actively contributes to the goals prescribed in the Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan, the Chewuch Watershed Analysis, several reach assessments, and the Chewuch Watershed Action Plan. Table 5.9 in the Upper Columbia Recovery Plan specifically lists beaver reintroduction as an enhancement for habitat productivity, abundance, diversity, and structure, with contributions to water quantity, water quality, and the addition of woody materials.

By storing water in headwater wetland "sponges," each beaver colony helps offset the smaller snowpack from a warming world. As we gain understanding of some new ecological trajectories related to climate change, the project demonstrates an adaptive practice to help build a more resilient ecosystem.

Additional information can be found in the following reports:

- Methow Beaver Project: Status Report 2016-2017
- Washington State Recreation and Conservation Office, Project: 14-1764 RST, Methow Watershed Beaver Reintroduction, Final Report



Photograph 83. Beaver and beaver dams provide and enhance habitat for anadromous fish.



Photograph 84. Beaver dams play a key role in salmon and steelhead streams by providing complex habitat for juvenile fish and improvements to water quality and quantity.



Photograph 85. Google Earth satellite image of Hooker release site from July 14, 2017.



Photograph 86. Ortho-rectified and geo-referenced drone picture of the same site on October 28, 2017, showing significantly more ponding.



Photograph 87. Beaver are nature's dam builders and have played an important historic role in salmon-bearing streams.



Photograph 88. Beavers work in riparian areas and recruit wood to the stream.

Silver Side Channel Habitat Enhancement Project – Phase 1

Sponsor: Cascade Columbia Fisheries Enhancement Group

Partner(s): Washington Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Washington Department of Natural Resources, Bonneville Power Administration, the Confederated Tribes of the Colville Reservation

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.47 miles side channel enhanced, 45 structures added
- Riparian Enhancement: 3.1 acres and 2,500 feet of stream length enhanced (planted), 2.5 acres and 1,050 feet of stream length protected (fenced)

Latitude: 48° 18’ 51” N

Longitude: 120° 03’ 15” W

Funding Source(s): Salmon Recovery Funding Board, the Confederated Tribes of the Colville Reservation (Bonneville Power Administration)

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $167,000

Implementation Costs: $515,000

Project Description: The Silver Side Channel is located along the Methow River between Twisp and Carlton and is approximately ½-mile long. The Silver Side Channel Habitat Enhancement Project – Phase 1 improves and increases salmonid habitat in a degraded side channel and floodplain corridor and is expected to benefit ESA-listed UCR spring Chinook salmon and steelhead. Degraded by grazing, the channel was wide, shallow, and homogenous, and lacked woody materials. The channel was also dominated by fine sediment. These characteristics led to deleterious water temperatures in summer. This project enhanced stream habitat quality and complexity along the ½-mile length of the predominantly ground-fed side channel by adding 500 feet of increased sinuosity, placing 351 pieces of habitat wood, and planting more than 20,000 native wetland plugs and 675 native woody plants in the riparian corridor. The riparian area along the channel was also protected by 2,450 feet of exclusion fencing with additional seeding and weed management on 7 acres of upland. This project improved the quality of important rearing habitat for juvenile salmonids and other native fished in this reach of the Methow River.

The short-term goals are to enhance and increase the existing habitat values through the side channel, while developing channel, riparian, and floodplain conditions that will be compatible with possible future treatments to fully connect the side channel with the mainstem of the river. Future phases of the Silver Side Channel Project will address perennial flow and levy removal.

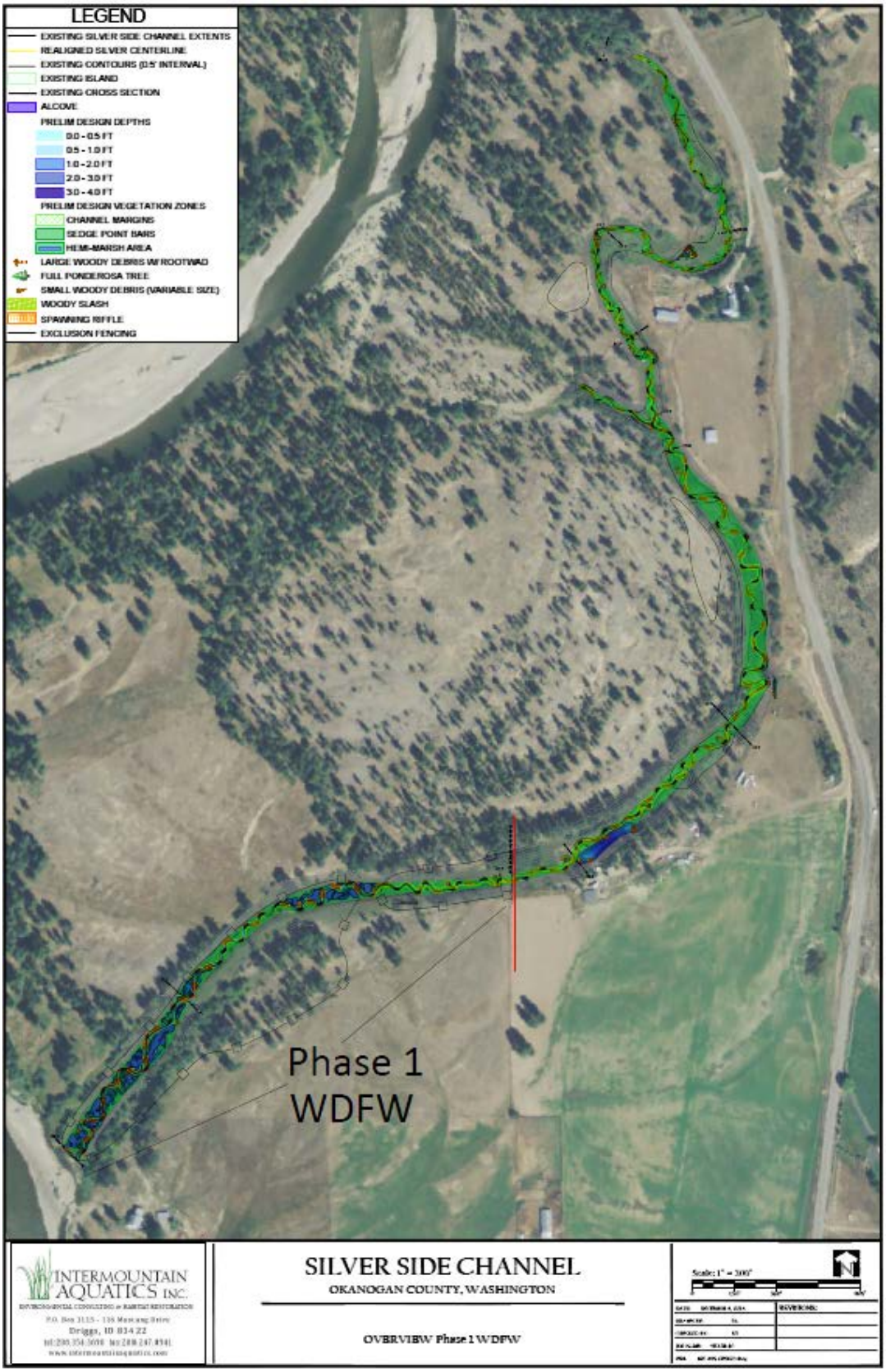


Figure 35. Aerial view of the Silver Side Channel – Phase 1.



Photograph 89. Post-project Silver Side Channel – Phase 1. View shows riparian planting and narrowing of the side channel, along with the addition of woody materials.



Photograph 90. Post-project Silver Side Channel – Phase 1. This downstream view shows riparian planting and narrowing of the side channel. This narrowing will help prevent temperature increases late in the season.

Twisp River Floodplain Enhancement Project

Sponsor: Methow Salmon Recovery Foundation

Partner(s): Bonneville Power Administration, Upper Columbia Salmon Recovery Board, Methow Conservancy

Project Type: Channel Access, Channel Complexity, Riparian Enhancement

- Channel Access: 1.2 miles accessible, diversion, partial
- Channel Complexity: 0.8 miles of main channel enhanced with 11 logjams, six boulder clusters, and 12 habitat logs; 0.2 miles of side channel enhanced with 20 individual logs
- Riparian Enhancement: 3.9 acres and 0.6 miles enhanced (planted)

Latitude: 48° 22’ 08” N

Longitude: 120° 11’ 43” W

Funding Source(s): Bonneville Power Administration, Priest Rapids Coordinating Committee and Salmon Recovery Funding Board, Washington Department of Ecology

NEPA Compliance: BPA’s Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation’s Development Costs: $673,000

Implementation Costs: $626,000

Project Description: The partnership between Methow Valley Irrigation District (MVID) and Trout Unlimited to convert to a groundwater source for the MVID West Canal completed in 2016-2017 allowed the removal of the Twisp River diversion infrastructure, including a levee, push-up dams, and headgates that previously isolated floodplains and limited off-channel habitat in critical rearing habitat for spring Chinook and steelhead. The project goals were to reconnect the river with existing riparian wetland habitat, increase instream complexity, enhance floodplain habitat, and increase side channel habitat. The project included the following elements:

- Installation of 11 large wood habitat structures, six boulder clusters, and additional habitat logs to improve instream habitat in a 4,200-foot-long reach of the Twisp River.
- Removal of 400-foot levee to increase channel access to 7.6 acres of floodplain and reconnect 2,300 feet of side channels.
- Planting of 3.9 acres of native trees and shrubs within the riparian zone and floodplain wetlands.
- Removal of two irrigation diversions from Poorman Creek and derelict irrigation infrastructure from the Twisp River.

- Removal of wetland drainage features.



Photograph 91. Post-project levee removal reconnected riparian wetland habitat previously isolated during 25-year floods.

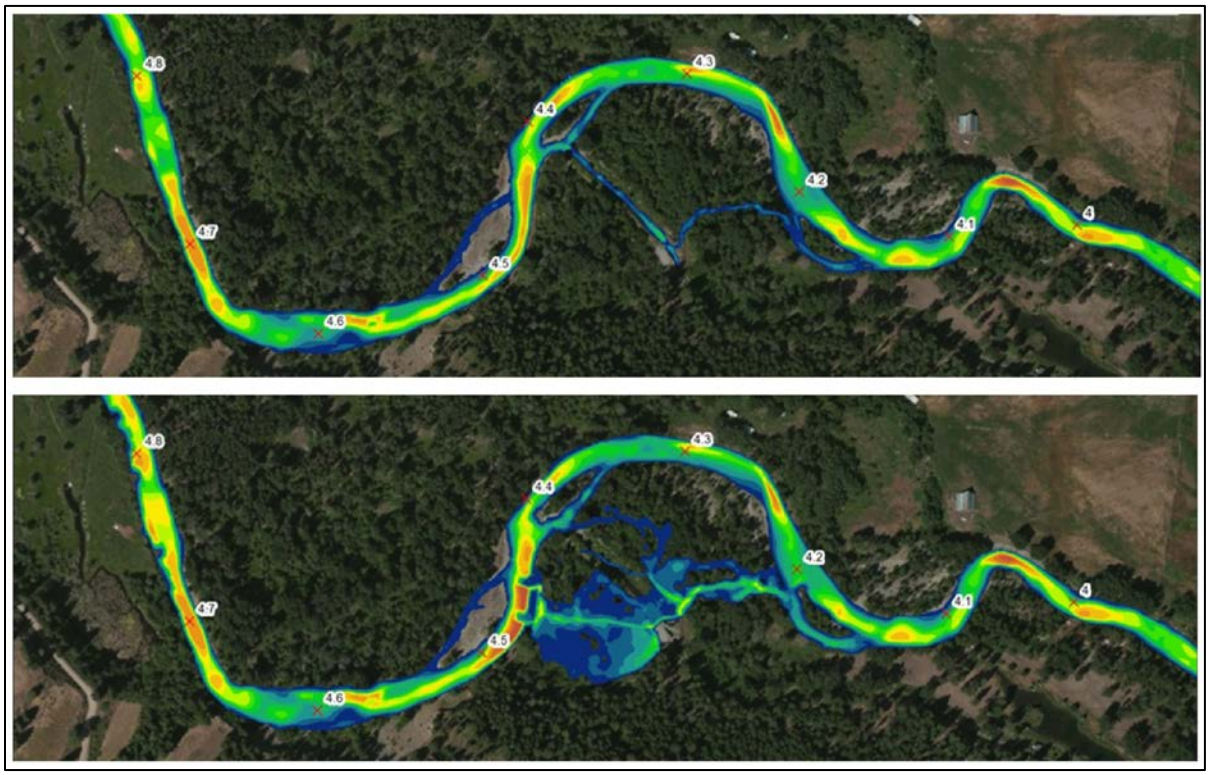


Figure 36. Inundation (depth) mapping of annual flows at the Twisp Floodplain project site prior to work (above) and after projected post-habitat enhancement (below). Note the change in floodplain connectivity.



Photograph 92. The post-project condition improved habitat complexity by creating and reconnecting side channel habitats and constructing large wood structures.



Photograph 93. The project also added channel complexity by the placement of habitat boulders.

Entiat River Subbasin

The Entiat River is tributary to the Columbia River at RM 483.7. The Entiat Subbasin (HUC 17020010) has a drainage area of about 1,520 square miles. In 2016 and 2017, three projects were completed in the subbasin.

ESA-listed anadromous species include UCR spring Chinook salmon (endangered), UCR steelhead trout, and Columbia River bull trout (threatened).

Project documentation including permits, as-built drawings, GIS files, additional photos, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 N. Curtis Road, Suite, 100, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Cottonwood Flats Bridge Removal
- Rip Rap Enhancement Sites A and B Island Jam Project
- Signal Peak Side Channel

Sponsors

- Chelan Douglas Land Trust
- Yakama Nation

Partners

- Chelan County Natural Resources Department
- U.S. Forest Service
- Bonneville Power Administration

Funding Sources

- Washington Salmon Recovery Funding Board
- Chelan PUD Tributary Committee
- Yakama Nation using Accord funds through BPA

Table 13. Bureau of Reclamation Total Expenditures for completed projects in subbasin.

Subbasin	Expenditures
Entiat River	$57,000

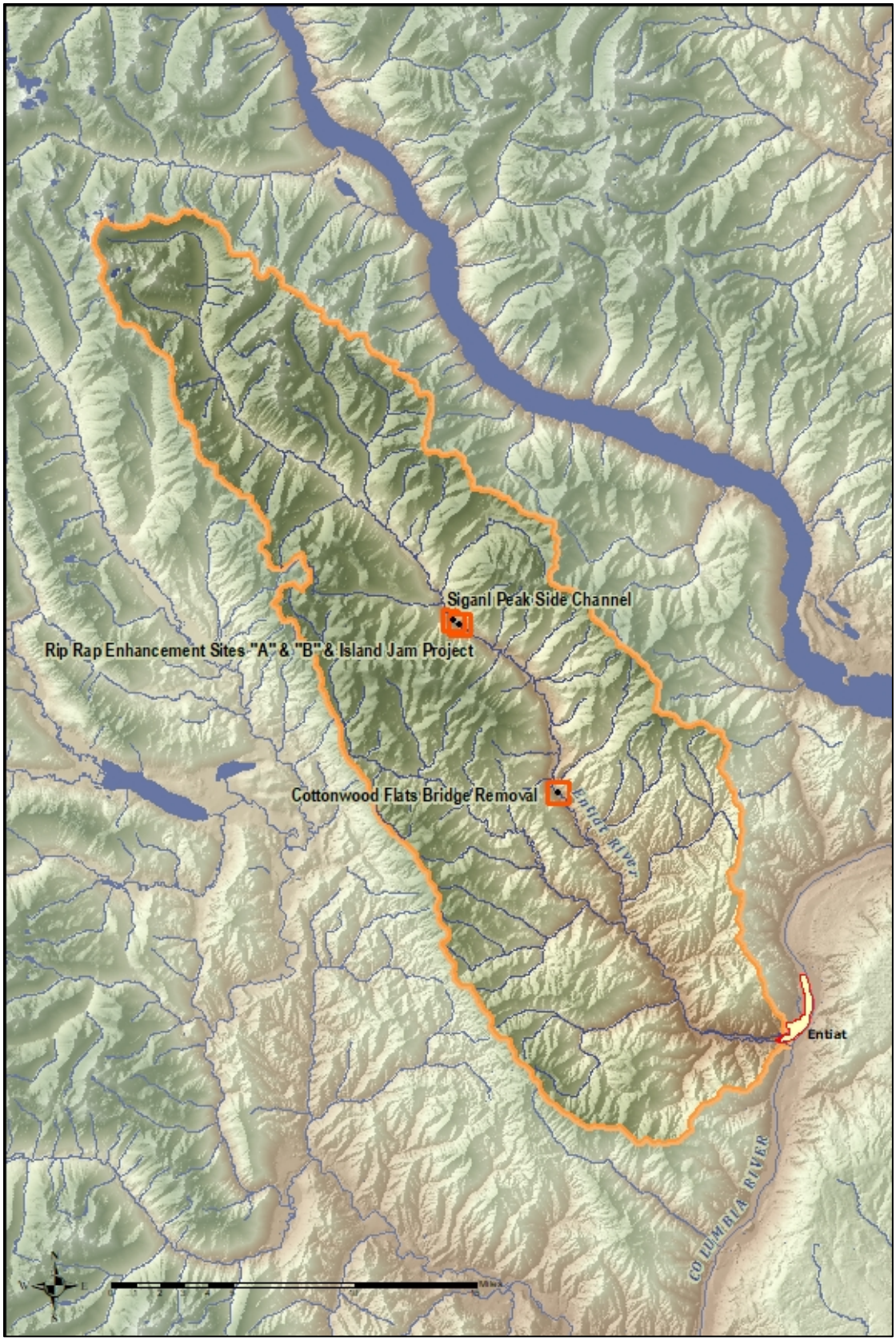


Figure 37. Location map of the projects completed in the Entiat River Subbasin in 2016-2017.

Cottonwood Flats Bridge Removal

Sponsor: Chelan Douglas Land Trust

Partner(s): Chelan County Natural Resources Department

Project Type: Channel Complexity

- Channel Complexity: 0.1 miles of floodplain access

Latitude: 47° 48’ 54” N

Longitude: 120° 25’ 04” W

Funding Source(s): Washington Salmon Recovery Funding Board, Chelan PUD Tributary Committee

NEPA Compliance: N/A

Reclamation’s Development Costs: Reclamation indirectly supported this project as a component of an overall strategy for improving habitat through the Middle Entiat Project. Reclamation contributed pre-project planning, including LIDAR and assessments. Engineering design and construction guidance were provided by Chelan County.

Implementation Costs: $154,000

Project Description: The Cottonwood Flats Bridge was installed to access the floodplain on the opposite side of the river from the highway but was no longer needed. The bridge abutments were failing from river erosion as the Entiat River flows attempted to break the confinement. There was a concern that the bridge would collapse into the river and make removal much more difficult. It was a persistent and long-term effort to get the elements in place to allow the bridge to be removed. The bridge was removed in 2017, and the river was allowed to flow freely and access its floodplain in this segment.



Figure 38. This pre-project upstream view shows the Cottonwood Bridge, which was not being used for any purpose. The bridge abutments were failing, and there was concern that the bridge would collapse into the Entiat River.

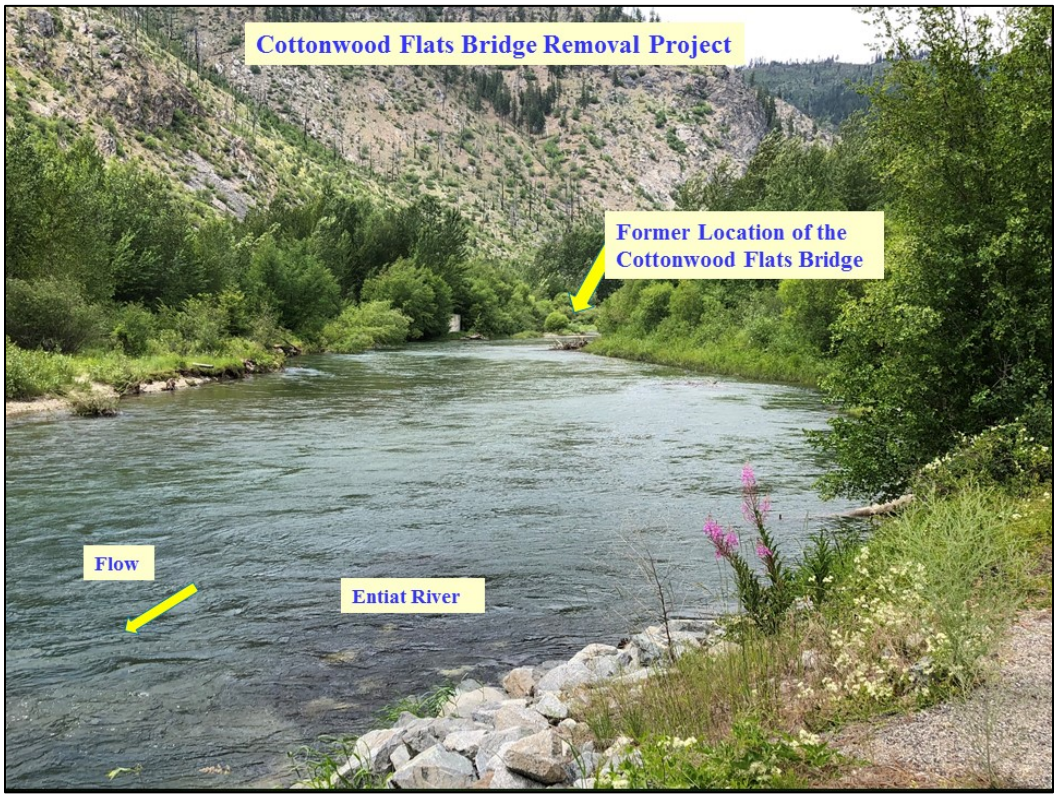


Figure 39. This post-project upstream view of the Entiat River shows increased floodplain connection with the bridge removed.

Rip Rap Enhancement Sites A and B and Island Jam Project

Sponsor: Yakama Nation

Partner(s): U.S. Forest Service and Bonneville Power Administration (BPA)

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.13 miles (680 feet) of large wood structures in the main channel and the side channel
- Riparian Enhancement: 0.13 miles (680 feet) of riparian planting

Latitude: 47° 55’ 00” N

Longitude: 120° 30’ 02” W

Funding Source(s): Yakama Nation using Accord funds through BPA

NEPA Compliance: U.S. Forest Service NEPA process

Reclamation’s Development Costs: approximately $22,000

Implementation Costs: $275,000

Project Description: The project was completed as part of the ongoing Yakama Nation Upper Columbia Habitat Restoration Project (UCHRP), which has been successful in implementing fish habitat projects for many years. Reclamation’s contribution was in the form of a Tributary Assessment completed for this section of river in 2009. A LiDAR survey used to inform the project was also conducted by Reclamation.

The project added large wood along 680 feet of an existing side channel and main channel and added a log jam at a key location on an existing island in the same area near Entiat River mile 27.2. The project added large wood to the channel and along the bank, which added roughness and complexity to the side channel and main channel along the island. The addition of large wood will provide habitat for juvenile salmonids to escape high spring flows and rear near the same location where they emerge from the gravels. Riparian enhancements and plants were also added along the bank where the large wood was added.



Photograph 94. Post-project view looking across the large wood added to the side channel. The view also looks across the island where the log jam was constructed. Note the vertical wood posts that help stabilize the island log jam.



Photograph 95. Post-project view looking upstream along the large wood, which was added to the existing riprap bank.

Signal Peak Side Channel

Sponsor: Yakama Nation

Partner(s): U.S. Forest Service and Bonneville Power Administration

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 0.15 (800 feet) of side channel enhancement
- Riparian Enhancement: 0.15 (800 feet) of riparian planting

Latitude: 47° 55’ 10” N

Longitude: 120° 30’ 21” W

Funding Source(s): Yakama Nation using Accord funds through BPA

NEPA Compliance: U.S. Forest Service NEPA process

Reclamation’s Development Costs: approximately $15,000

Implementation Costs: $175,000

Project Description: The project was completed as part of the ongoing Yakama Nation Upper Columbia Habitat Restoration Project (UCHRP) which has been successful in implementing fish habitat projects for several years. Reclamation’s contribution was in the form of a Tributary Assessment completed for this section of river in 2009. A LiDAR survey used to inform the project was also conducted by Reclamation.

The project reconnected an 800-foot-long side channel of the Entiat River at river mile 27.5. The reconnection was made possible by removing a levee and adding large wood at the channel entrance to enhance and encourage flow into the side channel. Part of the design called for the addition of large wood to add roughness and complexity along the side channel. The side channel will provide valuable off river habitat for juvenile salmonids to escape high spring flows and rear near the same location where they came out of the gravels. Riparian enhancements and plants were also added along the side channel.

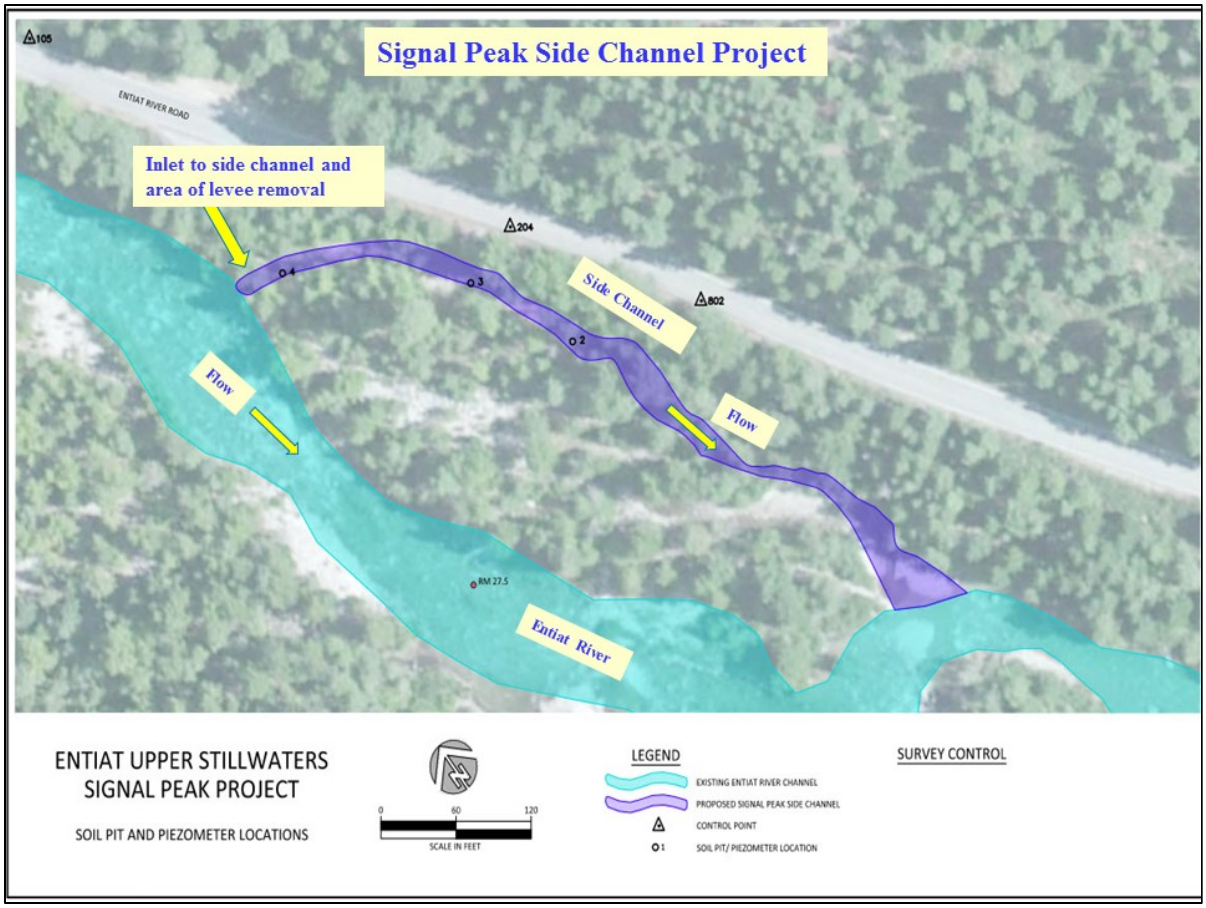


Figure 40. This figure shows the general concept and alignment of the Signal Peak Side Channel.



Figure 41. Post-project view of the entrance to the Signal Side Channel. Portions of the levee were removed, and large wood was added to encourage flow into the side channel.