

RECLAMATION

Managing Water in the West

Reclamation's 2018 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
Boise, Idaho

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Cover Photograph: Newly constructed Upper White Pine Floodplain Reconnection Project. View shows Nason Creek in the newly constructed channel, along with the side channel confluence which connects the wetland complexes.

Acronyms and Abbreviations

Acronym or Abbreviation	Description
BiOp	Biological Opinion
BPA	Bonneville Power Administration
cfs	cubic feet per second
CRS	Columbia River System
ELJ	Engineered Log Jam
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
HUC	Hydrologic Unit Code
IDL	Idaho Department of Lands
MCR	Mid-Columbia River
MSRF	Methow Salmon Recovery Foundation
NRCS	National Resources Conservation Services
NEPA	National Environmental Policy Act
NOAA Fisheries	National Oceanic and Atmospheric Administration National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
Reclamation	U.S. Bureau of Reclamation
RM	river mile
RPA	Reasonable and Prudent Alternative
SNRA	Sawtooth National Recreational Area
UCR	Upper Columbia River
WDFW	Washington Department of Fish and Wildlife
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 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 lifecycle. 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 (see 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)].

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

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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 15 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 have sound engineering and perform as intended. For continual improvement of project designs, Reclamation evaluates completed projects to determine if they are functioning as designed. The findings from these evaluations are incorporated 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 only contributed to a portion of the project. 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 2018. The development costs shown for each individual project include all years of project development summarized for the Reclamation contribution. 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. 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.

2018 Activities

In calendar year 2018, Reclamation and partners completed 11 fish-habitat improvement projects in the following four subbasins of the Columbia River Basin:

- Upper Salmon River Subbasin
 - Pahsimeroi River
 - Upper Salmon River
- Grande Ronde River Subbasin
 - Grande Ronde River
- John Day River Subbasin
 - Middle Fork John Day River
- Upper Columbia River Subbasin
 - Methow River
 - Entiat River
 - Wenatchee River

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

Future Projects

The 2008 FCRPS BiOp was replaced by a 2019 Columbia River System BiOp in March of 2019. Reclamation plans to continue providing technical assistance for habitat improvement projects that enhance tributary spawning and rearing habitat associated with implementing the 2019 CRS 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 CRS BiOp.

Acknowledgements

Reclamation's FCRPS BiOp implementation successes are 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 partners 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 Upper 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 2018, two projects were completed in the Pahsimeroi River and one project was 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).

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

Table 1: Reclamation's total expenditures for completed projects in the Upper Salmon River basin.

Basin	Expenditures
Upper Salmon River Basin	\$269,000

Pahsimeroi River

The Pahsimeroi River (Hydrologic Unit Code (HUC) 17060202) is a tributary to the Salmon River entering at RM 304. It has a drainage area of about 825 square miles. In 2018, two projects were completed in the Pahsimeroi River that improved streamflow, channel complexity, and riparian enhancement.

The focus of Reclamation's actions in the Pahsimeroi River 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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Projects

- Mulvaney Headgate Project
- Idaho Department of Lands Habitat Improvement Project

Sponsors

- Custer Soil and Water Conservation District
- Idaho Department of Fish and Game

Partners

- Idaho Department of Fish and Game
- Idaho Department of Water Resources
- Idaho Department of Lands
- Idaho Office of Species Conservation
- Landowners
- Leasees

Funding Source

- Bonneville Power Administration

Table 2: Reclamation's total expenditures for completed projects in the Pahsimeroi River.

Subbasin	Expenditures
Pahsimeroi River	\$199,000

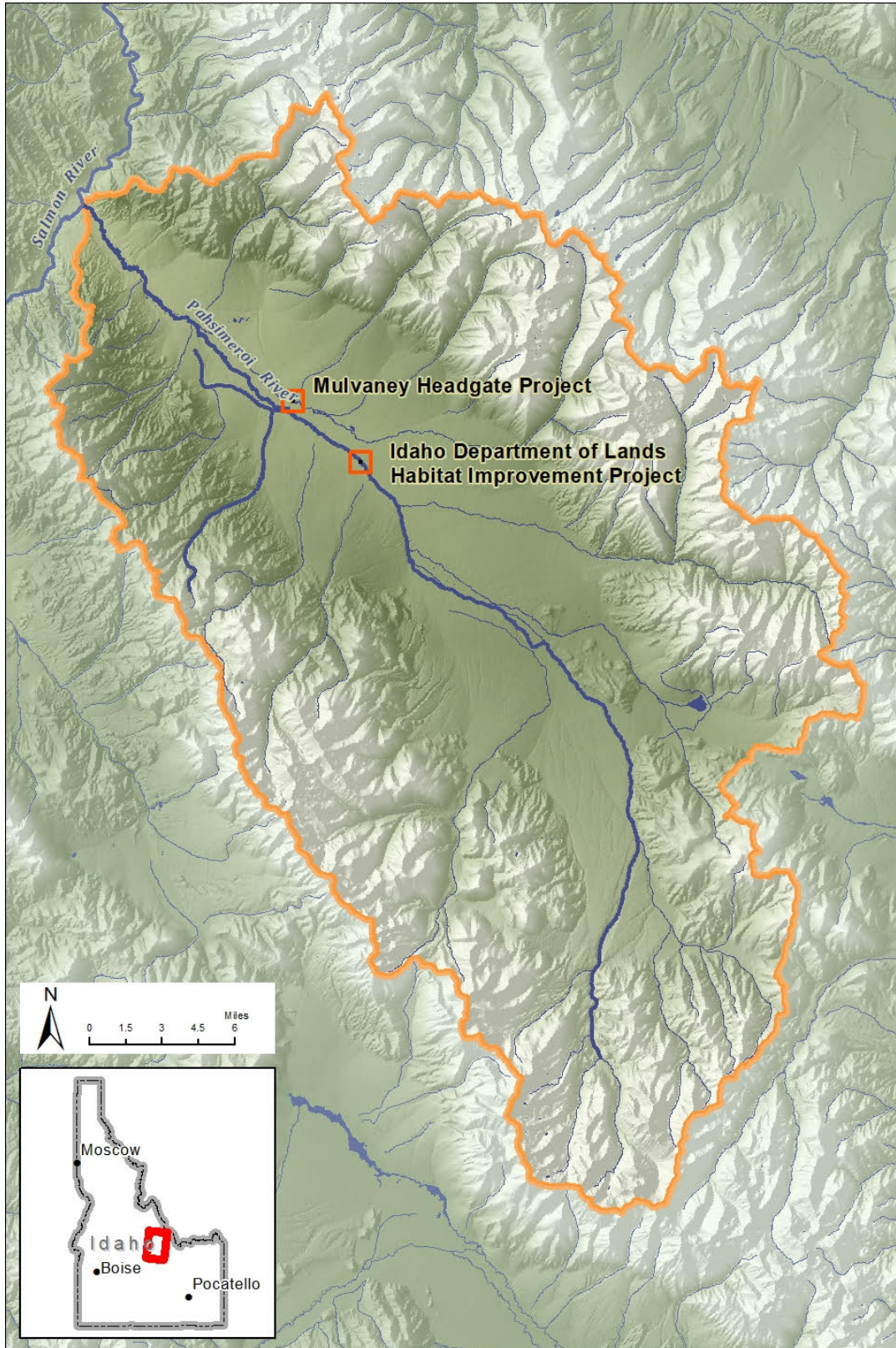


Figure 2: Location map of the projects completed in the Pahasimeroi River in 2018.

Mulvaney Headgate Project

Sponsor: Custer Soil and Water Conservation District

Partners: Idaho Department of Fish and Game, Idaho Department of Water Resources, and Landowners

Project Type: Streamflow: 15 cubic feet per second (cfs) of additional flow into Big Springs Creek

Latitude: 44° 33' 44.5" N

Longitude: 113° 53' 41.5" W

Funding Source: Bonneville Power Administration

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

Reclamation's Development Costs: \$18,000

Implementation Costs: \$19,000

Project Description: Big Springs Creek is a spring-fed channel that is a main tributary to the Pahsimeroi River. Mulvaney ditch diverts water from Big Springs Creek into the Pahsimeroi River for irrigation withdrawal further downstream. Recent projects have increased flows in the Pahsimeroi River to the point where the Mulvaney Ditch diversion will only need to be operated during times of low water. There was no headgate in place to control how much water was being diverted. A new headgate was installed to control the diversion of water from Big Springs Creek. Having control of the headgate allows additional water to be left in Big Springs Creek.



Photograph 1: Pre-project view of Mulvaney Ditch shows the excess uncontrolled water (up to 15 cfs), which now remains in Big Springs Creek.



Photograph 2: Post-project view of the new Mulvaney Ditch headgate. Uncontrolled water that used to flow into the ditch is now left in Big Springs Creek. Often the additional flow into Big Springs Creek is 15 cfs.

Idaho Department of Lands Habitat Improvement Project

Sponsor: Idaho Department of Fish and Game

Partners: Idaho Department of Lands, Idaho Office of Species Conservation, landowner, and leasees

Project Type: Channel Complexity, Riparian Enhancement

- Channel Access: 1.10 miles
- Riparian Enhancement: 1.10 miles planted

Latitude: 44° 31' 20" N

Longitude: 113° 50' 40" W

Funding Source: Bonneville Power Administration

NEPA Compliance: Bonneville Power Administration's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: \$181,000

Implementation Costs: \$470,000

Project Description: The Pahsimeroi River downstream of the P-16 and P-17 diversions was historically de-watered during the summer months. Recent conservation projects have increased the amount of water flowing in this section of the Pahsimeroi to the point that the river now flows year-round. The stream channel and riparian conditions were severely degraded after decades of being dry. The Idaho Department of Lands project was initiated to improve the river channel and riparian conditions on a 1.10 mile stretch of the river. This stretch of river is owned by the Idaho Department of Lands and a private landowner. Approximately 430 large rootwad trees were placed in the channel to create complexity, habitat, and pools. Side channels were activated, and more than 6,000 potted plants and willow stakes were planted.



Photograph 3: Pre-project view shows a section of the Pahsimeroi River that was dewatered in summer and fall by upstream diversions. Stream channel and riparian conditions were severely degraded. Upstream conservation projects have now created year-round flow.



Photograph 4: Post-project view displays a sample of the 430 large rootwad trees and more than 6,000 potted plants and willow stakes in 1.10 miles of the stream channel and riparian zone.



Photograph 5: Post-project view shows one of the eight channel-spanning log jams that were constructed to force water onto the floodplains at higher flows.



Photograph 6: Post-project view shows root wad structures that were installed to improve instream complexity and habitat. These structures ranged from single logs to seven logs. The vertical posts were driven into place to add stability to the structures.

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 2018, one project was completed in the Upper Salmon River that improved streamflow and entrainment.

The focus of Reclamation's actions in the Upper Salmon River includes 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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Project

- Meadow Creek Groundwater Project

Sponsor

- Custer Soil and Water Conservation District

Partners

- Idaho Department of Water Resources
- Landowners
- National Resources Conservation Services
- Bonneville Power Administration
- Sawtooth National Recreational Area

Funding Sources

- Bonneville Power Administration

Table 3: Reclamation's total expenditures for completed projects in the Upper Salmon River.

Subbasin	Expenditures
Upper Salmon River	\$70,000

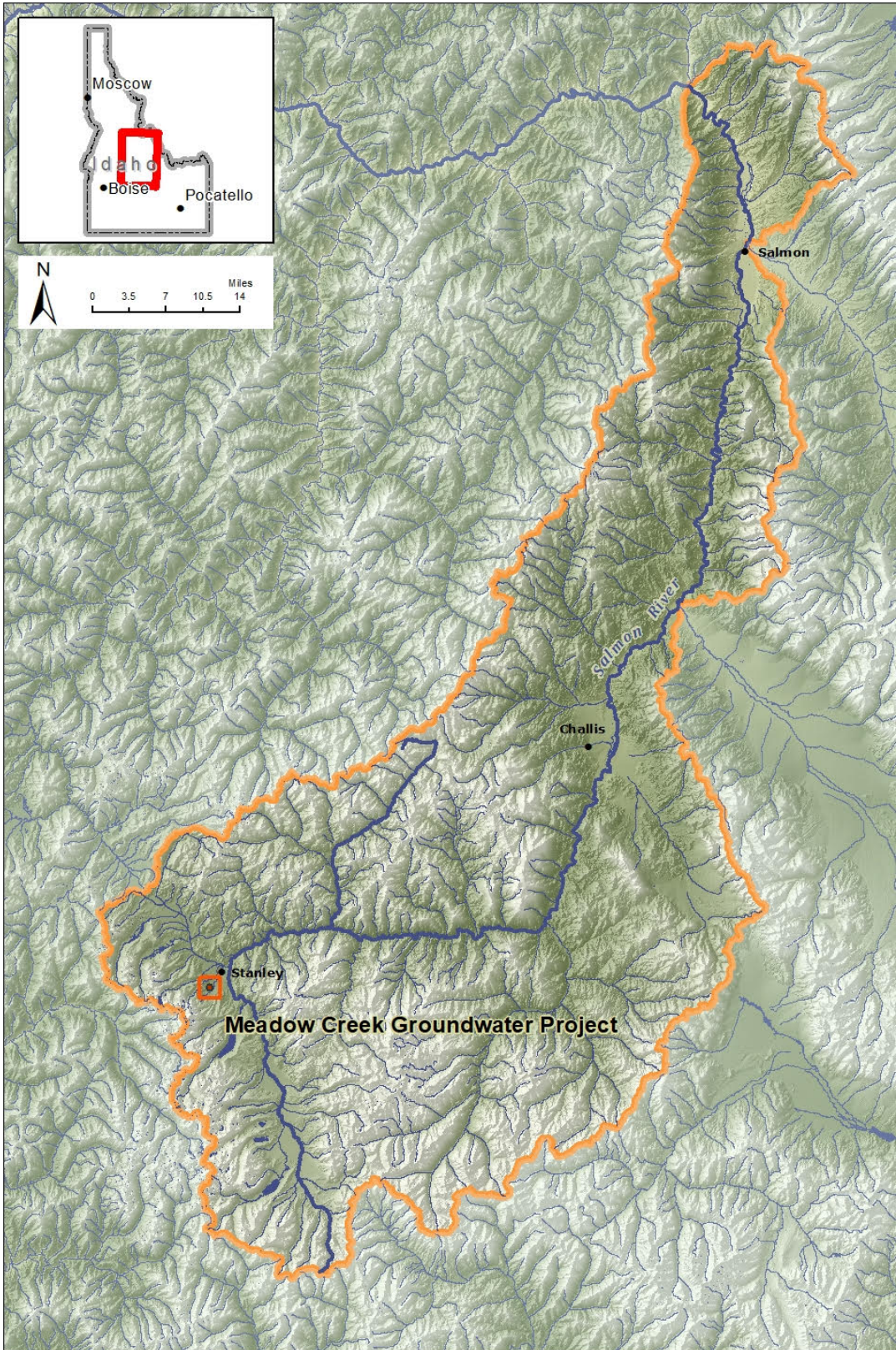


Figure 3: Location map of the project completed in the Upper Salmon River in 2018.

Meadow Creek Groundwater Project

Sponsor: Custer Soil and Water Conservation District

Partners: Idaho Department of Water Resources, Landowners, National Resources Conservation Services, Bonneville Power Administration, and Sawtooth National Recreational Area

Project Type: Streamflow, Entrainment

- Streamflow: 0.55 cfs to Meadow Creek
- Entrainment: removed two unscreened headgates and closed the associated ditches

Latitude: 44° 11' 25" N

Longitude: 114° 58' 12" W

Funding Source: Bonneville Power Administration and Reclamation

NEPA Compliance: Custer Soil and Water Conservation District

Reclamation's Development Costs: \$70,000

Implementation Costs: \$108,000

Project Description: This project was completed to support a land acquisition within the Sawtooth National Recreational Area. A 365-acre ranch was purchased and transferred to the Sawtooth National Recreational Area, including 280 irrigated acres of pasture. The property was irrigated through withdrawals from Meadow Creek and Goat Creek, both tributary to Valley Creek near Stanley, Idaho. Irrigation on the 280 acres was discontinued, leaving an additional 5.4 cfs in Goat Creek and 6.5 cfs in Meadow Creek. After the land acquisition, there were two small acreages in the area that were still irrigated out of Meadow Creek ditch MC3. MC3 was an unscreened diversion. This project drilled two test wells to determine the possibility to switch the irrigation to a groundwater source. The test wells were successful and the associated irrigation systems were installed. The switch to groundwater allowed for the closure of the MC3 ditch which left an extra 0.55 cfs in Meadow Creek.



Photograph 7: Post-project view of one of the new wells drilled to provide irrigation water to small pastures. This new well allowed the elimination of the MC3 Meadow Creek diversion.

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 2018, one project was completed in the Upper Grande Ronde River.

The focus of Reclamation's actions in the subbasin 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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Table 4: Reclamation's total expenditures for completed projects in the Grande Ronde River subbasin.

Subbasin	Expenditures
Grande Ronde River subbasin	\$93,000

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 2018, one project was completed in the Upper Grande Ronde River that 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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Project

- Rock Creek Habitat Improvement Phase 3 Project

Sponsor

- Confederated Tribes of the Umatilla Indian Reservation

Partner

- Bonneville Power Administration
- Grande Ronde Model Watershed

Funding Source

- Bonneville Power Administration

Table 5: Reclamation's total expenditures for completed projects in the Upper Grande Ronde River.

Subbasin	Expenditures
Upper Grande Ronde River	\$93,000

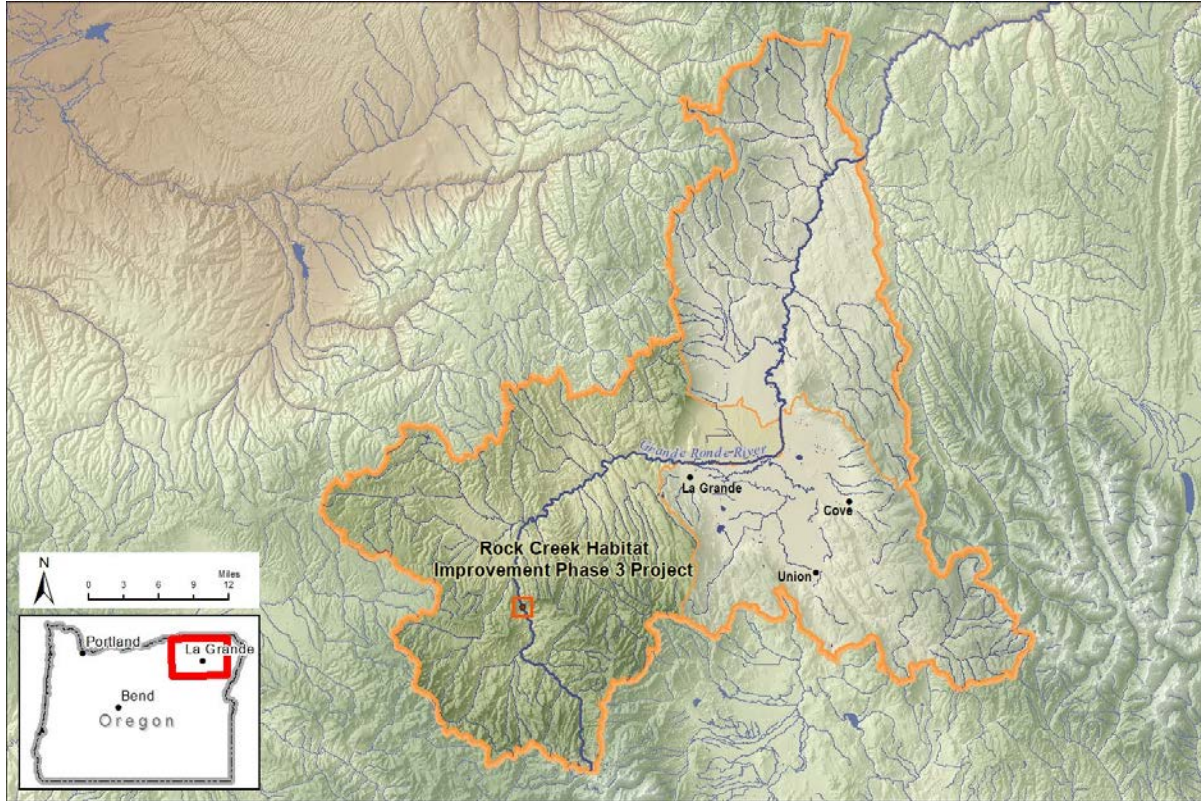


Figure 4: Location map of the project completed in the Upper Grande Ronde River in 2018.

Rock Creek Habitat Improvement Phase 3 Project

Sponsor: Confederated Tribes of the Umatilla Indian Reservation

Partners: Bonneville Power Administration, Grande Ronde Model Watershed

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 4,300 feet of new main channel construction; 462 feet of side channel construction; 10 alcoves; 3,000 feet of levee removal; 1,900 feet of brush mattress along streambanks; 54 engineered log jams; 300+ floodplain wood pieces; 5,284 feet of road decommissioned
- Riparian Enhancement: 6 acres of seeding/mulching

Latitude: 45° 9' 35" N

Longitude: 118° 22' 47" W

Funding Source: Bonneville Power Administration

NEPA Compliance: Bonneville Power Administration's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: \$93,000

Implementation Costs: \$347,000

Project Description: Rock Creek is a tributary that enters the Upper Grande Ronde River near Hilgard Junction State Park. The entire project (Phases 1, 2 and 3) is located within the NOAA National Marine Fisheries Service Snake River Recovery Plan UGC-2 and UGS-16 assessment units and was identified by the FCRPS BiOp Expert Panel as a high priority area for protection and rehabilitation of habitat. Phase 3 encompasses approximately 1 mile of lower Rock Creek. In its pre-project condition, the lower Rock Creek Stream channel was badly incised, and streambanks were eroded. There were very few pools, habitat complexity and floodplain connectivity were lacking, and riparian conditions were poor. Phase 3 implementation resulted in the construction of over 4,000 feet of new meandering stream channel and over 400 feet of new side channel. Habitat complexity was increased with the construction of pools, riffles, alcoves, and large wood features. Strategic placement of wood structures and levee removal created connectivity with the floodplain. Habitat for both Snake River spring/summer Chinook salmon and Snake River steelhead trout has been greatly improved.



Photograph 8: Pre-project view looking upstream along Rock Creek. Note the simplified channel and lack of pools.



Photograph 9: Post-project view shows the complex channel and side channel with the addition of pools, riffles, and wood.

John Day River Subbasin

The John Day River is a tributary to the Columbia River at RM 204. It enters 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 2018, one project was completed in the Middle Fork John Day River.

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

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

Table 6: Reclamation's total expenditures for completed projects in John Day River subbasin.

Subbasin	Expenditures
John Day River subbasin	\$307,000

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 2018, one project was 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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Project

- Long Creek Neal Habitat Project

Sponsor

- North Fork John Day Watershed Council

Partners

- Oregon Watershed Enhancement Board
- Oregon Department of Fish and Wildlife
- Confederated Tribes of Warm Springs
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- Grant Soil and Water Conservation District
- Monument Soil and Water Conservation District
- Oregon Youth Conservation Corp
- Landowner
- Bonneville Power Administration

Funding Sources

- Oregon Watershed Enhancement Board
- Bonneville Power Administration
- U.S. Fish and Wildlife Service

- Bella Vista Foundation
- Oregon Youth Conservation Corp
- U.S. Forest Service

Table 7: Reclamation’s total expenditures for completed projects in Middle Fork John Day River.

Subbasin	Expenditures
Middle Fork John Day River	\$307,000

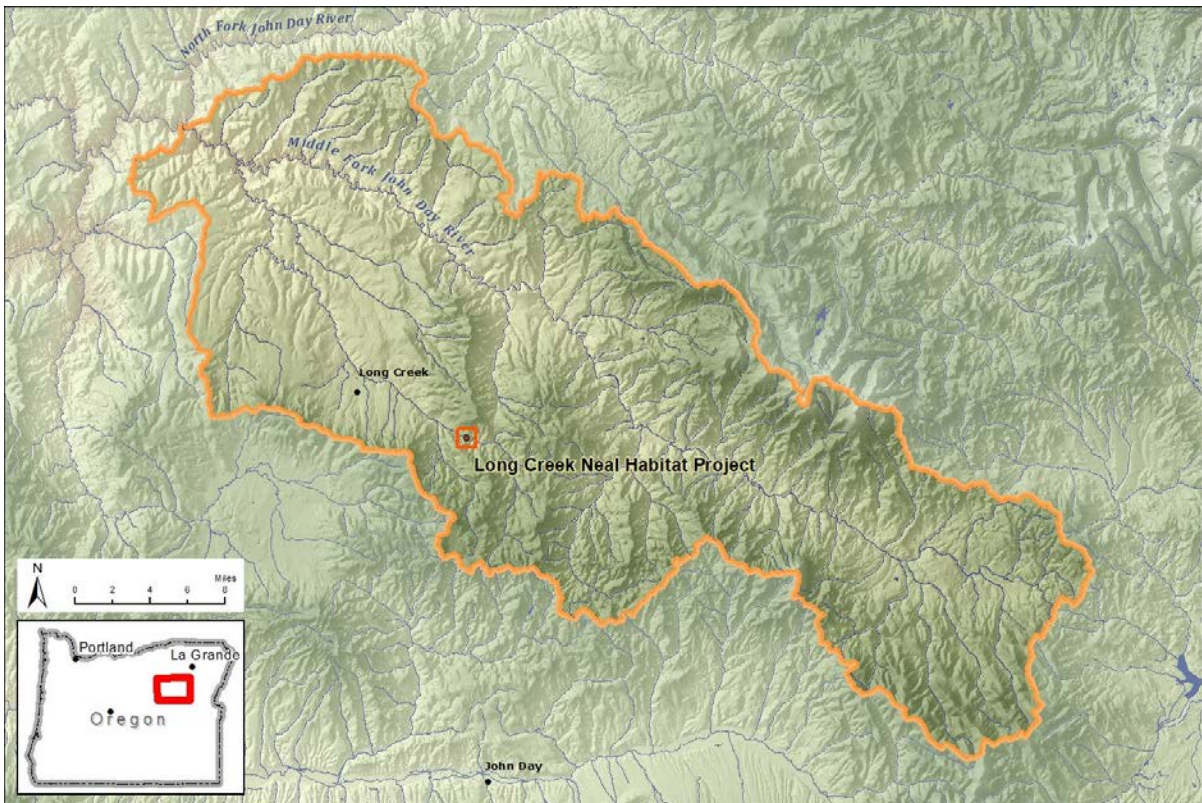


Figure 5: Location map of the project completed in the Middle Fork John Day River in 2018.

Long Creek Neal Habitat Project

Sponsor: North Fork John Day Watershed Council

Partners: Oregon Watershed Enhancement Board, Oregon Department of Fish and Wildlife, Confederated Tribes of Warm Springs, U.S. Fish and Wildlife Services, U.S. Forest Service, Grant Soil and Water Conservation District, Monument Soil and Water Conservation District, Oregon Youth Conservation Corp, and landowner

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 940 feet of side channel constructed, 0.67 miles of complexity improvement
- Riparian Enhancement: 0.42 miles of riparian zone protected from livestock and planted with over 1,000 containerized plants, creation of off-channel livestock watering

Latitude: 44° 40' 50.372" N

Longitude: 118° 59' 6.735" W

Funding Sources: Oregon Watershed Enhancement Board, Bonneville Power Administration, U.S. Fish and Wildlife Services, Bella Vista Foundation, Oregon Youth Conservation Corp, and U.S. Forest Service

NEPA Compliance: U.S. Fish and Wildlife Services (Partners in Wildlife Programmatic) and U.S. Forest Service

Reclamation's Development Costs: \$307,000

Implementation Costs: \$111,000

Project Description: The Neal property on Long Creek borders the Malheur National Forest. A portion of the channel on the private property was channelized and bermed in the 1940s or 1950s and heavily impacted by livestock for many decades resulting in an overly wide, greatly simplified channel, which was lacking pools and cover type habitat. Head cutting at the downstream end of the meadow also threatened important wetlands and a reduction in stream length and sinuosity. The project included activities on 0.40 miles of the Neal property and about 0.25 miles on the Malheur National Forest.

The overall project goal was to increase juvenile rearing habitat through increased flood plain connection, increased instream complexity, and stream narrowing to reduce maximum water temperatures for threatened summer steelhead.

The Long Creek Neal Habitat Project included nine main actions:

1. Created three high flow side channels by opening an existing side channel (500 feet) on the U.S. Forest Service land and excavating two side channels on the lower end of the private property (220 feet each). Side channels should activate annually.

2. Constructed twenty-five pools with large wood cover components. At fourteen of the pool locations, mid-channel bars and riffle features were constructed to reduce the cross-sectional area of the channel and narrow the base flow channel.
3. Constructed engineered log jams and other large wood placements. These improvements will encourage flow into side channels, cause narrowing of the river channel, deposit gravels, scour pools, create velocity breaks for emergent fry during high flows, and increase the overall channel roughness to decrease stream energy and encourage overbank flooding.
4. Lowered areas of the berms and set them back along the channel to increase available inset floodplain. This reduced channel confinement and decreased stream energy.
5. Constructed a grade control riffle at the bottom end of the meadow to raise the existing streambed profile at a natural confinement point. The riffle will help control vertical incision and help backwater the existing head cuts into the lower end of the meadow.
6. Placed floodplain wood and/or live brush rows to spread flows and reduce concentrated flows on the floodplain and into existing headcuts. Existing headcuts threaten to cut off the best meander sequence on the property and will cause further degradation of the meadow and wetlands.
7. Fenced the riparian zone along the entire project length on the private property and a spring-fed wetland at the lower end of the meadow. The fencing will reduce impacts by livestock. The riparian/wetland fence was enrolled in Oregon Department of Fish and Wildlife's fencing program for a 15-year period.
8. Planted over 1,000 containerized native woody plants that are protected from deer and elk browse. These plants were installed throughout the riparian zone and wetland. Riparian species were used, such as red osier dogwood, willow, alder, hawthorne, elderberry, current, aspen, chokecherry, and cottonwood.
9. To increase habitat complexity, the U.S. Forest Service directed harvest and placement of 25 to 30 large trees in various configurations in a ¼ mile of Long Creek above the private property.



Photograph 10: Pre-project view of the simplified channel in the straightened section at Pool No. 4.



Photograph 11: Post-project view of the complexity added to the same channel.



Photograph 12: Pre-project view showing bank layback and new Pool No. 9 location.



Photograph 13: Post-project view of the completed channel in the Pool No. 9 section.



Photograph 14: Pre-project view of the straightened channel where the Side Channel No. 2 inlet will be constructed.



Photograph 15: Post-project view of the inlet to Side Channel No. 2.



Photograph 16: Pre-project view of the proposed outlet location of Side Channel No. 3.



Photograph 17: Post-project view of the outlet location of Side Channel No. 3.



Photograph 18: Post-project view showing the large wood that was added to the stream to create cover and habitat for juvenile steelhead and salmon.

Upper Columbia River Subbasin

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: Entiat River subbasin, Methow River subbasin, and Wenatchee River subbasin. In 2018, three projects were completed in the Methow River subbasin, one project was completed in the Entiat River subbasin, and two projects were completed in the Wenatchee 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.

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

Table 8: Reclamation's total expenditures for completed projects in Upper Columbia River basin.

Subbasin	Expenditures
Upper Columbia River basin	\$3.8 Million

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 2018, three projects were completed in the subbasin that improved channel access, channel complexity, and riparian enhancement.

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

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

Projects

- Frazer Creek Post Fire – Laze K Bridge Project
- Methow Beaver Project 2018
- M2 Washington Department of Fish and Wildlife Cross Levee Removal Project

Sponsor

- Methow Salmon Recovery Foundation

Partners

- Washington Recreation and Conservation Office
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- U.S. Forest Service

Funding Sources

- Washington Salmon Recovery Funding Board
- Washington Department of Ecology
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- Confederated Tribes of the Colville Reservation
- Bonneville Power Administration

Table 9: Reclamation's total expenditures for completed projects in the Methow River subbasin.

Subbasin	Expenditures
Methow River	\$17,000

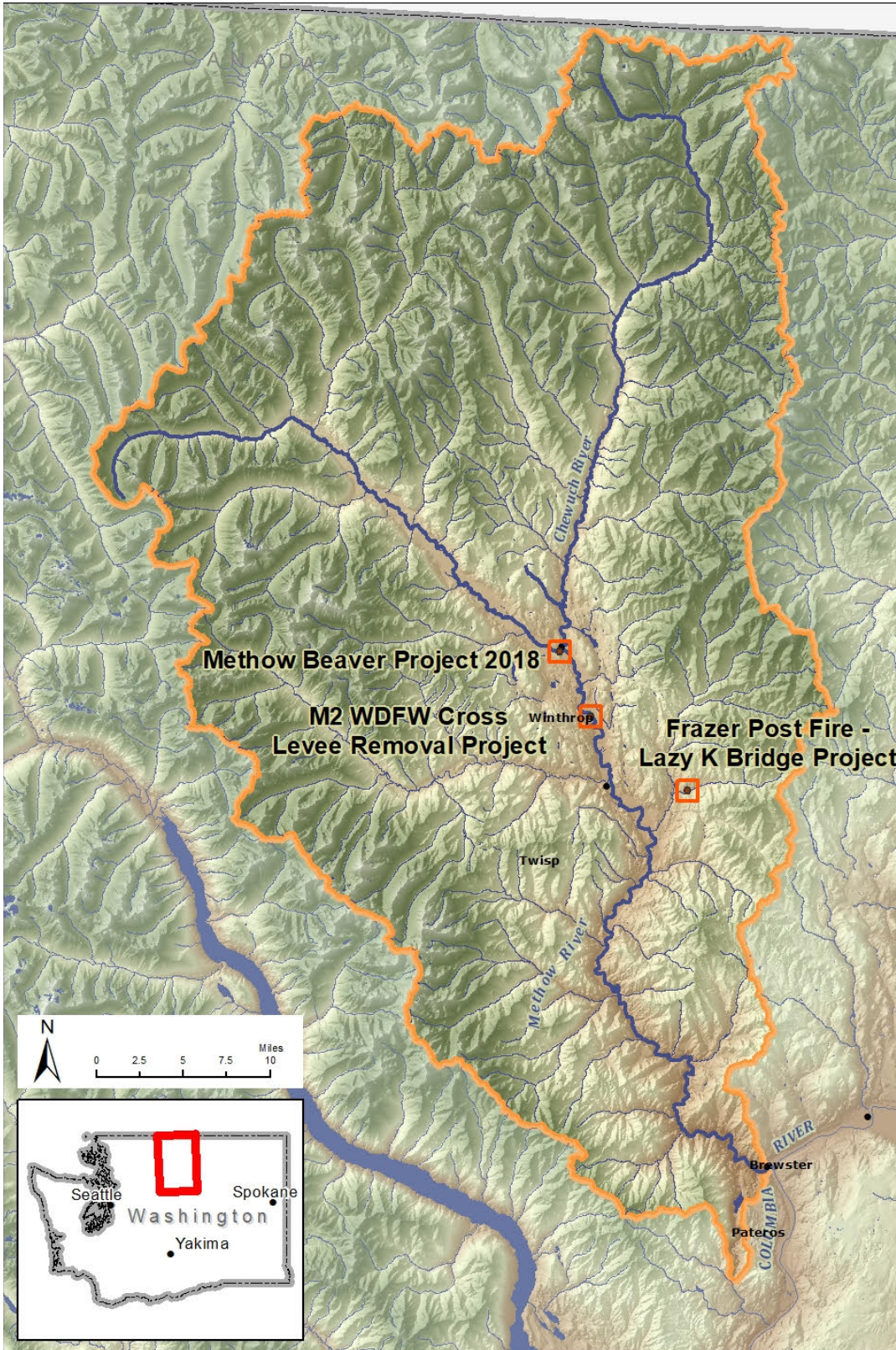


Figure 6: Location map of the projects completed in the Methow River in 2018.

Frazer Post Fire – Lazy K Bridge Project

Sponsor: Methow Salmon Recovery Foundation

Partners: Washington Recreation and Conservation Office, Washington Department of Ecology

Project Type: Channel Access, Channel Complexity, Riparian Enhancement

- Channel Access: 4.90 miles (temporary barrier in the form of a headcut at 0.25 miles)
- Channel Complexity: 0.045 miles, 3 engineered log jams
- Riparian Enhancement: 1.10 acres planted

Latitude: 48° 21' 44.49" N

Longitude: 120° 1' 18.31" W

Funding Source: Washington Salmon Recovery Funding Board

NEPA Compliance: Washington State Environmental Policy Act, no federal funds used for construction or ground disturbance

Reclamation's Development Costs: \$3,000

Implementation Costs: \$245,000

Project Description: With the installation of the Lazy K Bridge, Methow Salmon Recovery Foundation (MSRF) completed a 4 year effort to replace nine undersized road culverts that were damaged or destroyed by the 2014 Carlton Complex fires and flooding the following year. The Lazy K Bridge raised unique challenges as a large portion of the property was washed out when Frazer Creek avulsed around the failed road crossing culvert during a post-fire flood event.

MSRF provided the landowners with the technical and financial assistance needed to replace the fire-damaged road crossing with a 60 foot clear span bridge across Frazer Creek. Frazer Creek is a tributary to Beaver Creek and the Methow River, which supports ESA-listed Upper Columbia River spring Chinook, steelhead, bull trout and resident trout. Construction was completed by a licensed contractor retained by MSRF. The failed crossing presented a full barrier to the upstream fish passage of resident trout and steelhead. Reclamation provided funding to MSRF to help with planning costs.

Pre-project flood flows in 2015 and 2016 resulted in further damage to the crossing. During a flood in the spring of 2017, the Lazy K culvert was completely buried and the stream avulsed around it resulting in a 6 to 10 foot chasm through the driveway of the private residence. The damage to this and other crossings on Frazer Creek was a direct result of the fire and greatly increased peak stream flows and sediment transport.

Prior to the flooding damage, the undersized culvert at the site had been identified as an upstream fish passage barrier. Following the fire event, it was incapable of handling the

excessive flows and large amounts of debris that mobilized during the repeated floods. The new bridge restores fish passage. Also, the increased stream meander length that was constructed as part of the project reduces the erosive capabilities of high stream flows through the crossing and lessens the threat of future flood damage to the crossing.



Photograph 19: Pre-project and pre-fire view of the original barrier culvert at Frazer Creek – Lazy K.



Photograph 20. Post-project view of the new channel-spanning 60 foot bridge which restores fish passage at the site



Photograph 21. Pre-project/post-fire view shows where the creek avulsed around the plugged culvert during a spring high water event.

Methow Beaver Project 2018

Sponsor: Methow Salmon Recovery Foundation

Partners: Washington Department of Fish and Wildlife, U.S. Forest Service

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 1.90 miles of complexity added to the stream
- Riparian Enhancement: 1.86 acres of wetland created

Latitude: 48° 28' 26.71" N

Longitude: 120° 11' 18.10" W

Funding Sources: Washington Department of Ecology, U.S. Fish and Wildlife Service, U.S. Forest Service, Confederated Tribes of the Colville Reservation

NEPA Compliance: Bonneville Power Administration's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: \$10,000

Implementation Costs: \$40,000

Project Description: The Methow Beaver Project (MBP) was established in 2008 as a collaboration between State and Federal agencies, and non-governmental organizations to address the historic and continued loss of wetland habitat in the Methow River watershed. By reintroducing beavers into unoccupied habitat in the Methow watershed, the MBP has sought to:

- store water for later season streamflow;
- raise groundwater levels in the upper reaches of the watershed;
- reintroduce stream complexity and dynamic processes;
- increase nutrient availability in streams;
- reconnect floodplains;
- reduce sediment delivery to stream systems;
- improve habitat for threatened and endangered salmonids; and
- improve and expand riparian and wetland habitats.

The focus of the MBP has been to capture nuisance beavers on private lands and relocate them to suitable, unoccupied stream segments on public lands. From 2008 to 2017, 383 beavers were live-trapped and moved to 72 different sites. The beavers built dams at 40 of these sites. Additional components of the project are to provide environmental education opportunities for all ages, to provide research opportunities for universities and agencies, and to provide advice and guidance to similar beaver restoration efforts.



Photograph 22. Beavers in the South Fork of Beaver Creek immediately after their release.



Photograph 23. Volunteers transporting beavers to unoccupied beaver pond.



Photograph 24. Volunteers transporting a beaver to a new home.

M2 Washington Department of Fish and Wildlife (WDFW) Cross Levee Removal Project

Sponsor: Methow Salmon Recovery Foundation

Partner: Washington Department of Fish and Wildlife

Project Type: Channel Access, Riparian Enhancement

- Channel Access: 3,200 feet of side channel reconnected
- Riparian Enhancement: 3.70 acres

Latitude: 48° 25' 17.33" N

Longitude: 120° 8' 45.94" W

Funding Source: Bonneville Power Administration

NEPA Compliance: Bonneville Power Administration's Fish and Wildlife Implementation Plan Environmental Impact Statement

Reclamation's Development Costs: \$4,000

Implementation Costs: \$60,000

Project Description: The M2 WDFW Levee Removal and Floodplain Reconnection project is a follow-on project to the 2013 M2 WDFW Project. In 2013, the M2 WDFW project removed a portion of the levee parallel to the river, but did not remove the cross levee due to adjoining landowner concerns. After 4 years of post-project observation that demonstrated the benefits of the project, the upstream landowner agreed to allow removal of the cross levee. This project removed the cross levee and consequently reconnected a 3,200 feet long wetland side channel. The channel flows through WDFW property and into adjacent protected wetland areas. In addition, this project protects floodplain and riparian habitats from impacts associated with cattle grazing on the adjacent upstream property. To maintain a barrier between the properties once the levee was removed, a fence was installed to exclude cattle. WDFW and the landowner will share the responsibility for fence maintenance. This project will further enhance floodplain connection to the side channel and wetland habitats.



Figure 7: Post-project view shows the levee removed (red line) and side channel reconnected (blue line).



Photograph 25. Pre-project view looking east along the cross levee prior to removal.



Photograph 26. View of the construction process to remove the cross levee.



Photograph 27. Post-project view looking east along the new floodplain where the cross levee was removed.

Entiat River Subbasin

The Entiat River is tributary to the Columbia River at RM 483.7. The Entiat River (HUC 17020010) has a drainage area of about 1,520 square miles. In 2018, one project was completed in the Entiat River that improved streamflow.

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 photographs, and other technical records are located at the Bureau of Reclamation, Pacific Northwest Regional Office, 1150 North Curtis Road, Boise, Idaho 83706. Files can be requested through the Columbia/Snake Salmon Recovery Office at (208) 378-5057.

Project

- Roaring Creek Flow Improvement Project

Sponsor

- Trout Unlimited

Partners

- Cascadia Conservation District
- U.S. Fish and Wildlife Service
- Roaring Creek Water Users Association
- Entiat Valley Orchard

Funding Sources

- Salmon Recovery Funding Board
- Mid-Columbia Tributary Committee
- Washington Salmon Recovery Funding Board

Table 10: Reclamation's total expenditures for completed projects in the Entiat River subbasin.

Subbasin	Expenditures
Entiat River	\$94,000

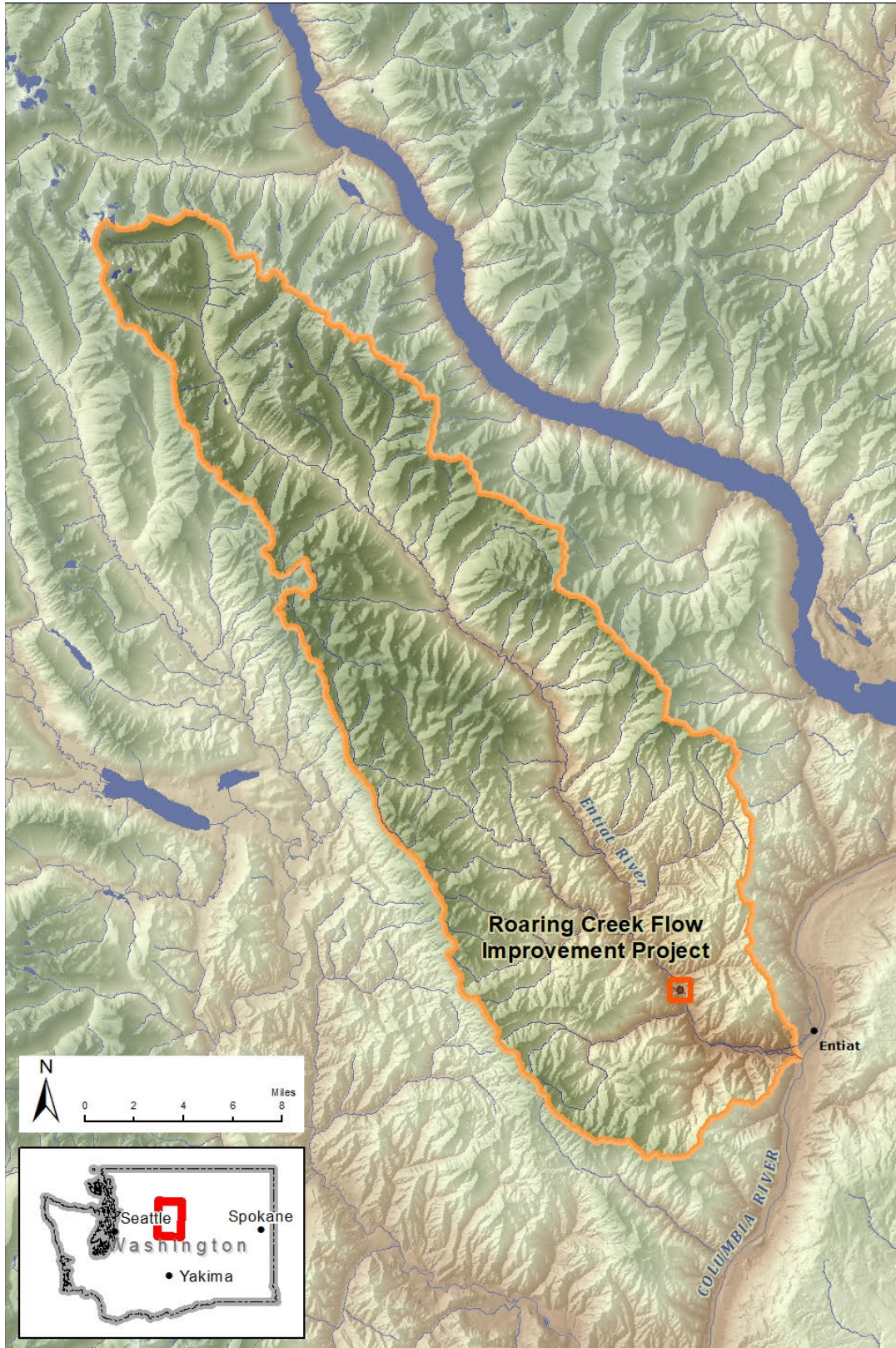


Figure 8: Location map of the project completed in the Entiat River in 2018.

Roaring Creek Flow Improvement Project

Sponsor: Trout Unlimited

Partners: Cascadia Conservation District, U.S. Fish and Wildlife Service, Roaring Creek Water Users Association, and Entiat Valley Orchards

Project Type: Streamflow: 1.41 cfs of instream flow to Roaring Creek

Latitude: 47° 42' 8" N

Longitude: 120° 19' 25" W

Funding Sources: Salmon Recovery Funding Board, Mid-Columbia Tributary Committee

NEPA Compliance: U.S. Fish and Wildlife Service

Reclamation's Development Costs: \$94,000

Implementation Costs: \$600,000

Project Description: Roaring Creek Flow Improvement Project is a salmonid habitat project in the lower Entiat River near Ardenvoir, Washington. Cascadia Conservation District started the project in cooperation with Reclamation. As the project progressed, issues surrounding water rights became more difficult. Cascadia Conservation District turned the project over to Trout Unlimited due to their significant experience in water rights issues.

Project implementation consisted of moving the point of diversion for Entiat Valley Orchards (ERV) and Roaring Creek Water Users Association (RCWUA) from Roaring Creek to the Lower Mainstem Entiat River and a new irrigation well. This action eliminated aging irrigation delivery infrastructure and allowed the opportunity for new efficient delivery systems to be installed for the water users. The project eliminated a channel-spanning diversion on Roaring Creek, approximately 9,500 feet of antiquated pipe, and leaking distribution boxes. The project included installation of a water intake, irrigation well, and three efficient water delivery systems. This project will provide water users with an adequate and reliable supply of water while creating 1.41 cfs of increased instream flow to Roaring Creek. Enhanced instream in Roaring Creek flows will directly benefit Chinook salmon, steelhead, bull trout, cutthroat trout, and other fish and wildlife species. Trout unlimited completed the project in September 2018.



Figure 9: Project map shows the newly created diversion and well. It also shows the two eliminated diversions from Roaring Creek.



Photograph 28: Pre-project photograph of Roaring Creek Diversion looking upstream. The diversion completely blocks the channel.



Photograph 29: Construction photograph shows the new efficient water delivery system being installed.



Photograph 30: Post-project view shows the newly installed fish screen on the new surface diversion from the Entiat River near the hatchery diversion.

Wenatchee River Subbasin

The Wenatchee River (HUC 17020011) is a tributary to the Columbia River at RM 468.4 and has a drainage area of about 1,350 square miles. There is a diversion weir at Wenatchee RM 17.5 serving the Public Utility District and Wenatchee Reclamation District. In 2018, two projects were completed in the Wenatchee River to improve channel complexity and riparian enhancement.

ESA-listed fish species present in the river include UCR spring-run Chinook salmon (endangered) and UCR steelhead trout (threatened). Also present are UCR summer/fall-run Chinook salmon (not listed). The Yakama Nation has a coho salmon reintroduction program in the subbasin.

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

Projects

- Nason 2.3 Project
- Upper White Pine Floodplain Reconnection Project

Sponsor

- Chelan County Natural Resources Department

Partners

- Chelan Douglas Land Trust
- U.S. Forest Service
- Chelan Public Utility District #1
- Burlington Northern Santa Fe Railroad

Funding Sources

- Washington Salmon Recovery Funding Board
- Bonneville Power Administration
- Priest Rapids Coordinating Committee
- Washington Department of Ecology Floodplains by Design Program

Table 11: Reclamation's total expenditures for completed projects in the Wenatchee River subbasin.

Subbasin	Expenditures
Wenatchee River	\$3.7 Million

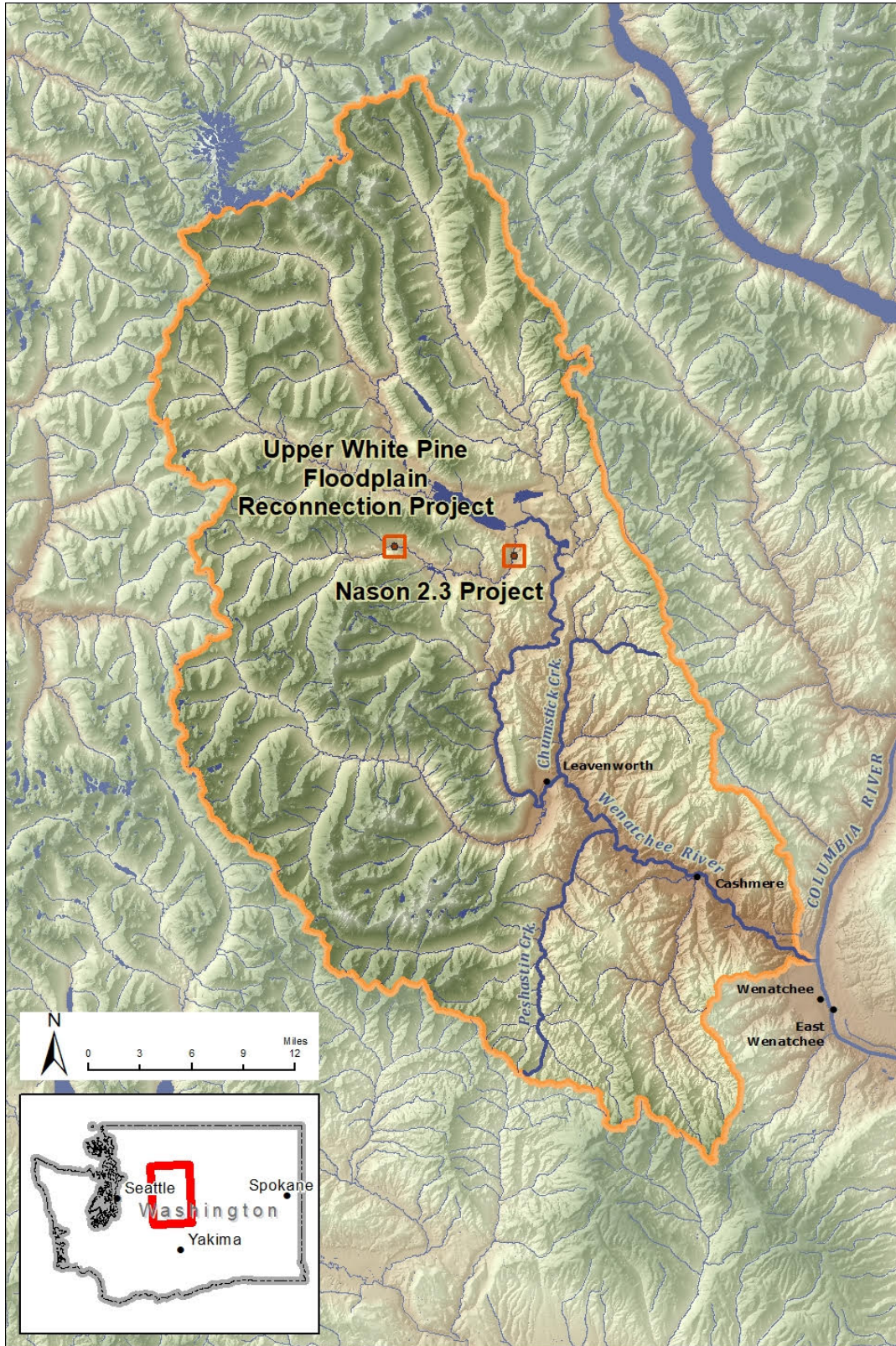


Figure 10: Location map of the projects completed in the Wenatchee River in 2018.

Nason 2.3 Project

Sponsor: Chelan County Natural Resources Department

Partner: Chelan Douglas Land Trust

Project Type: Channel Complexity: Reconnecting a 2,325-foot-long side channel to the mainstem

Latitude: 47° 47' 1" N

Longitude: 120° 42' 57" W

Funding Sources: Washington Salmon Recovery Funding Board, Bonneville Power Administration

NEPA Compliance: Washington Salmon Recovery Funding Board, Bonneville Power Administration

Reclamation's Development Costs: \$15,000

Implementation Costs: \$420,000

Project Description: The goal of this project was to provide high flow and temperature refugia, as well as year-round rearing habitat, for juvenile spring Chinook salmon and steelhead in Lower Nason Creek.

To achieve this, there were three main project tasks:

- 1) Reconnecting a 2,325-foot-long side channel to the mainstem. This was done with excavation and the construction of two engineered log structures on Nason Creek.
- 2) Increasing floodplain activation frequency and duration. There is expected to be an increase of 2.2 acres at the 1-year event, 4.04 acres at the 2-year event, and greater than 15 acres at the 10-year event.
- 3) Providing juvenile spring Chinook salmon low flow and over-winter off-channel habitat.



Photograph 31: Downstream view during construction at Nason Creek shows the two engineered log jams being installed, as well as the entrance location to the new side channel (see lower right of photograph) prior to activation.



Figure 11: Post-project view shows the completed engineered log jam across Nason Creek from the side channel entrance. Flow is from left to right.



Photograph 32: Post-project view shows the completed side channel along with the newly installed large woody material. River flow is from left to right.



Figure 12: Post-project view shows the side channel flowing back into the main channel of Nason Creek.

Upper White Pine Floodplain Reconnection Project

Sponsor: Chelan County Natural Resources Department

Partners: U.S. Forest Service, Chelan Public Utility District #1, Burlington Northern Santa Fe Railroad

Project Type: Channel Complexity, Riparian Enhancement

- Channel Complexity: 2,900 feet
- Riparian Enhancement: 2,900 feet of newly planted vegetation

Latitude: 47° 47' 13" N

Longitude: 120° 51' 53" W

Funding Sources: Priest Rapids Coordinating Committee, Washington Salmon Recovery Funding Board, Washington Department of Ecology Floodplains by Design Program

NEPA Compliance: U.S. Forest Service, Reclamation

Reclamation's Development Costs: \$3.657 Million

Implementation Costs: \$3.15 Million

Project Description: The Upper White Pine Floodplain Reconnection Project removed anthropogenic site impacts (levee and infrastructure) to restore floodplain connectivity, channel migration processes, and improved instream aquatic habitat in Nason Creek (between RM 13.30 and RM 13.85). Within the project area, Nason Creek was artificially confined by two riprap lined levees that protect the Chelan Public Utility District #1 powerlines on river left and the Burlington Northern Santa Fe Railroad on river right. Channelization had created an incised channel which resulted in habitat simplification and disruption of natural stream channel processes, such as floodplain inundation, channel migration, sediment deposition, and large wood recruitment. These impacts reduced the quantity, quality, and access to stream, wetland, and off-channel habitats within the project area.

The completed project removed approximately 0.50 mile of the river left levee and restored stream channel meanders to increase sinuosity and reduce confinement. These actions will increase the flood prone area by 10 to 27 acres (2-year to 100-year event, respectively). This project also added large woody material to increase pool quality and quantity and will increase the availability of off-channel rearing. Increasing access to floodplain and off-channel habitat for ESA-listed juvenile steelhead and spring Chinook salmon will improve rearing (feeding/foraging) and provide refugia from high water flows and predators. To accommodate restoration actions, six Chelan Public Utility District power poles were removed, and that section of transmission line was relocated to White Pine road.



Figure 13: Aerial view of the project area prior to implementation. Flow is left to right. The powerline corridor is parallel to the river to the north and the railroad is to the south.



Photograph 33: Pre-project photograph shows the typical condition of the river prior to construction.



Photograph 34: Overhead view during construction after Nason Creek was diverted to the new channel.



Photograph 35: Post-construction photograph shows large wood and horizontal willow plantings along the left bank of the new channel.