RECLAMATION

Managing Water in the West

2014 List of Tributary Habitat Projects Completed for the 2010 Federal Columbia River Power System Biological Opinion

U.S. Department of the Interior
Bureau of Reclamation
Pacific Northwest Region
Columbia/Snake River Office
Boise, Idaho

June 2015

U.S. DEPARTMENT OF THE INTERIOR

PROTECTING AMERICA'S GREAT OUTDOORS AND POWERING OUR FUTURE

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

MISSION OF THE 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: The new bridge installed across Pole Creek replaced a culvert that was restricting fish passage.

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Acronyms and Abbreviations

BA	Biological Assessment
BiOp	Biological Opinion
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe
BPA	Bonneville Power Administration
CCD	Cascadia Conservation District
CCNRD	Chelan County Natural Resources Department
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CRP	Columbia River Program
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
CWA	Clean Water Act
DSL	Department of State Lands
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
gpm	gallons per minute
GRMW	Grande Ronde Model Watershed Project
GSWCD	Grant Soil and Water Conservation District
IDFG	Idaho Department of Fish and Game
IDIQ	Indefinite Delivery, Indefinite Quantity
LiDAR	Light Detection and Radar
LSWCD	Lemhi Soil and Water Conservation District
LWM	large wood material
MCR	Middle Columbia River
MSRF	Methow Salmon Recovery Foundation
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NOAA Fisheries Service	National Oceanic and Atmospheric Administration National Marine Fisheries Service

NRCS	Natural Resources Conservation Service
ODFW	Oregon Department of Fish and Wildlife
OSC	Office of Species Conservation
OWEB	Oregon Watershed Enhancement Board
POD	point of diversion
POW	Pipe of Washington
PRCC	Priest Rapids Coordinating Committee
PUD	Public Utility District
PWUA	Pioneer Water User Association
RCO	Recreation and Conservation Office
Reclamation	U.S. Bureau of Reclamation
RM	river mile
ROE	Right of Entry
RPA	Reasonable and Prudent Alternative
ShoBan Tribes	Shoshone-Bannock Tribes
SHPO	State Historic Preservation Office
TU	Trout Unlimited
UCR	Upper Columbia River
UCSRB	Upper Columbia Salmon Recovery Board
USBWP	Upper Salmon Basin Watershed Program
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USWCD	Union Soil and Water Conservation District
WCC	Washington Conservation Commission
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
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 2010 Supplemental Federal Columbia River Power System Biological Opinion (FCRPS BiOp).[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 all meant to be within the framework of the FCRPS RPA or related commitments. This document covers only habitat improvement projects with Reclamation involvement.[2]

ESA-listed fish species present in the Columbia River Basin include Upper Columbia River (UCR) spring Chinook salmon (*Oncorhynchus tshawytscha*) (endangered), Mid-Columbia River (MCR) spring Chinook salmon (*O. tshawytscha*) (threatened), Snake River spring/summer Chinook salmon (*O. tshawytscha*) (threatened), steelhead trout (*O. mykiss*) (threatened), Snake River sockeye salmon (*O. nerka*) (endangered), and Upper Columbia River bull trout (*Salvelinus confluentus*) (threatened). Pacific lamprey (*Entosphenus tridentatus*) are not ESA-listed, but are afforded actions through commitments in the 2008 Fish Accords agreement with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), and the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation).

Habitat improvement projects in various Columbia River tributaries are one aspect of the RPA. Rehabilitation or improvement of altered stream habitat and formation of new habitat are generally accepted methods that benefit fish populations. 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)].

[2] For more information, see www.salmonrecovery.gov.

Figure 1. Map of 2014 Supplemental 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 identification, design, and construction of stream-habitat improvement projects that primarily address streamflow, access, entrainment, and channel complexity limiting factors. Approximately 20 to 30 projects are completed annually at a total cost to Reclamation ranging from $7.0 to $9.0 million, with 60 to 80 projects in different stages of development 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 endangered 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, such as assessing, modeling, designing, and verifying designs so that the projects are sound from an engineering perspective and should perform hydraulically 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 are 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 basin costs are included in each basin section and are repeated for each 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 2014 only. With 60 to 80 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.

2014 Activities

In 2014, Reclamation and partners completed 24 fish-habitat improvement projects in the following eight subbasins of the Columbia River Basin:

- Salmon River Basin
    - Lemhi River
    - Upper Salmon River
- Grande Ronde River Basin
    - Grande Ronde River
- John Day River Basin
    - Upper John Day River
    - Middle Fork John Day River
- Upper Columbia River Basin
    - Entiat River
    - Methow River
    - Wenatchee River

Objectives 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 in-stream 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 for the 2014 projects are listed under each subbasin in which they were active.

SALMON RIVER BASIN

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 works in four subbasins: the Upper Salmon (including the Yankee Fork), the Lemhi, the Pahsimeroi, and the Little Salmon. In 2014, five projects were completed in the Lemhi River subbasin and five projects were completed in the Upper Salmon River subbasin.

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).

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Salmon River Basin	$1,180,700

Lemhi River Subbasin

The Lemhi River (HUC 17060204) is a tributary to the Salmon River, and enters at RM 258.5. The basin contains a drainage area of about 1,270 square miles. In 2014, five projects were completed in the subbasin that improved fish passage, streamflow, and riparian habitat.

ESA-listed fish 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 may be requested through the Columbia/Snake Salmon Recovery Office, 208-378-5057.

Projects

- Lemhi - Hawley Creek Culvert To Bridge Access Enhancement Project (County)
- Lemhi L-1 Diversion Dam Removal and Access and Flow Enhancement Project
- Lemhi L-6 Diversion Stream Flow Optimization Project
- Lemhi - Lee Creek, Big Eightmile Creek Reconnects Habitat Enhancement and Reconnection/Lemhi River Flow Enhancement Project
- Upper Lemhi River (Amonson Ranch) Side Channel Habitat Enhancement Project

Sponsors

- Idaho Department of Fish and Game (IDFG)
- Trout Unlimited (TU)
- The Nature Conservancy (TNC)

Partners

- IDFG
- State of Idaho Office of Species Conservation (OSC)
- Landowners
- TU
- Natural Resource Conservation Service (NRCS)
- WD-74
- Lemhi County
- Lemhi Soil and Water Conservation District (LSWCD)
- Upper Salmon Basin Watershed Program (USBWP)
- Idaho Transportation Department (ITD)
- Shoshone-Bannock Tribes (ShoBan Tribes)
- Formation Capitol

Funding Sources

- Bureau of Reclamation (Reclamation)
- Bonneville Power Administration (BPA)
- NOAA Fisheries

- Idaho Transportation Department (ITD)
- Shoshone-Bannock Tribes (ShoBan Tribes)
- Formation Capitol

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Lemhi River	$525,400

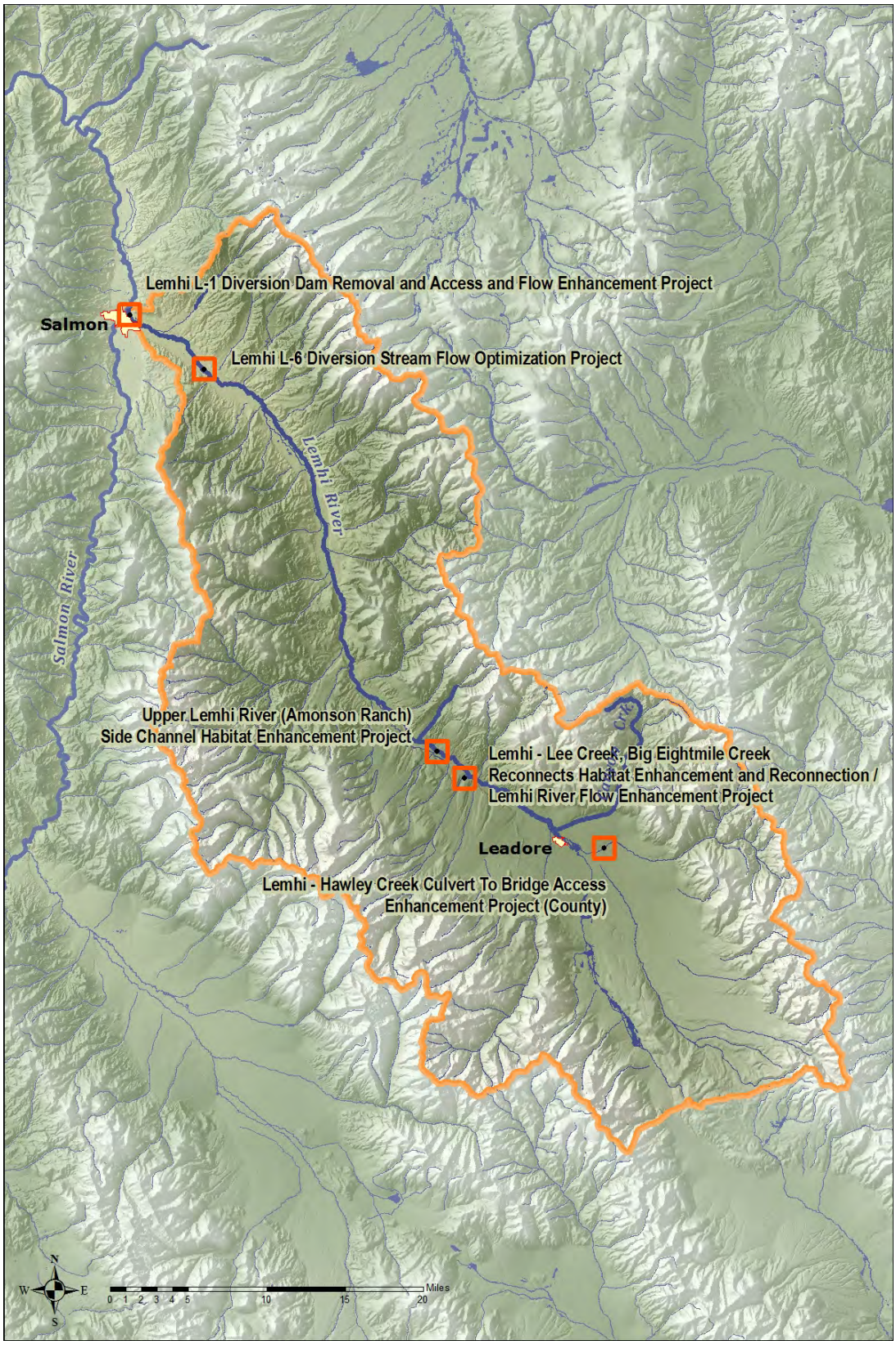


Figure 2. Location map of the projects completed in the Lemhi River Subbasin in 2014

Lemhi - Hawley Creek Culvert to Bridge Access Enhancement Project (County)

Project Name: Lemhi - Hawley Creek Culvert To Bridge Access Enhancement Project (County)	
Project Type: Fish Passage	
Project Sponsor: LSWCD	
Project Design: NRCS	
Landowner(s): Lemhi County	
Partners: Lemhi County, LSWCD, OSC, USBWP	**Reclamation Development Costs:** $3,000
Funding Source(s): BPA (Idaho Accord) and NMFS (PCSRF)	**Implementation Cost:** $ 124,335
Project Location	**State:** Idaho **County:** Lemhi **Stream:** Lemhi River
	Latitude: 44 40' 19.31" N **Longitude:** -113 18' 06.11" W **Local Landmark:** Hawley Creek Road
	Township: 16N **Range:** 26E **Section:** 36 **¼ Section:**
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding:** Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** August 12, 2014 **Construction Completion Date:** September 9, 2014
Contracting:	**Advertised:** June 2014 **Awarded:** July 2014
Biological Benefit:	**Species:** Chinook salmon, steelhead, bull trout **Benefit Type:** Improved fish passage
Metric: Provide 0.8 miles of improved fish passage in Hawley Creek	
Project Objectives and Description: The objective of the project was to improve fish passage in Hawley Creek, a tributary to the Lemhi River. This was accomplished by removing a 6-foot-diameter culvert that presented a barrier for fish migrating up Hawley Creek. The 6-foot-diameter steel county road culvert in Hawley Creek was removed and replaced with a 24-foot by 40-foot modular steel bridge. The design included rehabilitation of the stream channel to a more natural condition for improved fish habitat.	
Design, Permitting, and Construction Issues: Design for the project was completed by Fluckiger Consulting. Reclamation provided LiDAR and PHABSM flow data for use in design development. Environmental compliance was completed by OSC with assistance from Reclamation with survey for cultural resources. The OSC also provided overall project	

coordination. Funding for construction was provided by BPA (Accord) and NMFS (PCSRF) funding. The LSWCD administered construction contracts and managed construction. Construction was completed during low-flow conditions.

Gallery

Photograph 1. This culvert under the county road on Hawley Creek restricted fish passage during various flow conditions and was removed as part of the project.

Photograph 2. Hawley Creek Bridge after construction; fish passage is greatly enhanced during all flows.

Lemhi L-1 Diversion Dam Removal and Access and Flow Enhancement Project

Project Name: Lemhi L-1 Diversion Dam Removal and Access and Flow Enhancement Project	
Project Type: Fish Passage	
Project Sponsor: Trout Unlimited (TU)	
Project Design: Natural Resource Conservation Service (NRCS)	
Landowner(s): Private	
Partners: Landowners, TU, NRCS	**Reclamation Development Costs:** $489,800
Funding Source(s): Reclamation	**Implementation Cost:** $ 321,267
Project Location:	**State:** Idaho **County:** Lemhi **Stream:** Lemhi River
	Latitude: 45 10' 53.48" N **Longitude: -**113 53' 20.76" W
	Township: 21N **Range:** 22E **Section: 5 ¼ Section:** SW of NW
Project Status: Complete	
Project Phase: Complete	
Milestones:	**Funding***:* Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** April 2014 **Construction Completion Date:** September 2014
Contracting:	**Advertised:** March 2014 **Awarded:** April 2014
Biological Benefit:	**Species:** Chinook salmon, steelhead, bull trout **Benefit Type**: Improved fish passage
Metric: Provide 6 miles of improved access fish passage in Lemhi River. Provides 0.23 cfs increased flow to the Lemhi River for 0.5 miles during irrigation season from relinquished water rights and well conversions. Provide 2 cfs of increased flow to the Lemhi River for 0.5 miles during irrigation season from elimination of high flow diversions.	
Project Objectives and Description: The objective of the project was to improve fish passage in the Lemhi River, a major tributary to the Salmon River. A rock push-up dam was eliminated, the point of diversion was moved downstream, and a pump station and fish screen was installed to allow withdrawal of irrigation water from the Lemhi River. High-flow diversions were eliminated, which took place during the entire irrigation season, and a portion of the diversion from the Lemhi River was eliminated through the abandonment of water rights and a well conversion. Historically, L-1 was the first diversion dam in the Lemhi encountered by migrating steelhead, Chinook, and bull trout. The project entailed the abandonment of a large rock diversion dam and gravity-flow irrigation ditch. The point of diversion for two irrigators was	

transferred 0.4 mile downstream to a location where a pump station, portable fish screen, pipelines, and sprinklers were installed. Two of the L-1 water users relinquished their Lemhi surface rights in favor of irrigating from shallow wells established on their property. The remaining users chose to abandon their water rights.

Design, Permitting, and Construction Issues: Project development and coordination was completed by Reclamation. Final design for the pump station and sprinkler systems was completed by the NRCS. Environmental compliance was completed by Reclamation. Funding for project coordination / development, construction, and TU sponsorship was provided by Reclamation. As project Sponsor, TU administered funding, managed construction and acquired Landowner Agreements. Construction was completed in two phases. Phase 1 (pump, screen, irrigation system) was completed in the spring of 2014. Phase 2 (Irrigation wells and water right abandonment) was completed in late summer of 2014 after filing forms with IDWR and obtaining permits.

Gallery

Figure 3. Lemhi River L-1 project overview

Photograph 3. Lemhi River at L-1 Diversion before the project, with the push-up dam in place

Photograph 4. Lemhi River at L-1 after the project, with the push-up dam eliminated

Photograph 5. L-1 pump station with fish screen at the new point of diversion

Photograph 6. New L-1 pump station

Photograph 7. New L-1 fish screen and pump intake

Photograph 8. L-1 Sprinklers provide efficiency, which results in a lower diversion rate

Lemhi L-6 Diversion Stream Flow Optimization Project

Project Name: Lemhi L-6 Diversion Stream Flow Optimization Project	
Project Action: Install Remote Monitoring / Control Equipment	
Project Sponsor: Bureau of Reclamation	
Project Design: Bureau of Reclamation	
Landowner(s): Private	
Partners: WD- 74	**Reclamation Development Costs:** $2,000
Funding Source(s): Reclamation	**Implementation Cost:** $6,000
Project Location	**State:** Idaho **County:** Lemhi **Stream:** Lemhi River
	Latitude: 45 07'43.49" N **Longitude: -**113 47' 39.99" W
	Township: 21N **Range:** 22E **Section:** 24 **¼ Section:**
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** NA **Construction Start Date:** September 10, 2014 **Construction Completion Date:** September 11, 2014
Biological Benefit:	**Species:** Spring/summer Chinook, steelhead, bull trout **Benefit Type:** Flow enhancement
Metric: Insure minimum flow of 20 to 35 cfs is maintained in the Lemhi River below the L-6 diversion for a distance of 6.5 miles to the confluence with the Salmon River.	
Project Objectives and Description: The objective was to insure minimum flow necessary for fish passage is maintained in the 7-mile lower reach of the Lemhi River from the L-6 diversion downstream to the confluence with the Salmon River. This was accomplished by installing a digital data logger, radio control, digital cell modem, and a secondary drive system to automate the L-6 head gate. In addition, remote monitoring components were installed to measure water and to provide more-efficient operation of the L-6 Diversion and headgate structure. The system is set up to keep the flows in the Lemhi River as first priority and flows to the L-6 Diversion as second priority.	
Design, Permitting, and Construction Issues: Reclamation designed the system and installed automation features to existing head gate facilities. Work was completed without disturbance to the stream channel; therefore, no permits were required.	

Gallery

Figure 4. Aerial view of the Lemhi River and L-6 diversion/headgate structure

Photograph 9. With the headgate automated, the system will ensure that flows in the river receive first priority and the L-6 diversion flows are second priority.

Lemhi - Lee Creek, Big Eightmile Creek Reconnects Habitat Enhancement and Reconnection / Lemhi River Flow Enhancement Project

Project Name: Lemhi - Lee Creek, Big Eightmile Creek Reconnects Habitat Enhancement and Reconnection / Lemhi River Flow Enhancement Project	
Project Type: Flow, barrier, channel complexity, riparian	
Project Sponsor: TNC	
Project Design: Geum Environmental, Rumsey Engineers, West Water Consultants, Stream Basics, ITD	
Landowner(s): Beyeler Ranches, Ellsworth Angus Ranch, Tyler Ranch	
Partners: Landowners, TNC, OSC, BPA, NMFS, ITD, Formation Capitol, IDFG, ShoBan Tribes	**Reclamation Development Costs:** $27,600
Funding Source(s): BPA (Accord, NMFS (PCSRF), ShoBan Tribes, ITD, Formation Capitol	**Implementation Cost:** $ 1,327,000
Project Location:	**State:** Idaho **County:** Lemhi **Stream:** Lemhi River
	Latitude: 44 44' 32.02" N **Longitude: -**113 28' 43.31" W
	Township: 16N **Range:** 25E **Section:** 4 **¼ Section:**
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** November, 2010 **Construction Completion Date:** October 31, 2014
Biological Benefit:	**Species:** Chinook salmon, steelhead, bull trout **Benefit Type**: Barrier removal, flow enhancement, habitat improvement, riparian enhancement
Metric: Removed eight partial barriers; replaced one culvert with a bottomless arch; increased stream access on 3 river miles; improved stream complexity on 1 river mile; enhanced riparian habitat on 3.5 river miles; increased flow by 14.5 cfs during the irrigation season, divided between Big Springs, Big Eightmile Creek, Lee Creek, and Lemhi River; eliminated 29.5 cfs of high-flow diversions during the April-through-June runoff period, installed one fish screen and eliminated another fish screen; eliminated a ditch entrainment at four locations	
Project Objectives and Description: The objective of the project was to re-establish connection of the lower reaches of both Lee Creek and Big Eightmile Creek with the Lemhi River and improve stream habitat on the Cotton Ranch property containing lower Lee Creek,	

upon which TNC holds a conservation easement. This was a complex project involving the transfer/exchange of water rights from multiple locations and landowners. Lee Creek and Big Eightmile Creek, both tributaries to the Lemhi, were the primary beneficiaries of habitat features/actions, including three barrier removals (an inverted siphon on Big Eightmile Creek, the highway culvert replacement on Lee Creek, and stream channel reconstruction on Lee Creek). This also included increasing in-stream flow in both Lee Creek and Big Eightmile Creek by reducing irrigation water withdrawal and utilizing improved pump station/sprinklers/pivots systems. The Lemhi River and another tributary, Big Springs Creek, also benefitted from increased flow associated with water right transfers and improvements in irrigation efficiency. Water that was diverted from these streams for irrigation is now benefitting in-stream flow.

Design, Permitting, and Construction Issues: The complex task of project development and coordination was handled by TNC. Private consultants and ITD engineers were enlisted to provide design for a siphon under Big Eightmile Creek, State Highway 28 Lee Creek culvert, pump station, pipeline/sprinkler systems, stream channel construction, vegetation planting, and environmental compliance. Reclamation provided LiDAR and PHABSM flow data for use in design and planning, assisted with environmental compliance by completing cultural resource survey/SHPO consultation, ESA consultation, acquisition of stream permits, and provided equipment for riparian vegetation irrigation. TNC acquired funding for project coordination, design, and implementation from various sources such as BPA, NMFS, FCC, ShoBan Tribes, IOSC, and ITD. As project Sponsor, TNC administered funding, managed construction with multiple contractors and acquired landowner agreements. Construction was completed in phases over the course of two years as permits, contracts and agreements with landowners were obtained.

Gallery

Figure 5. This view shows the many stream habitat improvements in Lee Creek, including the reconnection with the Lemhi River.

Figure 6. This view shows the habitat improvements in Big Eightmile Creek, including the reconnection with the Lemhi River.

Upper Lemhi River (Amonson Ranch) Side Channel

Project Name: Upper Lemhi River (Amonson Ranch) Side Channel	
Project Type: Channel complexity	
Project Sponsor: Idaho Dept. of Fish and Game (IDFG)	
Project Design: IDFG, Intermountain Aquatics	
Landowner(s): Amonson Family	
Partners: IDFG, OSC, Landowner	**Reclamation Development Costs:** $3,000
Funding Source(s): NMFS (PCSRF), BPA (Accord)	**Implementation Cost:** $ 122,500
Project Location:	**State:** Idaho **County:** Lemhi **Stream:** Lemhi River
	Latitude: 44 46' 05.55" **Longitude: -**113 30' 44.70" **Local Landmark:** Approx. 10 miles S. of Leadore
	Township: 17N **Range:** 25E **Section:** 29 **¼ Section:**
Project Status: Complete	
Project Phase: Complete	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** July 2014 **Construction Completion Date:** November 2014
Contracting:	**Advertised:** June 2014 **Awarded:** June 2014
Biological Benefit:	**Species:** Chinook salmon, steelhead, bull trout **Benefit Type:** Side channel connection and riparian enhancement
Metric: Completed 750 feet of channel complexity and riparian enhancement	
Project Objectives and Description: The objective of the project was to improve side channel and floodplain connectivity, riparian condition, fish habitat complexity, and spawning/rearing habitat. The project entailed continuation (Phase 2) of project components that were part of the Upper Lemhi River Side Channel Project that were not completed in 2012. Phase 2 actions include the removal of an old wood bridge; filling of a portion of former Lemhi River channel and reclaimed as pasture; construction of 300 feet of additional side channel; and installation of rock weirs and ditch construction. In addition, root wads and engineered logjams were strategically placed in 450 feet of existing side channel. Riparian vegetation was planted along streambanks, disturbed areas were hydroseeded, and riparian fencing was relocated to exclude livestock.	
Design, Permitting, and Construction Issues: There were no issues. Project funding was provided by the NMFS and BPA. Funding administration was provided by IDFG and	

OSC. The IDFG coordinated with landowners, completed environmental compliance, and managed construction. Reclamation provided technical assistance to the IDFG by providing LiDAR data for use in project planning and design.

Gallery

Photograph 10. Upper Lemhi River Side Channel: View of the project area before the side channel was added and the old channel was filled in.

Photograph 11. Upper Lemhi River Side Channel: View of the project area after the old channel was filled, the new channel was constructed, and complexity structures were installed.

Upper Salmon River Subbasin

The Upper Salmon River subbasin (HUC 17060201) extends from its headwaters in the Sawtooth Mountains to its confluence with the Middle Fork Salmon River, excluding the Lemhi and Pahsimeroi River subbasins. The subbasin has a drainage area of approximately 2,425 square miles. In 2014, five projects were completed in the subbasin, three in the Upper Salmon River Subbasin and two in the Upper Salmon-Yankee Fork Subbasin.

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).

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, 208-378-5057.

Projects

- Garden Creek City of Challis Diversion Access Improvement and Flow Enhancement Project
- Upper Salmon - Poison Creek Diversion Consolidation and Access and Flow Enhancement Project
- Pole Creek Culvert to Bridge Access Enhancement Project
- Yankee Fork - Forest Service Large Wood Enhancement Project
- Yankee Fork - Preacher's Cove Channel Complexity Project

Sponsors

- Custer Soil and Water Conservation District (SWCD)
- LSWCD
- IDFG

Partners

- Custer Soil and Water Conservation District (SWCD)
- City of Challis
- IDFG
- NRCS
- USBWP
- OSC
- Landowners
- ShoBan Tribes
- TU
- U.S. Forest Service (USFS)
- Simplot Corporation

Funding Sources

- BPA
- NMFS

- NRCS
- Reclamation

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Upper Salmon River, incl. the Yankee Fork	$655,300

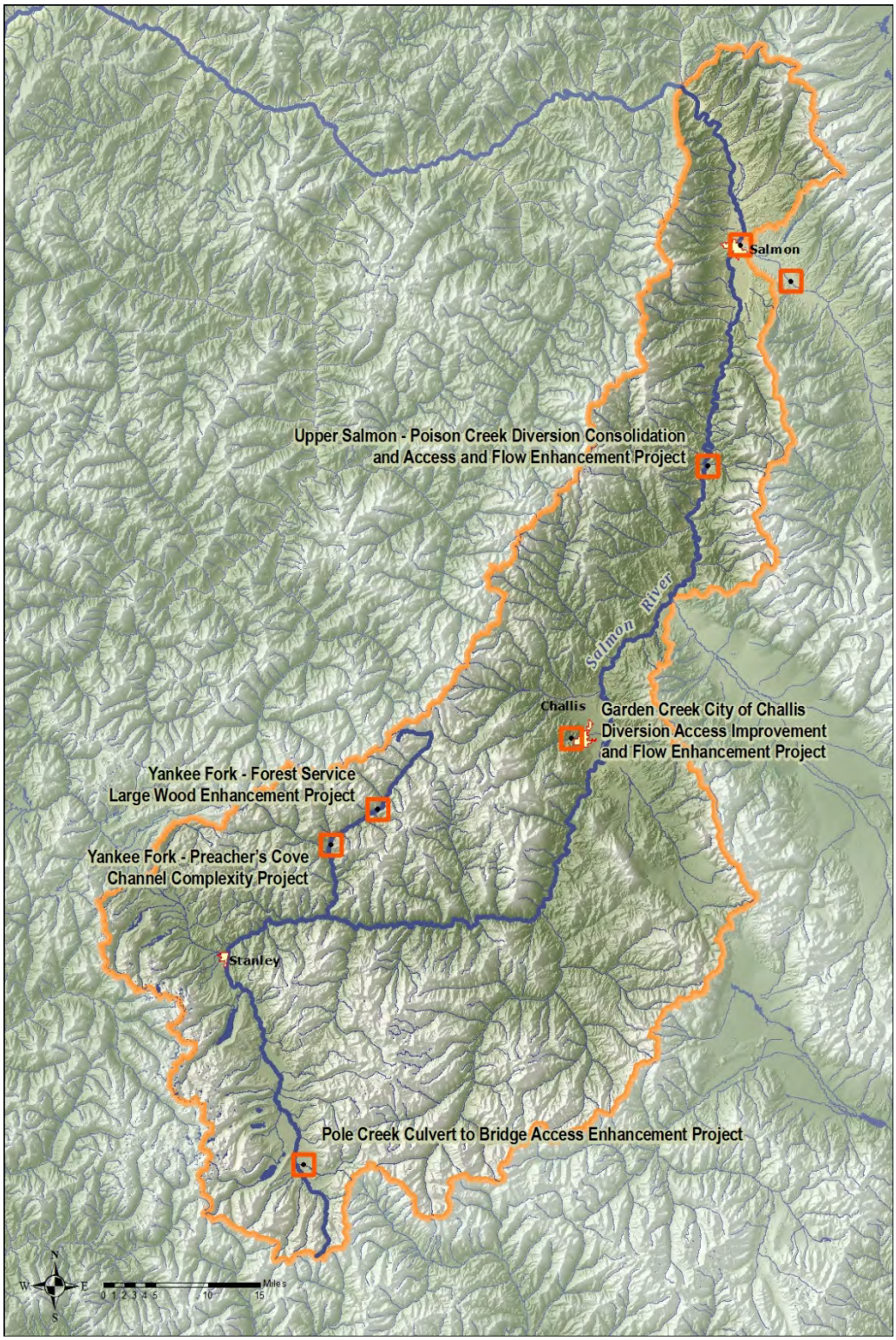


Figure 7. Location map of the projects completed in the Upper Salmon River Subbasin in 2014

Garden Creek City of Challis Diversion Access Improvement and Flow Enhancement Project

Project Name: Garden Creek City of Challis Diversion Access Improvement and Flow Enhancement Project	
Project Action: Remove two diversion structures, install one fish-passable diversion**,** **i**ncrease in-stream flow	
Project sponsor: Custer SWCD	
Project Design: Bureau of Reclamation PN Regional Office	
Landowner(s): City of Challis, Yacomella	
Partners: Custer SWCD, City of Challis, IDFG	**Reclamation Development Costs:** $156,100
Funding Source(s): BPA	**Implementation Cost:** $148,000
Project Location:	**State:** Idaho **County:** Custer **Stream:** Garden Creek
	Latitude: 44 degrees 30' 20" N **Longitude:** -114 degrees 15' 12" W
	Township: 14N **Range:** 19E **Section:** 32 **¼ Section:** NW
Project Status: Complete	
Project Phase: Monitoring	
Milestones	**Funding:** Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** September 2014 **Construction Completion Date:** October 2014
Biological Benefit	**Species:** Steelhead and Chinook **Benefit Type:** Access and flow
Metric: 1.4 miles of access, increase flow by 1.58 cfs for 3.4 miles	
Project Objectives and Description: The project included removal of the City of Challis municipal diversion structure that was impassible for fish. A nearby diversion (just upstream) that diverted water into an irrigation ditch was also removed. A new diversion structure was established upstream that allows fish passage. Groundwater wells were drilled to provide water to the City of Challis, reducing the amount of water diverted from Garden Creek. The city will maintain the right to divert water in case of emergency. The IDFG screen shop will install a fish screen on the new diversion before the next irrigation season.	
Design, Permitting, and Construction Issues: There were no issues. Custer SWCD worked with City of Challis to permit the project.	

Gallery

Photograph 12. City of Challis diversion structure on Garden Creek; this structure was a complete barrier to fish movement. It was removed as part of this project.

Photograph 13. This Garden Creek diversion, located just upstream of the City of Challis diversion, was also removed.

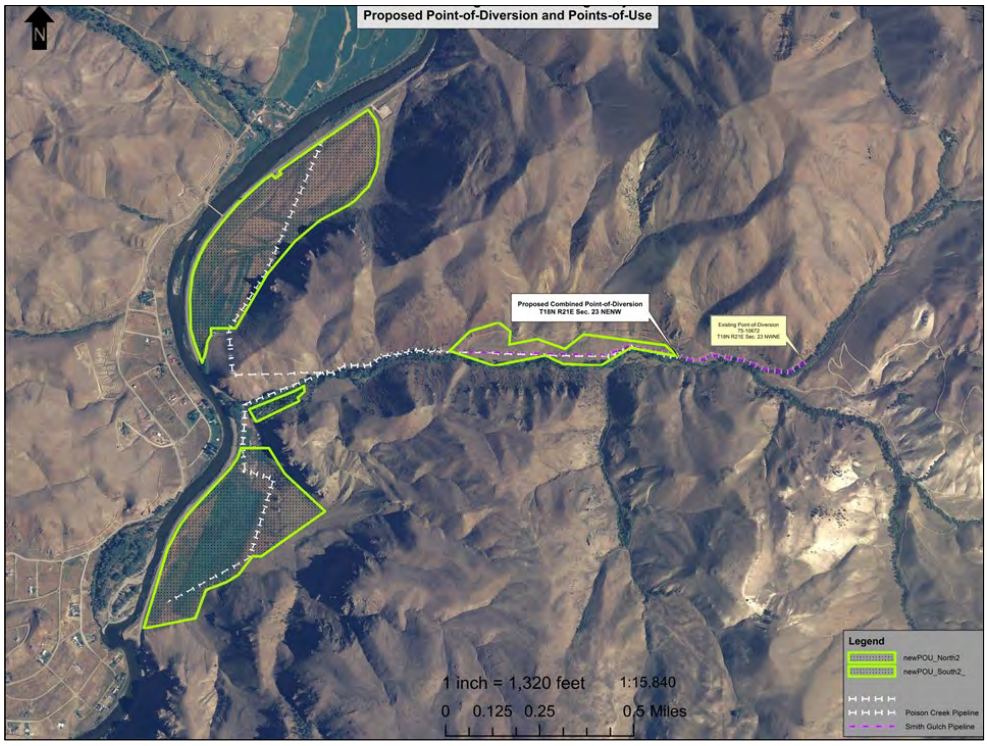
Photograph 14. A new diversion was established approximately 100 yards upstream of the old diversions. This diversion provides passage to fish at all life stages.

Photograph 15. The Garden Creek channel near the old City of Challis diversion structure The channel was re-built with additional habitat features along the existing alignment where the old diversion structures were located. Large rock was installed to hold the channel at the new grade and provide fish habitat.

Upper Salmon - Poison Creek Diversion Consolidation and Access and Flow Enhancement Project

<table>
<tr><td colspan="2">Project Name: Upper Salmon - Poison Creek Diversion Consolidation and Access and Flow Enhancement Project</td></tr>
<tr><td colspan="2">Project Action: Channel access</td></tr>
<tr><td colspan="2">Project Sponsor: LSWCD, IDFG</td></tr>
<tr><td colspan="2">Project Design: NRCS, IDFG</td></tr>
<tr><td colspan="2">Landowner(s):</td></tr>
<tr><td>Partners: NRCS, USBWP,OSC, Landowner</td><td>Reclamation Development Costs: $3,000</td></tr>
<tr><td>Funding Source(s): BPA (Accord), NMFS (PCSRF), NRCS (EQUIP)</td><td>Implementation Cost: $ 438,200</td></tr>
<tr><td rowspan="3">Project Location:</td><td>State: Idaho County: Lemhi Stream: Poison Creek</td></tr>
<tr><td>Latitude: 44 52’36.34” N Longitude: -113 58’ 11.86” W</td></tr>
<tr><td>Township: 18N Range: 21E Section: 22 ¼ Section: SENW</td></tr>
<tr><td colspan="2">Project Status: Complete</td></tr>
<tr><td colspan="2">Project Phase: Monitoring</td></tr>
<tr><td>Milestones:</td><td>Funding: Secured
Design: Completed
Permitting: Completed
Construction Start Date: Oct 2013
Construction Completion Date: May 2014</td></tr>
<tr><td>Biological Benefit:</td><td>Species: Spring/Summer Chinook, steelhead , bull trout Benefit Type: Flow Enhancement , barrier removal, elimination of entrainment</td></tr>
<tr><td colspan="2">Metric: 9.2 cfs flow added to Poison Creek, 1.6 miles of habitat made accessible, three unscreened diversions removed and one passable diversion with fish screen constructed</td></tr>
<tr><td colspan="2">Project Objectives and Description: The objectives of this project were: (1) increase water quantity in Poison Creek, (2) increase access to habitat, (3) eliminate entrainment of fish in ditches, and (4) maintain cooler water temperature in Poison Creek. Objectives were achieved in the main stem of Poison Creek by consolidating three diversions into a single point of diversion, installing a fish screen, improving efficiency of water delivery/use by installation of 15,358 feet of pipeline, and installing of three pivots and six inline pod systems. In Smith Gulch, a tributary of Poison Creek, a diversion was replaced and 4,622 feet of pipeline and six inline pod systems were installed.</td></tr>
<tr><td colspan="2">Design, Permitting, and Construction Issues: There were no issues. NRCS designed the pipeline and irrigation system. IDFG designed the fish screen/diversion. USBWP/OSC coordinated the project and completed environmental compliance. Reclamation completed the survey for cultural resources and Section 106 consultation with Idaho SHPO. As project Sponsor, the LSWCD administered funding and managed construction.</td></tr>
</table>

Gallery



Photograph 16. This shows the project features, which resulted in 9.2 cfs of additional flow in the lower reaches of Poison Creek.

Photograph 17. One of the passage-blocking diversions that was removed by the project

Photograph 18. The new consolidated diversion along with the efficiency improvements ensures that 9.2 cfs are available for fish passage and habitat.

Photograph 19. A new fish screen was installed at the consolidated diversion to ensure that fish remain in the stream.

Photograph 20. Efficiency improvements include pod sprinklers, which allow for much lower diverted flows.

Photograph 21. Efficiency improvements also include pivot sprinklers, which require lower diverted flows.

Pole Creek Culvert to Bridge Access Enhancement Project

Project Name: Pole Creek Culvert to Bridge Access Enhancement Project	
Project Action: Remove culvert, re-establish historical stream channel, install bridge	
Project Sponsor: ShoBan Tribes	
Project Design: Bureau of Reclamation PN Regional Office	
Landowner(s): Henslee	
Partners: Custer SWCD, USFS-SNRA	**Reclamation Development Costs:** $130,700
Funding Source(s): BPA	**Implementation Cost:** $210,000
Project Location:	**State:** Idaho **County:** Blaine **Stream:** Pole Creek
	Latitude: 43 55' 28" N **Longitude: -**114 47' 40" W
	Township: T 7 N **Range:** R 14 E **Section:** S 22 **¼ Section:** NENE
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** September 2014 **Construction Completion Date:** October 2014
Biological Benefit:	**Species:** Chinook salmon, steelhead **Benefit Type:** Access, improved habitat
Metric: Partial barrier removal increased access 3.6 mile; improved mainstem channel habitat for .06 miles.	
Project Objectives and Description: An existing culvert that did not meet fish-passage criteria was removed and replaced with a bridge. As the culvert was removed, an historic river channel (300 feet) was reconstructed and a straightened section of stream channel was closed off. The project is related to several other projects in Pole Creek, including barrier removals, riparian fencing, a new irrigation diversion structure, new fish screen, converting stream diversions to groundwater diversions, and reconfiguring irrigation systems. The result will be increased flow in Pole Creek, with better passage and habitat conditions.	
Design, Permitting, and Construction Issues: Permitting was complicated and delayed by additional Blaine County layer of approval.	

Gallery

Photograph 22. This culvert providing access across Pole Creek was removed because it did not meet fish-passage criteria.

Photograph 23. This portion of the historic channel was cut off when the culvert was installed years ago. The channel was re-constructed as the culvert was removed. The photo was taken just prior to Pole Creek being moved back into it. Wetland sod has been placed along the bank, and willows were added later.

Photograph 24. Looking upstream along the same alignment as the previous photo, after water was returned to the historic channel alignment
Willow cuttings were planted along both sides of the new channel, and fencing installed to keep livestock out of the area.

Photograph 25. Looking upstream at the new bridge installed across Pole Creek

Yankee Fork - Forest Service Large Wood Enhancement Project

Project Name: Yankee Fork - Forest Service Large Wood Enhancement Project	
Project Action: Channel complexity	
Project Sponsor: USFS	
Project Design: USFS	
Landowner(s): USFS	
Partners: ShoBan Tribes, TU, USFS	**Reclamation Development Costs:** $6,000
Funding Source(s): Reclamation, BPA (ShoBan Tribes Accord)	**Implementation Cost:** $ 111,800
Project Location:	**State:** Idaho **County:** Custer **Stream:** Yankee Fork
	Latitude: 44 24' 54.10"N **Longitude:** 114 38' 31.67" W
	Township: 13N **Range:** 16E **Section:** multiple **¼ Section:**
Project Status: Phase 1 Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Complete **Permitting:** Complete **Construction Start Date:** July 31, 2014 **Construction Completion Date:** August 13, 2014
Biological Benefit:	**Species:** Chinook, steelhead, bull trout **Benefit Type:** Restore main channel function
Metric: Enhanced complexity of 3.15 miles of channel habitat	
Project Objectives and Description: The objective of this project was to restore large-wood abundance in a 7.6-mile reach of the Yankee Fork to natural levels. Large wood and habitat complexity are lacking in the Yankee Fork due to historic logging and dredging activity associated with gold mining. The first phase of the project entailed placement of 340 trees and 70 yards of rock and gravel in a 3.15-mile section of the 7.6-mile stream reach between Jordan and Eightmile Creeks. Trees and rock were placed in the river to mimic natural recruitment from streamside, avalanche, and debris flow sources.	
Design, Permitting, and Construction Issues: There were no issues. The project lead for coordination and design of this project was USFS. Permitting was completed by USFS and TU. Funding for support of USFS and TU coordination, permitting, etc., was provided by Reclamation. Additional funding was provided by the ShoBan Tribes. Forest Service crews, TU personnel and a private contractor placed trees/rock in the stream channel. Trees were felled and placed by hand, with excavator and by helicopter. Construction of the first phase was completed in less than 2 weeks without any problems encountered.	

Gallery

Photograph 26. Placement of trees by hand in the treated reach of the Yankee Fork

Photograph 27. Placement of trees in the Yankee Fork to enhance fish habitat using an excavator

Photograph 28. Habitat was enhanced with construction of a simulated debris flow in the treated reach.

Photograph 29. The completed simulated debris flow will allow holding areas for adult fish and refuge for juvenile rearing.

Photograph 30. This view shows a portion of the treated section of the Yankee Fork after wood placement.

Photograph 31. This placement of wood simulates an avalanche that entered the stream.

Yankee Fork - Preacher's Cove Channel Complexity Project

Project Name: Yankee Fork - Preacher's Cove Channel Complexity Project	
Project Action: Channel complexity	
Project Sponsor: Trout Unlimited	
Project Design: Bureau of Reclamation	
Landowner(s): Simplot Corporation, USFS	
Partners: Simplot, BPA, ShoBan Tribes, TU, USFS	**Reclamation Development Costs:** $ 359,500
Funding Source(s): BPA (ShoBan Tribes Accord)	**Implementation Cost:** $ 200,000
Project Location:	**State:** Idaho **County:** Custer **Stream:** Yankee Fork
	Latitude: 44 22' 02.66"N **Longitude:** 114 43' 31.67"W
	Township: 12N **Range:** 15E **Section:** 17 **¼ Section:**
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Complete **Permitting:** Complete **Construction Start Date:** Sept. 2, 2014 **Construction Completion Date:** Sept. 10, 2014
Biological Benefit:	**Species:** Chinook, steelhead, bull trout **Benefit Type:** Restore main channel function
Metric: Enhanced complexity for 0.85 miles of channel habitat, added 13 log and rock structures to the Yankee Fork	
Project Objectives and Description: The objective of this project was to restore natural channel function to a section of the main Yankee Fork Channel by increasing habitat complexity. Channel complexity is currently lacking in the Yankee Fork drainage due to historic dredging activity associated with gold mining. The project entailed the placement of engineered rock (55 boulders) and wood structures (more than 100 logs) in the channel, resulting in the creation of additional spawning / rearing habitat that is more suitable for use by juvenile and adult Chinook, steelhead and bull trout. With this project, 120 yards of spawning gravel were also added to the reach.	
Design, Permitting, and Construction Issues: There were no issues. The project lead for this project was BPA. The ShoBan Tribes provided their BPA (Accord) funding for project construction. Trout Unlimited served as the project Sponsor. Reclamation provided technical assistance to BPA/TU with development of project design. BPA was the lead for NEPA and ESA compliance. Reclamation provided private consultants to assist BPA and TU with completion of NEPA/ESA compliance (HIP 3 BiOp documents, wetland delineation, Section 404 CWA application, construction observation). A Reclamation archaeologist completed cultural resource survey/SHPO consultation. As project Sponsor, TU administered the BPA/ShoBan funding and managed construction contracts. Construction was completed in less than 2 weeks	

without any problems encountered.

Gallery

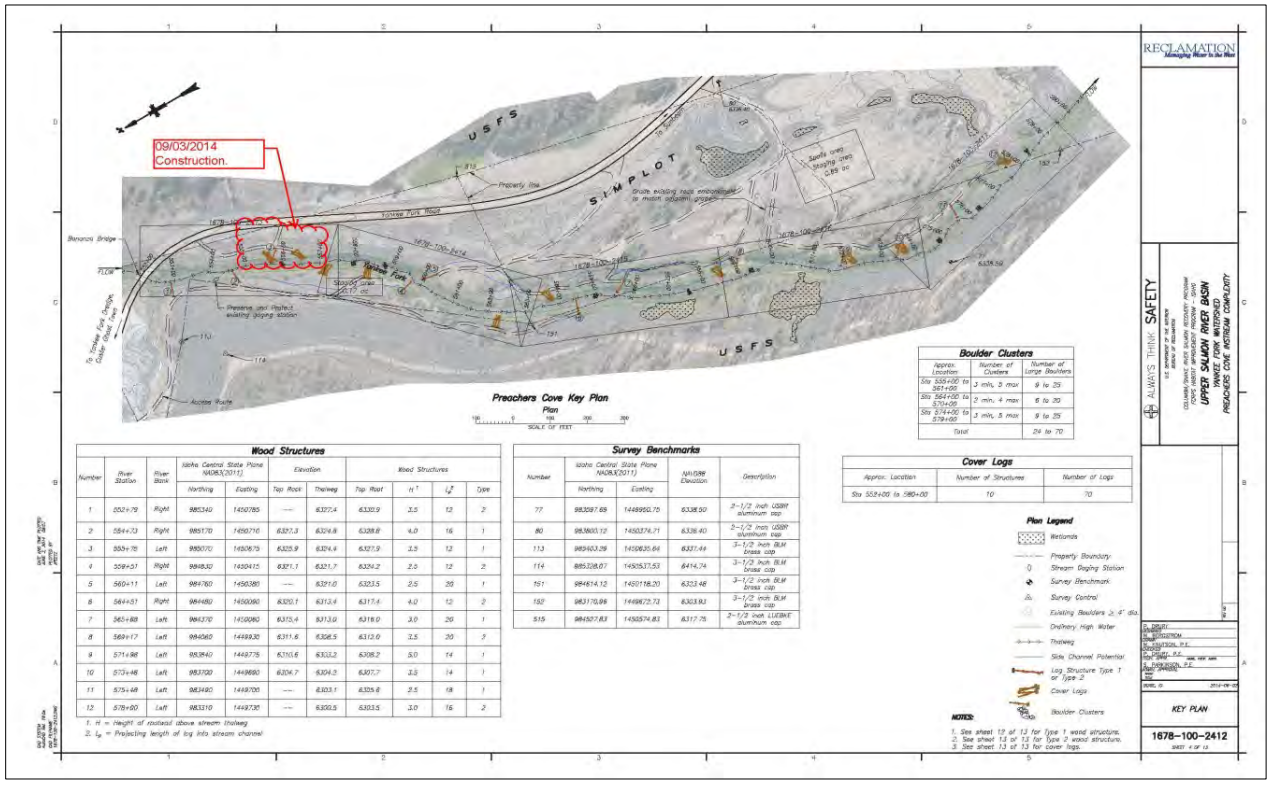


Figure 8. Location of Preacher's Cove Channel Complexity project on the Yankee Fork

Photograph 32. View of the Preachers Cove stream reach before the project

Photograph 33. Same view as the previous photograph after project features were added

Photograph 34. Installation of one of 13 log and rock structures added to the Preachers Cove reach as part of the project

Photograph 35. Log and rock structures in the Preachers Cove reach provide cover for migrating adult salmon and steelhead and refuge for juvenile fish.

GRANDE RONDE RIVER BASIN

The Grande Ronde River is a tributary to the Snake River at RM 168 and has a drainage area of about 3,950 square miles. Its major tributaries include the Wallowa River (RM 81.4) and Catherine Creek (RM 143.9). Catherine Creek extends from its headwaters in the Wallowa Mountains to its confluence with the Grande Ronde River.

In 2014, one project that enhanced habitat was completed in the basin. The focus of Reclamation's actions in the basin includes Snake River spring/summer Chinook salmon (threatened) Snake River steelhead trout (threatened), and Snake River sockeye salmon (endangered).

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, 208-378-5057.

Projects

- Catherine Creek - CC-44 Phase 2 Habitat and Flow Enhancement Project

Sponsors

- Union Soil and Water Conservation District (USWCD)

Partners

- USWCD
- Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
- Oregon Department of Fish and Wildlife (ODFW)

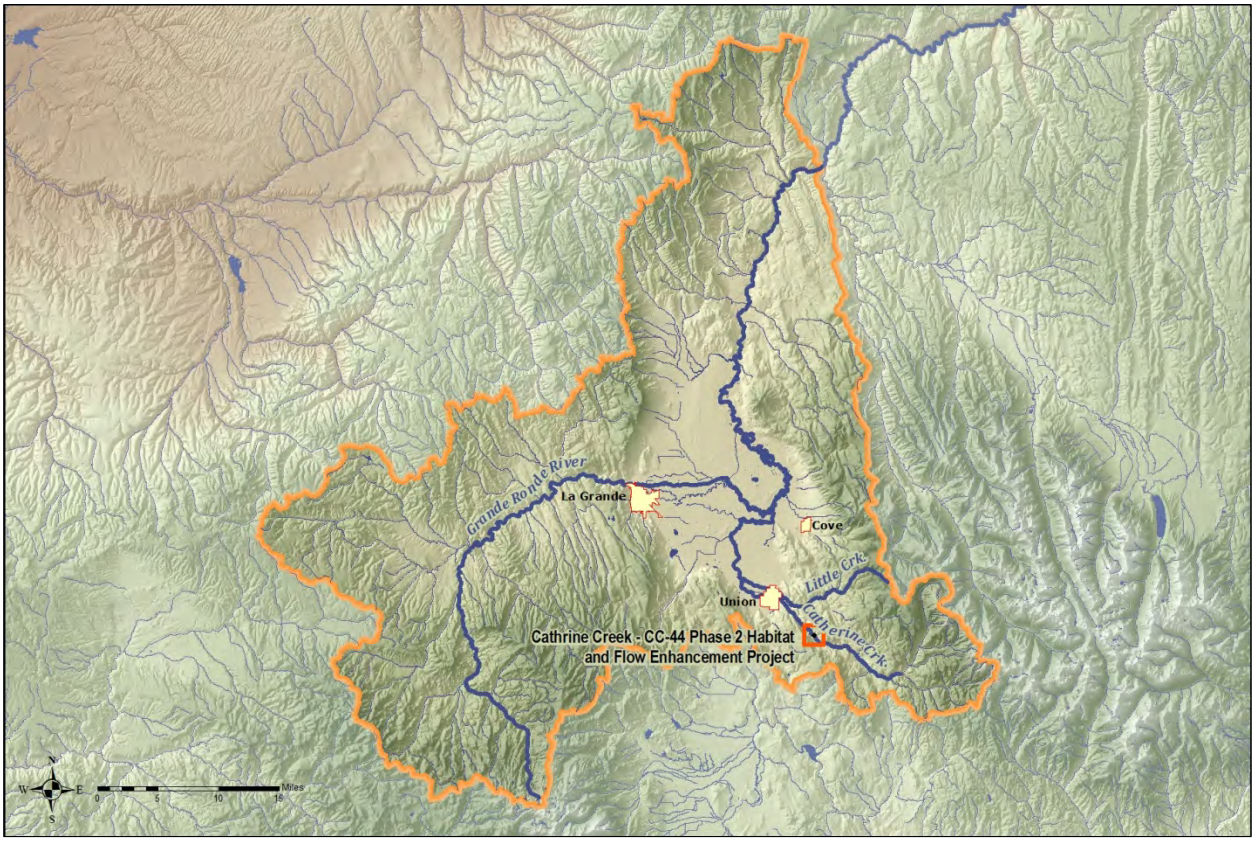
Funding Sources

- USWCD
- BPA
- CTUIR

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Grande Ronde River	$750,600

Figure 9. Location map of the project completed in the Grande Ronde River Basin in 2014



Catherine Creek - CC-44 Phase 2 Habitat and Flow Enhancement Project

Project Name: Catherine Creek - CC-44 Phase 2 Habitat and Flow Enhancement Project	
Project Action: Channel complexity	
Project Sponsor: USWCD	
Project Design: Reclamation	
Landowner(s): Private landowners	
Partners: USWCD, CTUIR, ODFW	**Reclamation Development Costs:** $750,600
Funding Source(s): USWCD, BPA, CTUIR	**Implementation Cost:** about $1 million
Project Location: Catherine Creek in Grande Ronde Subbasin	**State:** Oregon **County:** Union **Stream:** Catherine Creek
	Latitude: 45 09' 53" N **Longitude: -**117 47' 39" W
	Township: 4 & 3 S **Range:** 39 & 40 E **Section:** 28, 33, 34, 2, 3 **¼ Section:**
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** July 14, 2014 **Construction Completion Date:** August 26, 2014; In-water work completed August 15, 2014
Biological Benefit:	**Species:** Spring Chinook salmon, steelhead, and bull trout **Benefit Type:** Restore main channel function
Metric: 1.6 cfs flow added to Catherine Creek**,** 7.2 miles of habitat made accessible, two diversions removed and one passable diversion with fish screen constructed; enhanced mainstem complexity for 1.0 miles and enhanced 0.1 miles of side channel complexity.	
Project Objectives and Description: The Catherine Creek - CC-44 Phase 2 Habitat and Flow Enhancement Project addresses fish habitat complexity, flow enhancement, and diversion consolidation and screens. Phase 1, completed in 2013, constructed 18 large woody material (LWM) structures and installed boulder clusters in the stream to provide juvenile rearing cover. Phase 2 construction was completed in 2014 and consisted of a consolidated diversion structure combining three existing points of diversion into a single structure and fish screen. There were 40 large woody material (LWM) structures installed in a 1-mile section of Catherine Creek to initiate pool formation and cover. An irrigation-piping network was constructed on the north and south sides of Catherine Creek to improve efficiency for delivery of irrigation rights from the consolidated diversion. A side channel, alcove, and riffle-run-pool were constructed. This project increased floodplain connectivity and established an enhanced riparian corridor through riparian plantings.	

The overall purpose of the CC-44 Habitat Project is to address critical habitat-limiting factors in Catherine Creek by protecting and restoring fish habitat within the natural character and function of the stream reach that extends from river mile (RM) 46.15 downstream to RM 42.75. Catherine Creek is a spawning and rearing tributary for spring-run Chinook salmon, summer steelhead, and bull trout in the upper Grande Ronde River basin. There will be additional complexity work in Phases 3, 4, and 5, which will be constructed in 2015 and 2016.

Primary project objectives for all phases include:

- Protect habitat: develop riparian easements with four separate landowners (CTUIR/BPA, ODFW easements, and/or CREP).
- Stream flow enhancement during irrigation season
- Enhance riparian habitat conditions: increase riparian plant communities through planting, seeding, and natural recruitment.
- Enhance floodplain connectivity: remove channel confinement structures and expand floodplain.
- Enhance in-stream structural diversity and complexity: re-activate historic channel meanders to increase sinuosity and place bioengineered LWM structures within the active channel.
- Reduce excessive sediment: manage riparian grazing with enclosure fencing, stabilize existing erosion sites with wood structures, and reestablish riparian vegetation.
- Decrease summer peak temperatures: improve/increase riparian vegetative cover/shade to potentially decrease summer stream temperatures and increase winter temperatures.

Design, Permitting, and Construction Issues: Phase 2 permits were obtained July 16, 2014, which was past the start of the in-water work window. Receiving the permits later than anticipated necessitated an expedited construction schedule. Union Soil and Water Conservation District entered into an agreement with the contractor prior to getting the permits. The options available to the contractor were to cancel the contract or complete the contract over a shorter period. The contractor decided that he could complete the contract within the permitted time.

Gallery

Photograph 36. This photo of the side channel shows a brush mattress structure that was created during the project.
The purpose of the brush mattress is to control bank erosion while also providing shade to the stream. This lowers water temperatures and offers protection from predators to improve fish habitat.

Photograph 37. This view shows a LWM structure on the right bank of Catherine Creek. It is intended to provide habitat during all flows and rack material during high flows. The LWM structure will promote bed scour and gravel recruitment.

Photograph 38. Employees from ODFW, CTUIR, and Reclamation complete fish salvage on the roughed channel area before construction.
In order to avoid and minimize impacts on ESA-listed fish species and other aquatic species, non-lethal methods are used to remove fish and relocate them downstream.

Photograph 39. This picture shows a LWM structure placed in a section of Catherine Creek that has over-widened due to excessive grazing.
Removal of vegetation through overgrazing can lead to unstable banks and erosion during high flows. The LWM structure provides fish habitat, serves as a framework for channel narrowing, and is keyed into the existing bank to protect the right floodplain flank of the structure from channel avulsion.

Photograph 40. This LWM structure is intended to provide habitat during all flows and rack material during high flows. It will also promote bed scour and gravel recruitment.

Photograph 41. This picture shows construction of the consolidated diversion and intake structure outside the creek near the roughened channel.
The diversion design promotes natural river processes, allows fish passage for all life stages, removes three annual push-up dams, and consolidates three points of diversion into one.

JOHN DAY RIVER BASIN

The John Day River is a tributary to the Columbia River at RM 204, entering about 13 miles upstream from the U.S. Army Corps of Engineers (Corps) John Day Dam. Within the John Day River watershed (HUC 17060209), Reclamation works in three subbasins: the Upper John Day, the North Fork John Day, and the Middle Fork John Day. In 2014, one project was completed in the Middle Fork John Day River subbasin and one project was completed in the Upper John Day River subbasin.

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

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
John Day River	$440,900

Middle Fork John Day Subbasin

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 2014, one project that enabled fish passage was completed in this subbasin.

Anadromous species present in the river include Middle Columbia River (MCR) steelhead trout (ESA-listed as threatened) and MCR spring-run Chinook salmon (not ESA-listed). 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, 208-378-5057.

Projects

- John Day Middle Fork - Oxbow Conservation Area Phase 3 Complexity Project

Sponsors

- Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)

Partners

- BPA
- USFWS
- ODFW

Funding Sources

- BPA
- NOAA Fisheries
- USFWS
- Oregon Watershed Enhancement Board (OWEB)

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Middle Fork John Day River	$428,000

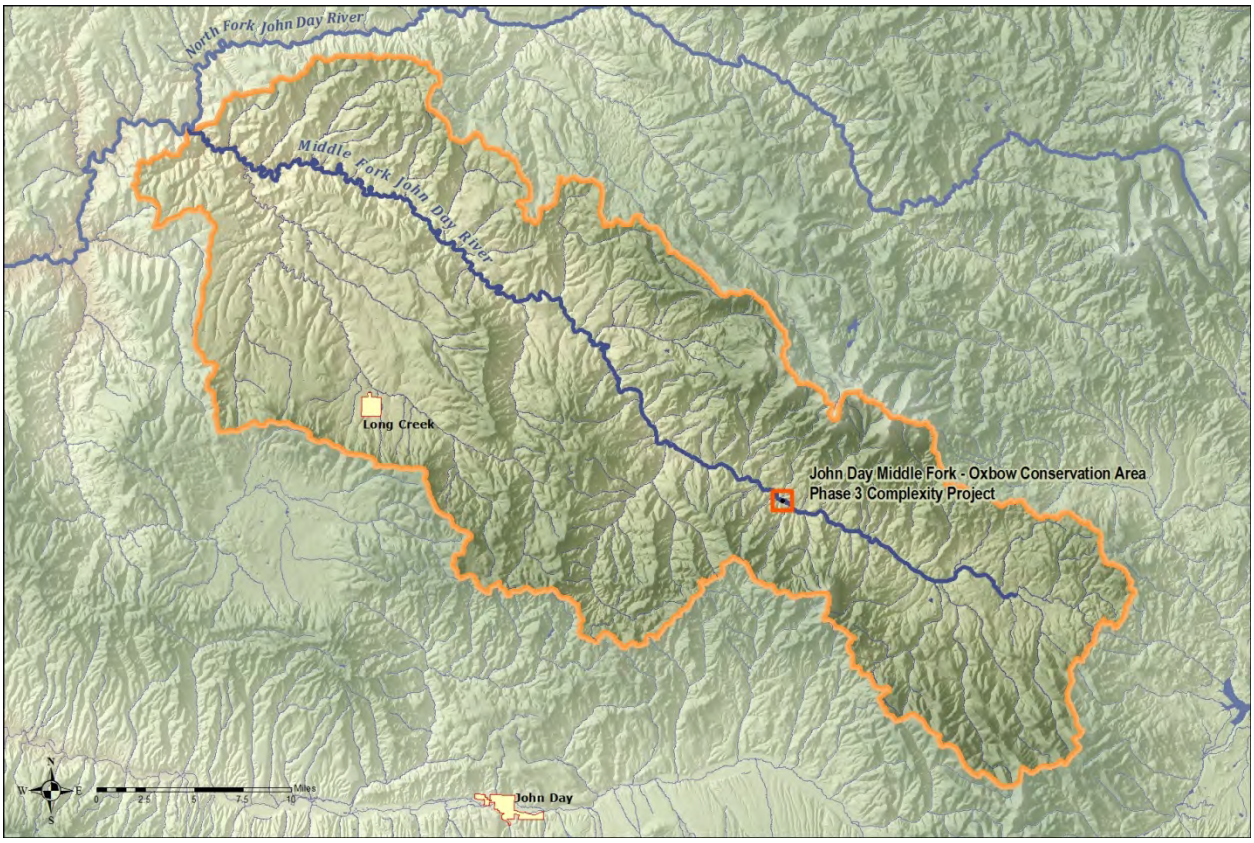


Figure 10. Location map of the project completed in the Middle Fork John Day River Subbasin in 2014

John Day Middle Fork - Oxbow Conservation Area Phase 3 Complexity Project

Project Name: John Day Middle Fork - Oxbow Conservation Area Phase 3 Complexity Project	
Project Action: Channel complexity	
Project Sponsor: Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO)	
Project Design: Bureau of Reclamation, with assistance from Inter-Fluve, Inc.	
Landowner(s): CTWSRO	
Partners: BPA, USFWS, ODFW	**Reclamation Development Costs:** $428,000
Funding Source(s): BPA, PCSRF, USFWS, OWEB	**Implementation Cost:** $700,000
Project Location:	**State:** Oregon **County:** Grant **Stream:** MF John Day
	Latitude: 44 39' 3.14" N **Longitude:** -118 40' 26.76" W
	Township: 10S **Range:** 34E **Section:** 31 ¼ **Section:** SWSW
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** July 1, 2014 **Construction Completion Date:** September 30, 2014
Biological Benefit:	**Species:** Steelhead, Chinook salmon, lamprey, bull trout **Benefit Type:** Channel complexity
Metric: Enhanced complexity for 0.34 miles and enhanced riparian for 5.5 acres / 0.34 miles.	

Project Objectives and Description: The Confederated Tribes of the Warm Springs Reservation of Oregon (Tribes), U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service Partners Program, and other partners sought to restore habitat to benefit federally listed summer steelhead and bull trout, along with Chinook salmon and lamprey on the Middle Fork John Day (MFJD) River. 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 river miles 58.0 and 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 in-stream fish habitat. The dredged area affected 4 miles of the MFJD 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 Bonneville Power Administration. Among the first restoration goals for the property was the restoration of the dredge-mined areas. The development of this current Oxbow Tailings Restoration project began in 2005 with a partnership with the Bureau of

Reclamation. A large data collection endeavor resulted in LiDAR and aerial photography acquisition in 2006, a tributary assessment in 2008, a geomorphology and hydraulic model analysis in 2009, and a reach assessment for the project site in 2010. Using the data collected, an interdisciplinary team was assembled in 2008 to assist with design development. Most of the design effort has focused on restoring the site to natural conditions, as there are few anthropomorphic features on the Oxbow Conservation Area that limit project actions. The scale of the project involves more than 2 miles of river channel work and up to 1,500 feet of tributary habitat; therefore, the project has been split into multiple phases to ease construction and acquisition of funding for project implementation. Phases 1 and 2 were completed in 2011 and 2012. This project (Phase 3) was completed in 2014, along with partial construction of Phase 4. The remainder of Phase 4 and Phase 5 are planned for 2015 and/or 2016.

This project (Phase 3) involved:

- Construction of 0.34 miles of channel to replace the straightened and entrenched channel,
- Construction of 10 large engineered log jams and 10-15 smaller log placements,
- Construction of 10 riffles, glides, and point bars,
- Extensive earthwork to grade tailings and cover with soils,
- Construction of side channels and backwater alcove areas,
- Wetland creation and enhancement, and
- Extensive vegetative planting/transplanting and installation of browse-protection measures

Design, Permitting, and Construction Issues: Design was completed by Bureau of Reclamation staff with technical assistance from Inter-Fluv, Inc., under an ID/IQ contract. U.S. Fish and Wildlife Service handled ESA compliance through their programmatic ESA coverage, which required a detailed monitoring and maintenance plan, written by the Warm Springs Tribe. USFWS also covered the Army Corps fill-and-removal permit under the Nationwide 27 process. BPA provided NEPA and Section 106 coverage. Reclamation drafted the DSL permit application that was submitted by the Tribe.

The Warm Springs Tribe secured all the funding for construction of the project and administered all of the contracts. Reclamation funded Inter-Fluv, Inc., through the ID/IQ contract for onsite construction observation.

Construction began in the uplands around July 1, prior to the in-stream work window. Construction began in-stream after July 15. The Phase 3 channel was completed in three sections such that fish salvage and introduction of flow into the new sections occurred on three different dates. All flow was directed into the new channel by the end of the in water work period of August 15. The remaining work of shaping the flood plains, planting vegetation, fencing, and regrading the dredge tailings and adding top soil lasted until late September 2014.

Three major adjustments to the design were identified after construction began:

1. The dredge tailings in the Phase 3 area contained a fair amount of clay that rapidly plugged the small size screens in the screen plant used to separate gravels for construction of riffles, glides, and point bars. The gradation requirements were subsequently adjusted by the design engineer such that larger screen sizes could be used.

2. Because of the dredging process, large pockets of coarse sand were encountered in numerous locations along the new channel alignment. Pockets were 3 to 6 feet deep and up to 50 feet long. Designs were adjusted to over-excavate and replace the sand, along with additional large wood treatments to reinforce the channel banks in those locations.
3. The alignment of the constructed channel from station 50+00 to 54+00 was revised by the engineer to avoid removal of large riparian vegetation.

Gallery

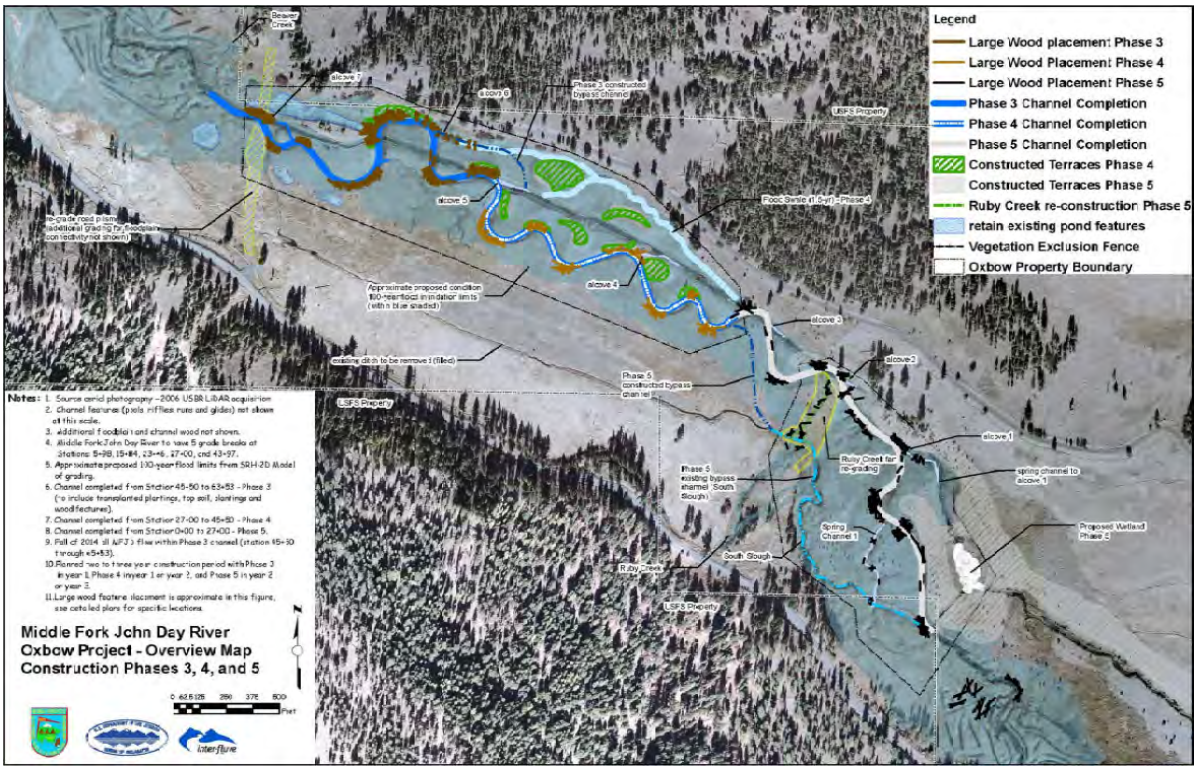


Figure 11. Overview of the Phase 3 portions of the project completed in 2014, which includes the future Phase 4 and Phase 5 portions of the Oxbow Conservation Area

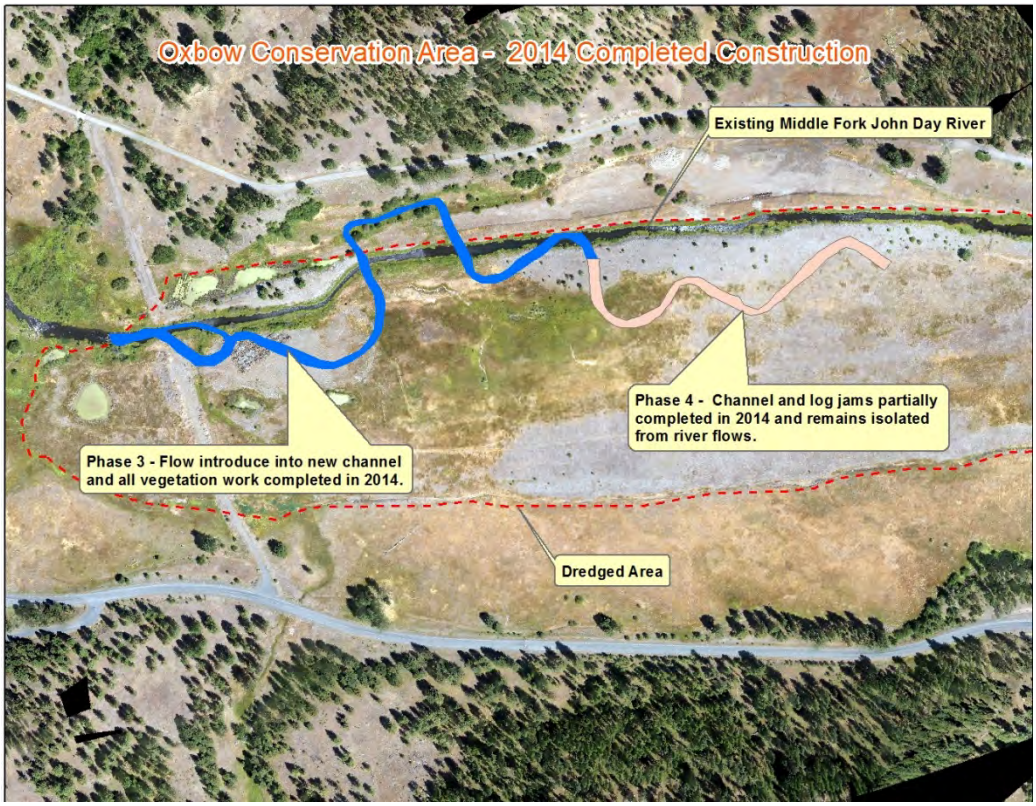


Figure 12. This diagram shows the work completed for Phase 3 in 2014.

Photograph 42. Before Phase 3, the Middle Fork John Day River flowed through a confined and straightened dredge channel in the project area.

Photograph 43. A new channel section during construction, prior to releasing the Middle Fork flows into it

Photograph 44. Completed channel section with the full Middle Fork flow

Photograph 45. Completed riffle in the new channel, showing willow cuttings and torrent sedge transplants

Upper John Day River Subbasin

The Upper John Day River (HUC 17070201), which includes the South Fork John Day River, becomes the mainstem John Day River after it is joined by the North Fork John Day River. The Upper John Day River subbasin has a drainage area of about 2,130 square miles. In 2014, one project was completed in the subbasin that improved fish passage, streamflow, and channel complexity and reduced entrainment potential.

Anadromous species present in the river include MCR steelhead trout (ESA-listed as threatened) and MCR spring-run Chinook salmon (not ESA-listed). 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, 208-378-5057.

Projects

- John Day Upper Main - Meredith Beech Creek Diversion #5 Access Enhancement Project

Sponsors

- Grant Soil and Water Conservation District (GSWCD)

Partners

- OWEB
- GSWCD
- Landowner

Funding Sources

- Landowner

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Upper John Day River	$12,900

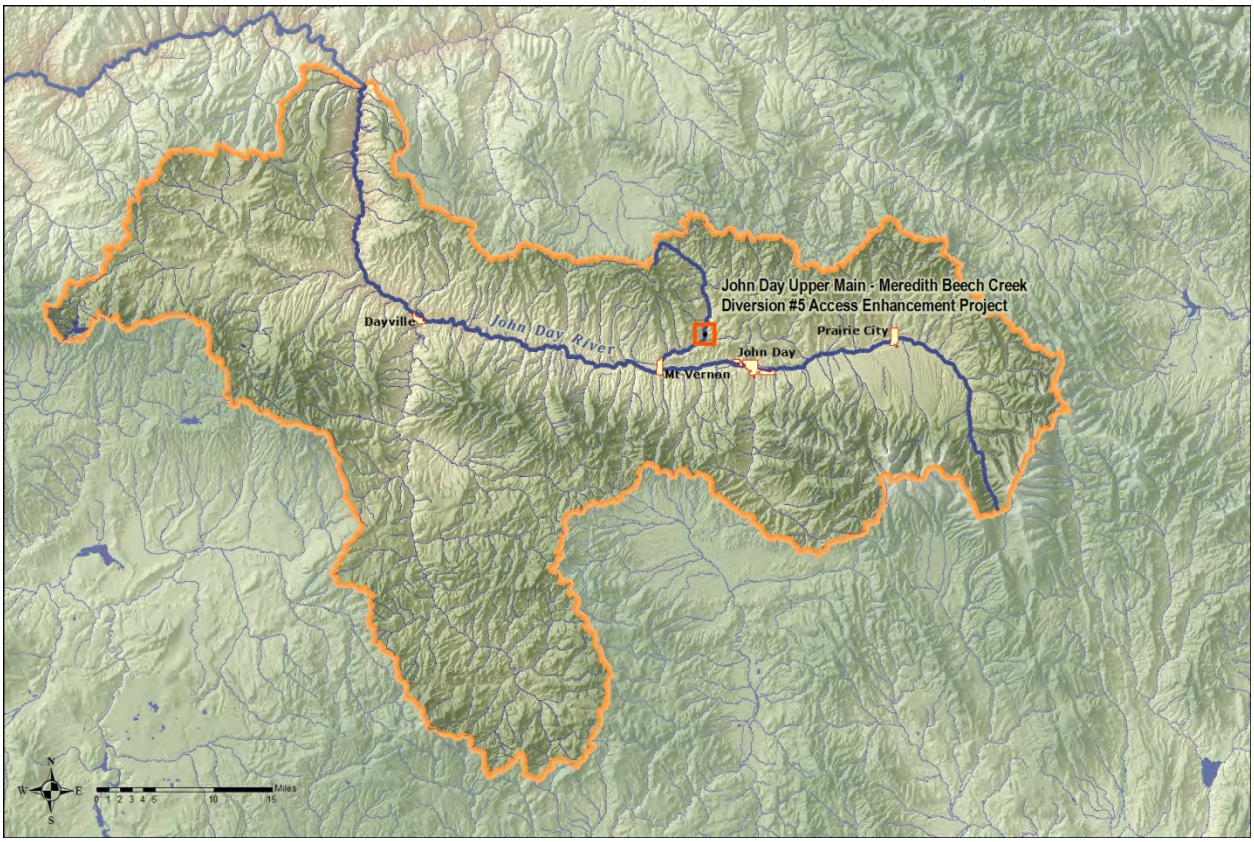


Figure 13. Location map of the projects completed in the Upper John Day River Subbasin in 2014

John Day Upper Main - Meredith Beech Creek Diversion #5 Access Enhancement Project

Project Name: John Day Upper Main - Meredith Beech Creek Diversion #5 Access Enhancement Project	
Project Action: Passage	
Project Sponsor: Grant Soil and Water Conservation District (GSWCD)	
Project Design: Grant Soil and Water Conservation District (Reclamation Contract)	
Landowner(s): George and Priscilla Meredith	
Partners: OWEB, GSWCD, Landowner	**Reclamation Development Costs:** $12,900
Funding Source(s): Landowner	**Implementation Cost:** $30,000
Project Location:	**State:** Oregon **County:** Grant **Stream:** Beech Creek
	Latitude: 44 27' 30.81" **Longitude: -**119 2' 13.32"
	Township: 13S **Range:** 31E **Section:** 7 **¼ Section:** NW
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** August 1, 2014 **Construction Completion Date:** August 15, 2014
Biological Benefit:	**Species:** Steelhead, Chinook **Benefit Type:** Barrier
Metric: Partial barrier removal, increased access to 9.5 miles of Beech Creek	

Project Objectives and Description: Meredith Diversion #5 is the last of five diversions scheduled for treatment on the Meredith property on Beech Creek, a tributary to the Upper John Day River. These diversions are located about 1.5 miles northeast of Mt. Vernon, Oregon. Diversion #5 consists of a semi-permanent post-and-timber structure dam that acts as a 2-foot-tall grade control weir to divert flow into the ditch. A second rock dam about 30 feet below the timber structure was also present and created an additional passage barrier. A headgate controlled flow into the ditch and through a relatively new fish screen. Beech Creek at this location normally dries up completely by mid-summer regardless of irrigation withdrawals; therefore, the goal was to maintain fish passage as long as possible.

The Grant SWCD reviewed several alternative diversion structure types for this site. The design chosen was a modified constructed riffle with a sheet-steel-reinforced riffle crest and low-flow notch. The low-flow notch was located at the left bank to sweep sediment past the irrigation headgate structure and maintain a preferential low flow path for fish passage. The notch elevation is set to maintain proper flow into the irrigation system at most stream flows; however, as flows get very low, a single 6-inch-wide flashboard can be installed in the notch to increase head for the diversion and still maintain passage with a 6-inch jump height. An 80-foot-long

riffle makes the transition from the riffle crest to the natural streambed elevation, eliminating the lower check dam. The riffle consists of a sheet-steel diversion sill at the riffle crest and three large rock cut-off walls. Between the steel and rock walls, stream simulation gravel/cobbles were placed, giving the overall appearance of one long, roughened riffle. The top of the sheet steel wall is 6 inches below grade so that it is not exposed except at the low flow notch.

Design, Permitting, and Construction Issues: There were no issues. The landowner funded the entire cost of the construction and managed the contracting for the project. GSWCD completed the DSL fill and removal application on behalf of the landowner and assisted with on-site construction observation and management. Beech Creek at the construction site was dry at the time of construction, which made construction easier than normal.

Gallery

Photograph 46. Pre-project Meredith Beech Creek Diversion #5 shown with a passage barrier

Photograph 47. Photo of completed diversion project showing low flow notch with flashboard in place

Photograph 48. Constructed riffle below completed diversion structure (looking upstream)

Photograph 49. Completed diversion structure showing submerged concrete head gate box protected by flash boards and the low flow notch

UPPER COLUMBIA RIVER BASIN

The UCR basin, generally described as the Columbia River upstream from Grand Coulee Dam in Washington, 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 in the United States: the Entiat, the Methow, and the Wenatchee. In 2014, five projects were completed in the Entiat subbasin, three projects were completed in the Methow River subbasin, and three 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) 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 Wenatchee River subbasin.

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Upper Columbia River	$2,276,000

Entiat River Subbasin

The Entiat River is tributary to the Columbia River at RM 483.7. The Entiat subbasin (HUC 17020010, officially the Upper Columbia-Entiat subbasin) has a drainage area of about 1,520 square miles. In 2014, five projects were completed in the subbasin.

ESA-listed anadromous species include UCR spring Chinook salmon (endangered) and UCR steelhead trout.

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, 208-378-5057.

Projects

- Entiat Fish Hatchery Complexity Phase II
- Harrison Side Channel and Main Stem Habitat Enhancement
- Entiat - Keystone to Kiosk RM 0.8 to 2.3 Habitat Enhancement Project
- Lower Entiat River Side Channel Enhancement RM 1.9 to RM 2.3 Project
- Entiat River RM 2.6-3.5 Habitat Enhancement Project

Sponsors

- Cascadia Conservation District (CCD)
- Chelan County Natural Resources Department (CCNRD)
- Yakama Nation

Partners

- CCD
- USFWS
- NRCS
- BPA
- CCNRD
- Washington Department of Fish and Wildlife (WDFW)
- Landowners

Funding Sources

- BPA

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Entiat River	$566,000

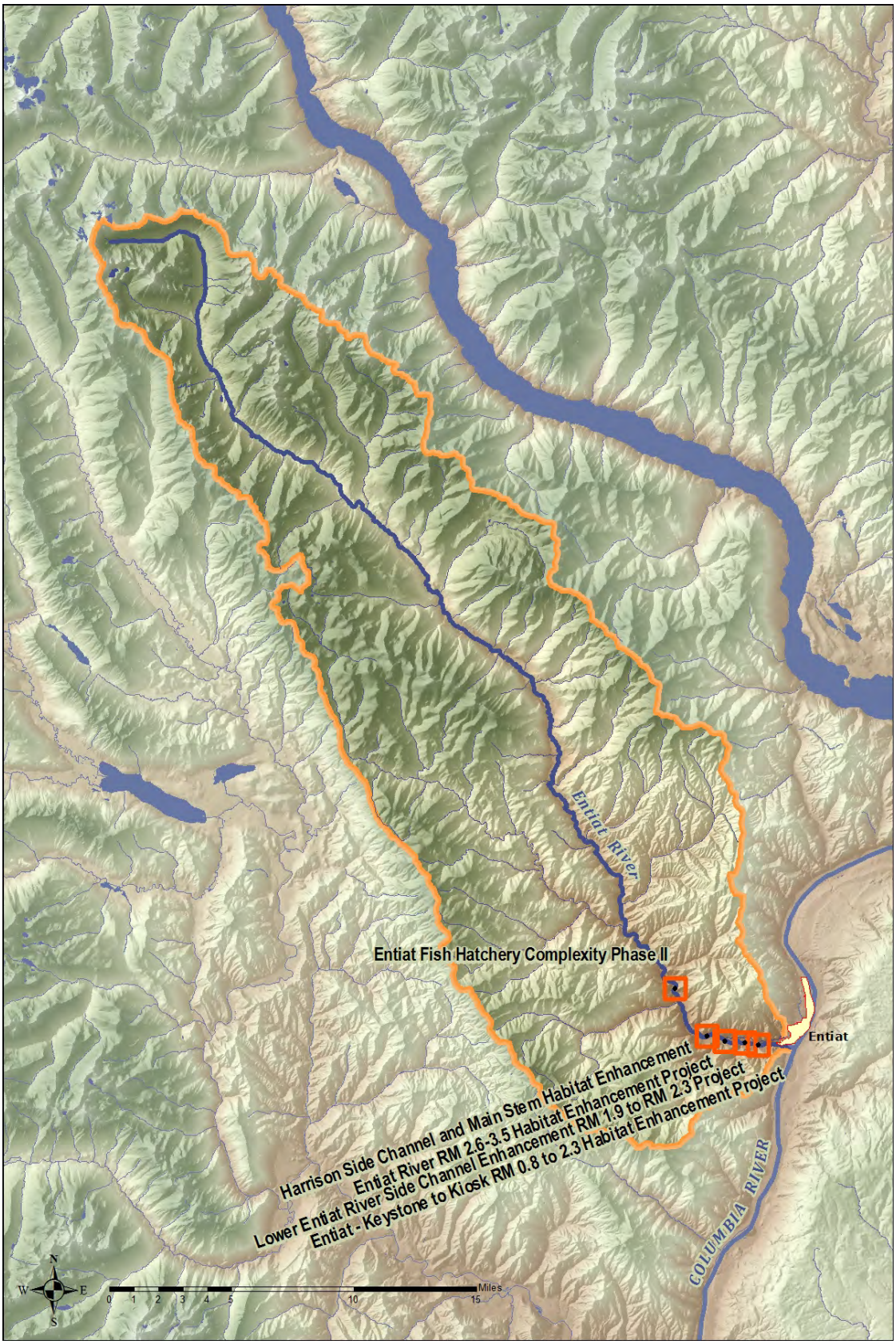


Figure 14. Location map of the projects completed in the Entiat River Subbasin in 2014

Entiat Fish Hatchery Complexity Phase II

Project Name: Entiat Fish Hatchery Complexity Phase II		
Project Action: In-stream and off-channel complexity		
Project Sponsor: Cascadia Conservation District		
Project Design: USFWS/NRCS Design Team		
Landowner(s): Entiat National Fish Hatchery, USFWS		
Partners: CCD, USFWS, NRCS, BPA		**Reclamation Development Costs:** $30,000; This includes project development and a pro-rated share of the Lower Entiat Reach Assessment
Funding Source(s): BPA		**Implementation Cost:** $125,000
Project Location:	**State:** Washington **County:** Chelan **Stream:** Entiat River	
	Latitude: 47 41' 53.3898" **Longitude:** -120 19' 17.6874"	
	Township: 25N **Range:** 20E **Section:** 3¼ **Section:** NW	
Project Status: Complete		
Project Phase: Monitoring		
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Permitting:** Completed **Construction Completion Date:** September 15, 2014	
Biological Benefit:	**Species:** Spring Chinook, steelhead, bull trout **Benefit Type:** Habitat	
Metric: 0.1 miles of side-channel complexity		
Project Objectives and Description: This project provided resting and holding areas and summer and winter rearing habitat; augmented side-channel complexity to provide high-flow refugia; connected existing off-channel habitat, and installed in-stream complexity for juvenile and adult salmonids. Project treatments include: split-flow channel inlet excavation to connect at lower flows near RM 6.8; one boulder cluster at RM 6.8 to direct flow into the split channel; one engineered log jam (ELJ) at the head of the split channel island; 15 habitat logs with boulders along the channel margin; connection of an off-channel alcove at RM 6.73; and installation of a pedestrian footbridge over the reconnected alcove.		
Design, Permitting, and Construction Issues: None		

Gallery

Photograph 50. ELJ during construction at the head of the island, with a boulder cluster to the right of the backhoe at RM 6.8

Photograph 51. An alcove is reconnected at high flows and offers refuge to juvenile anadromous fish.
The alcove can now be crossed by a new footbridge along a walking trail at RM 6.73.

Harrison Side Channel and Main Stem Habitat Enhancement

Project Name: Harrison Side Channel and Main Stem Habitat Enhancement	
Project Action: Side channel activation and in-stream complexity	
Project Sponsor: Chelan County Natural Resources Department	
Project Design: RTS/ICF	
Landowner(s): Harrison, WDFW	
Partners: CCNRD, BPA, WDFW	**Reclamation Development Costs:** $461,000
Funding Source(s): BPA	**Implementation Cost:** $460,000
Project Location:	**State:** Washington **County:** Chelan **Stream:** Entiat
	Latitude: 47 40' 9.99" **Longitude: -**120 17' 41.01"
	Township: T25N **Range:** R20E **Section:** 14 **¼ Section:** NE
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** August 4, 2014 **Construction Completion Date:** November 21, 2014
Biological Benefit:	**Species:** Spring Chinook, steelhead **Benefit Type:** side channel, in-stream complexity
Metric: Improve off-channel habitat connection to 1,300 feet of side channel; add five engineered logjams along 700 feet of main stem shoreline to increase habitat complexity; increase riparian cover along 1,000 feet of shoreline.	
Project Objectives and Description: This project addressed the entrance to the Harrison side channel, which at times was disconnected from the Entiat River because of sedimentation issues. Engineered logjams were placed at the entrance to the Harrison side channel, which increased definition of the side channel confluence, provides complexity, and ensures flow into the side channel. The project also added five ELJs to enhance habitat complexity and narrow the over-widened mainstem channel in the project area. The project also breached the levee on river left in the Harrison side-channel entrance area.	
Design, Permitting, and Construction Issues: Design issues included accessing shoreline for five ELJs, which was addressed by removing 40 pear trees, vegetating the shoreline, and compensating the landowner. This solution was proposed by the landowner. Permitting issues included an extension of the in-water work window to August 10 to complete the ELJs. Construction issues included work restrictions with a 1:00 p.m. shutdown based on Industrial Fire Precaution Class; a temporary bridge was used to access the left side of river and Harrison side-channel entrance area. Construction activities were connected with the operation of other activities near the construction zone, such as a summer camp and orchard operations.	

Gallery

Photograph 52. A temporary bridge to access river left and the Harrison side channel entrance area

Photograph 53. Workers pin key members of an ELJ, which was established at the entrance to the Harrison side channel to enhance habitat and to encourage flow into the side channel.

Photograph 54. A Type 4 structure under construction at the side channel inlet

Photograph 55. Side channel inlet from upstream, featuring the new ELJ at the inlet to the side channel

Photograph 56. An expandable stinger mounted on a track hoe for planting the eliminated levee area near inlet

Photograph 57. Brush mattress installation in the Harrison side channel will provide additional fish habitat.

Photograph 58. A view from upstream of one of five right-bank ELJs under construction in the main Entiat channel
The ELJs narrow the over-widened main channel and create habitat for adult and juvenile salmon and steelhead.

Entiat - Keystone to Kiosk RM 0.8 to 2.3 Habitat Enhancement Project

Project Name: Entiat - Keystone to Kiosk RM 0.8 to 2.3 Habitat Enhancement Project	
Project Action: In-stream and off-channel complexity	
Project Sponsor: Cascadia Conservation District	
Project Design: USFWS/NRCS Design Team	
Landowner(s): Keystone Ranch, William Rust, Chelan PUD, WDFW	
Partners: CCD, USFWS, NRCS, WDFW, BPA	**Reclamation Development Costs:** $30,000; This includes project development and a prorated share of the Lower Entiat Reach Assessment
Funding Source(s): BPA	**Implementation Cost:** $132,000
Project Location:	**State:** Washington **County:** Chelan **Stream:** Entiat River
	Latitude: 47 39' 47.9088" **Longitude:** -120 15' 2.3436"
	Township: 25N **Range:** 21E **Section:**18 **¼ Section:** NW
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** August 4, 2014 **Construction Completion Date:** September 1, 2014
Biological Benefit:	**Species:** Spring Chinook, steelhead, bull trout **Benefit Type:** Channel complexity
Metric: 0.25 miles side channel, 0.1 miles mainstem	
Project Objectives and Description: This project provided resting and holding areas and summer and winter rearing habitat; augmented side-channel complexity to provide high-flow refugia; connected existing off-channel habitat, and installed in-stream complexity for juvenile and adult salmonids. Project treatments include side-channel connection at RM 0.8, seven boulder clusters at RM 1.1, two boulder clusters at RM 2.2, 23 habitat logs with boulders at RM 1.6 side channel, side channel excavation to allow connection at lower flows at RM 1.6, and three habitat log structures along the mainstem channel margin.	
Design, Permitting, and Construction Issues: Permit limitations did not allow placement of boulder clusters mid-channel. Work had to be completed from the bank.	

Gallery

Photograph 59. Boulder cluster at RM 2.2 provides flow disruption and habitat variety.

Photograph 60. Side channel outlet at RM 1.6 with wood and rock installed as part of the project.

Photograph 61. Habitat log structure and boulders at RM 1.6

Lower Entiat River Side Channel Enhancement RM 1.9 to RM 2.3 Project

Project Name: Lower Entiat River Side Channel Enhancement RM 1.9 to RM 2.3 Project	
Project Action: Side-channel construction	
Project Sponsor: Chelan County Natural Resources Department	
Project Design: NRCS	
Landowner(s): Dale Foreman	
Partners: Landowners, BPA, Chelan County	**Reclamation Development Costs:** $25,000; Includes project management and a prorated share of the Lower Entiat RA
Funding Source(s): BPA	**Implementation Cost:** $12,500
Project Location:	**State:** Washington **County:** Chelan **Stream:** Entiat River
	Latitude: 47 39' 53.6682" **Longitude:** -120 15' 43.5204"
	Township: 25N **Range:** 20E **Section:** 13 **¼ Section:** SE
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** August 4, 2014 **Construction Completion Date:** August 9, 2014
Biological Benefit:	**Species:** Steelhead and spring Chinook **Benefit Type:** peripheral and transitional habitat (side channel or off-channel habitat)
Metric: 0.1 miles of side channel enhancement	
Project Objectives and Description: This project included shallow excavation in an existing 500-foot-long intermittent drainage channel located near RM 1.65 of the Entiat River. The project increases the frequency and duration of fish access to off-channel rearing and refuge habitat. The RM 1.65 drainage channel collects surface and sub-surface flows from the orchard and conveys them to the Entiat River. The downstream end is connected to the Entiat River and a portion of the downstream end of this feature is inundated during 2-year flow events. Excavation throughout this side channel increases the frequency of inundation by increasing the extent of backwater or alcove conditions for juvenile salmonid rearing and refuge habitat. Excavation varies but is approximately 2 feet in depth.	
Design, Permitting, and Construction Issues: Design – There were no design issues. The Lower Entiat River Side Channel Enhancement RM 1.9 to RM 2.3 Project (sometimes called Foreman side channel enhancement project) evaluated several alternative locations for side channel enhancement on the Foreman property from RM 1.6 – 2.3. The final site selected was on river left. NRCS provided topographic survey and design. Permitting – There were no permitting issues associated with this project. Reviewers asked for clarification on tree removal and there were discussions about the most appropriate methods for	

site access.
Construction – The landowner withdrew construction approval for the high-flow channel portion of the project. The construction estimate for the hyporheic channel portion of the project allowed CCNRD to award a construction agreement to Olin Excavation. In mid-July, the Mills Canyon Fire caused the Washington DNR to issue severe fire hazard restrictions on all construction. Construction began on August 4. CCNRD provided construction staking. Olin utilized a small excavator (CAT 304) to clear the channel alignment. Excavation of the channel began near the outlet continuing up stream. All earthwork and disposal of excess material was completed by August 9.

Gallery

Photograph 62. Contractor excavating the deepened side channel to allow inundation at lower river flows

Entiat River RM 2.6-3.5 Habitat Enhancement Project

Project Name: Entiat River RM 2.6-3.5 Habitat Enhancement Project	
Project Action: Habitat enhancement	
Project Sponsor: Yakama Nation	
Project Design: IFI	
Landowner(s): Milne, Asher, Scoville, Whitehall, Small	
Partners: Yakama Nation, BPA	**Reclamation Development Costs:** $20,000; This includes a pro-rated share of the Lower Entiat Reach Assessment
Funding Source(s): BPA	**Implementation Cost:** $225K
Project Location:	**State:** Washington **County:** Chelan **Stream:** Entiat River
	Latitude: 47 39' 58.0314" **Longitude:** -120 16' 46.1598"
	Township: 25N **Range:** 20E **Section:** 13 **¼ Section:** NW
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** July 16, 2014 **Construction Completion Date:** August 1, 2014
Biological Benefit:	**Species:** Chinook, steelhead **Benefit Type:** Habitat complexity
Metric: 0.9 miles main-channel complexity with 43 boulder clusters, 22 margin wood structures	
Project Objectives and Description: The Entiat River RM 2.6-3.5 Habitat Enhancement Project improved habitat values in the Lower Entiat River to support the short-term and long-term recovery of ESA-listed salmonids (spring Chinook, steelhead). This project was designed to increase the diversity and complexity of fish habitat, and treatments were based on recommendations by the Upper Columbia Salmon Recovery Board's Regional Technical Team (RTT). The treatments were designed to address the ecological concerns from the biological strategy, such as lack of in-stream complexity and diversity as well as adding hydraulic variability for the Lower Entiat. This was accomplished through the creation of 22 margin wood structures and 43 boulder clusters.	
Design, Permitting, and Construction Issues: None	

Gallery

Photograph 63. Boulder clusters added to the Entiat River as part of the project provide stream diversity and habitat.

Photograph 64. Margin wood added to the Entiat River provides rearing habitat and refuge for juvenile fish.

Methow River Subbasin

The Methow River (HUC 17020008) is a tributary to the Columbia River at RM 523.9 and has a drainage area of about 1,820 square miles. The mainstem Methow River forms where the West Fork Methow and Lost River meet at RM 73. In 2014, three 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, 208-378-5057.

Projects

- Methow - Beaver Creek Weirs Access Enhancement Project
- Chewuch River Permanent In-stream Flow Enhancement Project
- Middle Methow River Rock Reach (M2- 3R) Floodplain and Side Channel Enhancement Project

Sponsors

- Methow Salmon Recovery Foundation
- TU – Washington Water Project

Partners

- WDFW
- Reclamation
- Methow Conservancy
- Washington State Parks and Recreation Commission
- Washington State Recreation and Conservation Office – Salmon Recovery Funding Board
- Washington Department of Ecology
- NOAA Fisheries
- Upper Columbia Salmon Recovery Board (UCSRB)

Funding Sources

- Reclamation
- National Fish and Wildlife Foundation
- Confederated Tribes and Bands of the Yakama
- Public Utility District No. 1 of Chelan County – Rock Island Habitat Conservation Plan Tributary Committee
- Grant County Public Utility District – Priest Rapids Coordinating Committee
- Washington State Recreation and Conservation Office – Salmon Recovery Funding Board

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Methow River	$1,591,000

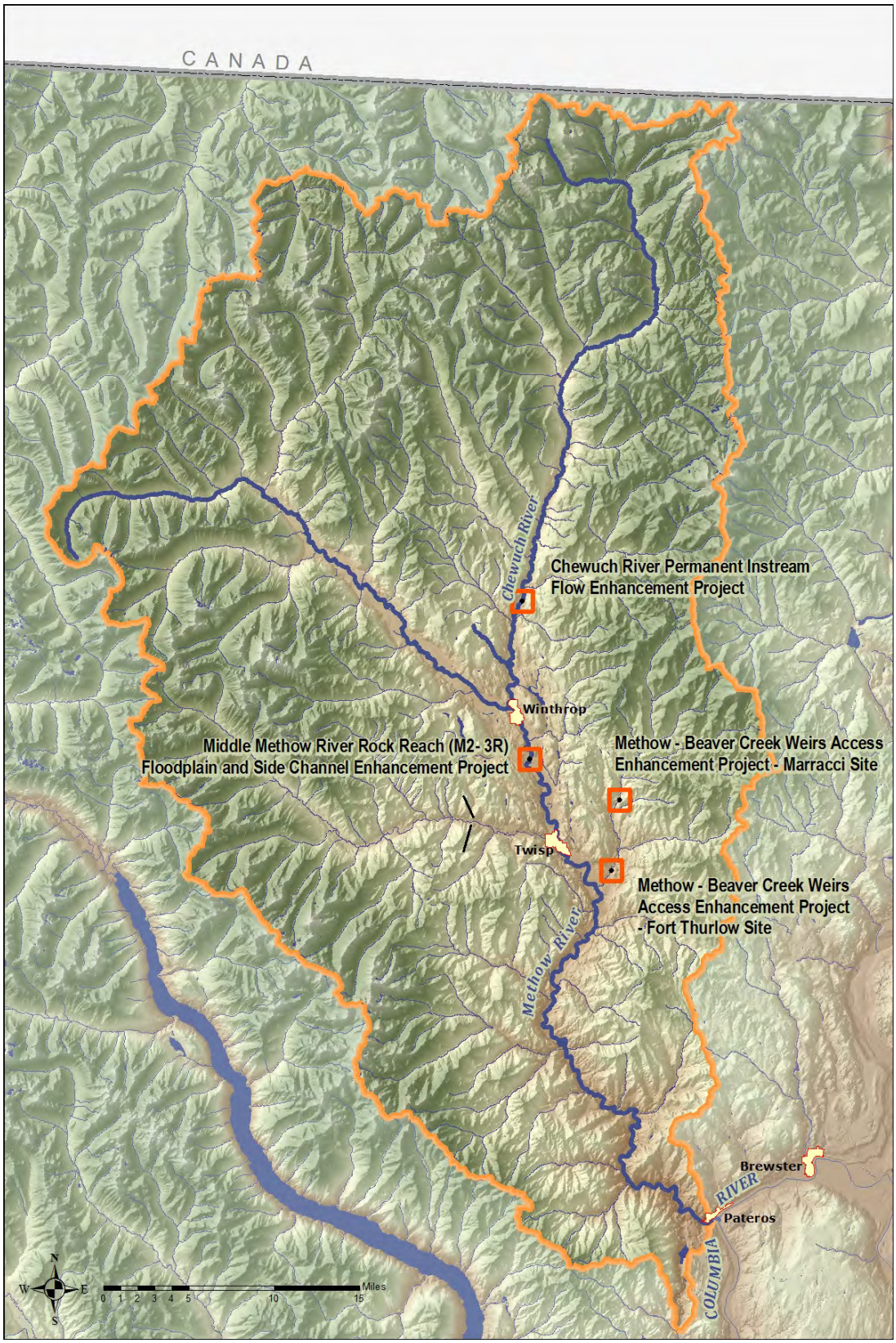


Figure 15. Location map of the projects completed in the Methow River Subbasin in 2014

Methow - Beaver Creek Weirs Access Enhancement Project

<table>
<tr><td colspan="5">Project Name: Methow - Beaver Creek Weirs Access Enhancement Project</td></tr>
<tr><td colspan="5">Project Action: Establishing fish passage at two diversion sites after a 500-year flood event</td></tr>
<tr><td colspan="5">Project Sponsor: Methow Salmon Recovery Foundation</td></tr>
<tr><td colspan="5">Project Design: Bureau of Reclamation; Mike Knutson</td></tr>
<tr><td colspan="5">Landowner(s): Private</td></tr>
<tr><td colspan="2">Partners: WDFW, Bureau of Reclamation (Reclamation), Methow Conservancy</td><td colspan="3">Reclamation Development Costs: $236,300</td></tr>
<tr><td colspan="2">Funding Source(s): Reclamation</td><td colspan="3">Implementation Cost: $127,000</td></tr>
<tr><td rowspan="3">Project Location:</td><td colspan="4">State: Washington County: Okanogan Stream: Beaver Creek</td></tr>
<tr><td colspan="2">Latitude:
Marracci Site: 48° 24' 5.904"
Fort Thurlow Site: 48° 20' 31.4514"</td><td colspan="2">Longitude:
Marracci Site: -120° 2' 29.76"
Fort Thurlow Site: -120° 2' 53.6958"</td></tr>
<tr><td>Township:
Marracci: 34
Fort Thurlow: 33</td><td>Range:
Marracci: 22E
Fort Thurlow:22E</td><td>Section:
Marracci: 35
Fort Thurlow:23</td><td>¼ Section:
Marracci: SE
Fort Thurlow: SW</td></tr>
<tr><td colspan="5">Project Status: Complete</td></tr>
<tr><td colspan="5">Project Phase: Monitoring and adaptive</td></tr>
<tr><td>Milestones:</td><td colspan="4">Funding: Secured
Design: Completed
Permitting: Completed
Construction Start Date: (Marracci) October 28, 2014; (Fort Thurlow) September 23, 2014
Construction Completion Date: (Marracci) November 7, 2014; (Fort Thurlow) October 6, 2014</td></tr>
<tr><td>Biological Benefit:</td><td colspan="4">Species: Upper Columbia River spring Chinook salmon, Upper Columbia River steelhead trout, Columbia River bull trout
Benefit Type: Fish passage</td></tr>
<tr><td colspan="5">Metric: Increased access, 7.5 Miles via two diversion structure passage enhancements</td></tr>
<tr><td colspan="5">Project Objectives and Description: Beaver Creek, a tributary of the Methow River, supports spawning and rearing habitat for wild steelhead and limited habitat for spring Chinook. This project was designed to establish fish passage at two irrigation diversion complexes on Beaver Creek that had been damaged after a 500-year flood event.

The two irrigation diversions are the Marracci diversion at RM 6.5 and the Fort Thurlow diversion at river mile (RM) 1.5. Both diversions were previously reconstructed with the goal of providing fish passage while maintaining irrigation diversions. The diversions were modified initially between 2003 and 2005 to include a series of rock vortex weirs designed to improve fish passage. These weir complexes provided a series of drops (each no more than 0.8 feet) to improve fish passage while maintaining adequate water diversion to irrigators and to reduce in-stream impacts of annual weir construction.</td></tr>
</table>

In 2011, a 500-year flood and debris flow event damaged the Marrachi diversion structure to the point that it no longer met NOAA Fisheries' fish passage criteria for all salmonid life stages. The Fort Thurlow diversion structure became a complete barrier to fish passage due to damage from the event. Reclamation engineers reviewed the data and determined that although the weirs had functioned well for several years prior to flood damage, a revised structural design was needed to restore fish passage at all flows. Reclamation developed revised designs for both diversions to address the damage and improve long-term stability and environmental function.

Project Objectives

1. Restore long-term fish passage at both diversions in compliance with NOAA criteria for fish passage (0.8 ft. maximum drop)
2. Optimize intake performance for agricultural use, thereby eliminating the need for seasonal in-stream actions by irrigators that could affect fish passage.

Specific actions for the **Marracci** project area:

- Reconstruct the existing damaged weir with a more natural roughened channel design to provide long-term fish passage in compliance with NOAA criteria.
- Repair damaged intake headbox to improve function and reduce the need for seasonal in-stream actions by irrigators, which could hinder fish passage.
- Inspect and repair intake pipes as needed to ensure long-term operation.

Specific actions for the **Fort Thurlow** project area:

- Reconstruct the drop weirs with a more natural chute-pool roughened channel design to address the damage, restore fish passage, and improve long-term function.
- Reconfigure the existing fish return pipe to work with the new roughened channel.
- Restore stream bank stability with engineered material placement.

Design, Permitting, and Construction Issues:

Design Issues:
Marracci: Following high water in 2011, the diversion box and trash rack were damaged beyond the scope of normal maintenance and repair. Key rocks in the upper weir were also dislodged. Reclamation evaluated the in-stream weirs and identified continued fish passage problems.
Fort Thurlow: The Fort Thurlow diversion site is the Class 1 measuring point for the Beaver Creek adjudication, and is the oldest and most senior diversion right within the drainage. This means that diversions at this site are the last to be limited by stream flows, and there is always stream flow upstream from this point, as other users are curtailed to provide flows for this diversion. Efficiency improvements at this diversion and ditch system allows in-stream flows in Beaver Creek to reach the Methow River and provide a fish corridor most of the year, so the need to accommodate very low stream flows was an important design consideration.

Permitting Issues:
Marracci: WDFW participated in development of the Marracci repairs with a key stated concern that a more durable solution be implemented to avoid the need for annual reconstruction or maintenance of the diversion weirs. A multi-agency review team was assembled by Reclamation and MSRF to develop a preferred alternative that would satisfy WDFW and key irrigation stakeholders.

The project could not be completed in 2013, in part because of the 2013 Government shutdown and delays in completion of the NEPA process.

Fort Thurlow: WDFW participated in the design development, with the objective of eliminating the annual need to rebuild diversion weirs or placement of sandbags or flashboards needed to meet the irrigation diversion needs. After extensive flow modeling was completed, the preferred alternative was selected from a modified weir drop-based design to a chute-pool roughened channel. The project change increased construction budget from an estimated $40,000 to more than $127,000 and resulted in an additional year to complete construction. A temporary fish passage ladder (Denile) was placed in the creek in an effort to provide marginally improved passage while the design and construction were being completed.

Implementation/Construction Issues:
Marracci: MSRF worked to obtain consent from all stakeholders as a pre-requirement to implementing the preferred alternative. MSRF determined after discussions with each stakeholder that majority support from stakeholders was sufficient to move forward, and initiated implementation efforts in October of 2014.
Fort Thurlow: The Carlton Complex fire in July of 2014 severely burned a large percentage of the watershed above the Fort Thurlow diversion, resulting in elevated flows and elevated sediment load prior to and during construction. Increased stream flows following the fire exceeded the capacity of the Thurlow intake canal, requiring temporary work stoppage and implementation of alternate strategies.

Gallery

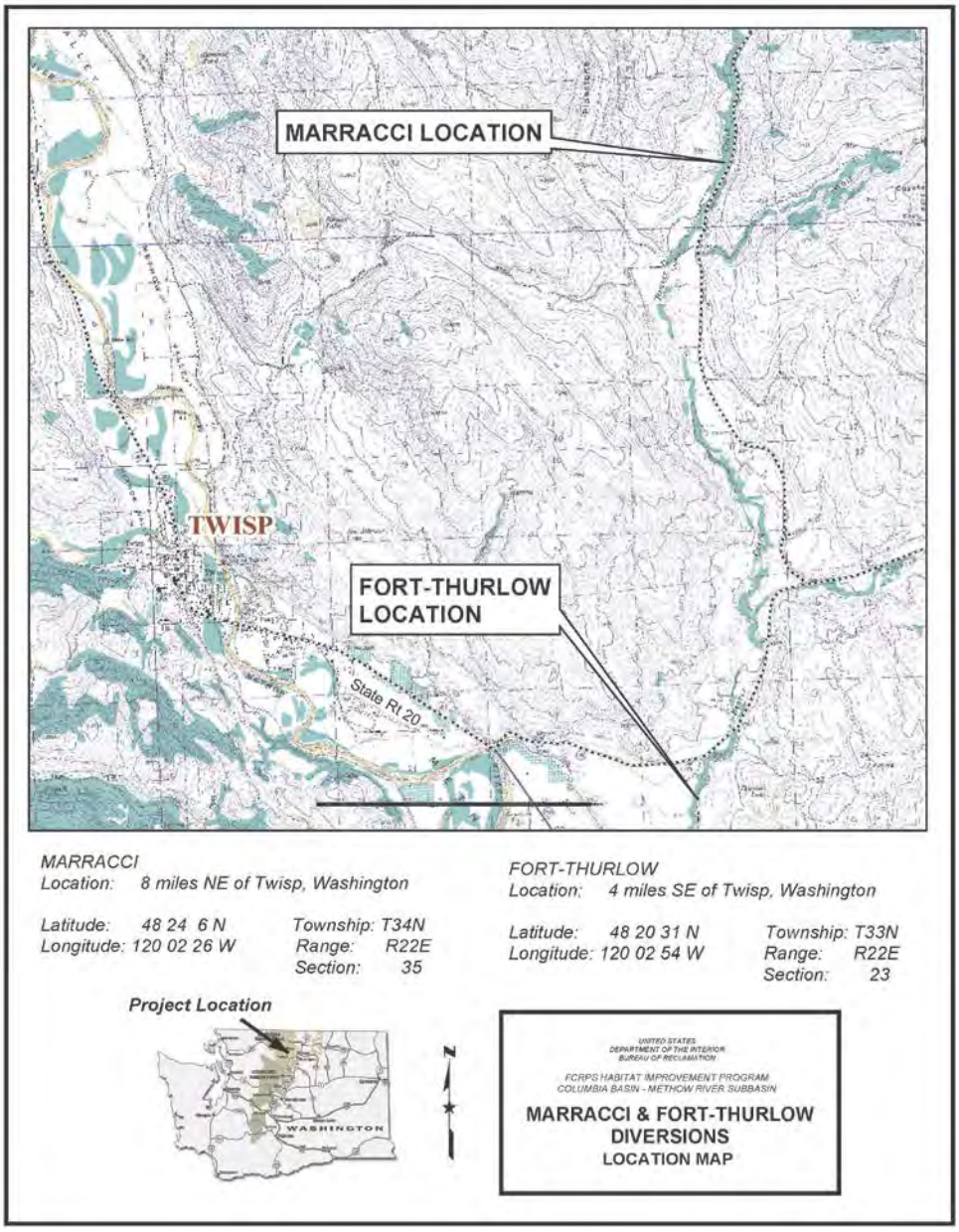


Figure 16. Location map of the two Beaver Creek diversions involved in this project

Photograph 65. The Marrachi diversion as damaged by the 500-year flood; the diversion weir provided some fish passage but not at all life stages.

Photograph 66. The Marrachi diversion during construction of the roughened channel

Photograph 67. Marrachi diversion after construction; fish passage was established for all life stages.

Photograph 68. The Fort Thurlow diversion before construction, showing portions of the diversion weir that were damaged by the 500-year flood event

Photograph 69. The Fort Thurlow diversion during construction, with Beaver Creek flows bypassed around the site

Photograph 70. The chute-pool roughened channel design called for grouting a portion of the engineered materials to create the desired fish passage channel.

Photograph 71. The Fort Thurlow diversion as the Beaver Creek flows were introduced to the chute-pool roughened channel after construction was completed
The design looks natural and provides fish passage for all life stages.

Chewuch River Permanent In-stream Flow Enhancement Project

Project Name: Chewuch River Permanent In-stream Flow Enhancement Project		
Project Action: In-stream flow, water quantity		
Project Sponsor: Trout Unlimited-Washington Water Project (TU-WWP)		
Project Design: Reclamation		
Landowner(s): Chewuch Canal Company		
Partners: Washington Parks; Methow Conservancy; Washington State Recreation and Conservation Office-Salmon Recovery Funding Board; WDFW; Ecology; NOAA Fisheries	**Reclamation Development Costs:** $1,211,800	
Funding Source(s): NFWF; Confederated Tribes and Bands of the Yakama; BPA; PUD No. 1 of Chelan County – Rock Island Habitat Conservation Plan Tributary Committee; Grant County PUD – Priest Rapids Coordinating Committee; SRFB	**Phase 3 (Final Phase) Implementation Cost:** $2,500,000 **Previous Phases:** **Phase 1 pipe:** $700,000 **Phase 2 pipe:** $302,684.00	
Project Location:	**State:** Washington **County:** Okanogan **Stream:** Chewuch	
	Latitude: 48 34' 00.72" **Longitude:** -120 10' 32.78"	
	Township: 35N **Range:** 21E **Section:** 2 **¼ Section:** NE	
Project Status: Complete		
Project Phase: Construction completed and permanent Chewuch River flow agreement in place		
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** October 21, 2013 **Construction Completion Date:** May 1, 2014	
Biological Benefit:	**Species:** Upper Columbia River spring Chinook, UCR steelhead, and Columbia River bull trout **Benefit Type:** In-stream flow	
Metric: 9 cfs benefiting 8.6 miles of the Chewuch River and 23.4 miles of the M2 Middle Methow River		

Project Objectives and Description:

- Increase late summer in-stream flows to protect spring Chinook spawning and rearing habitat, and steelhead rearing habitat in the lower Chewuch River and Middle Methow River
- Increase fall and winter flows in the lower Chewuch River and Middle Methow River
- Change reservoir filling schedule from fall to spring to protect spring Chinook redds and incubating eggs.
- Improve water delivery system and water management of the Chewuch Canal

Company.

- Minimize impact to Pearrygin State Park

The Chewuch River Permanent In-stream Flow Enhancement Project has improved in-stream flows to protect rearing and spawning habitat for Spring Chinook salmon and steelhead. The project converted 6 miles of an unlined, earthen canal to an enclosed, gravity pressurized pipe system and upgraded irrigation infrastructure to allow efficient canal operations at reduced flows. In return for infrastructure improvements, the Chewuch Canal Company (CCC) entered into a permanent flow and operation agreement that increases river flows by 9 cfs over 8.6 miles in the Chewuch River and 23.4 miles in the Middle Methow River in late summer. The agreement also protects flows during the fall and winter. The canal piping and structure improvements involving Chewuch Canal and Pearrygin Lake change the time when Chewuch diversions fill the Pearrygin Lake reservoir from fall to spring.

The final project phase converted 9,000 feet of open earthen ditch to enclosed pipe and implemented a new Pearrygin Lake outlet works/inflow structure, distribution piping, and other control structures, which allows a more efficient use of reduced diverted flows. The construction took place in three phases over several years. The first 2 phases of the project piped large segments of the canal. This final phase completes the project and provides CCC users a reliable water supply while creating in-stream flow benefits to the Chewuch River. Enhanced flows will directly benefit steelhead, Chinook salmon, bull trout, cutthroat trout, and a variety of other fish and wildlife species. The total amount of canal piped in all phases is 6 miles.

Design, Permitting, and Construction Issues:

Design: Additional control structures were added to the scope as additional funding for implementation became available. This led to scope changes and field-engineered problem solving during construction.

Permitting: A change from purely non-federal funding sources with the addition of a federal fund source caused the need for a new set of permits to satisfy NEPA, ESA, and cultural resource processes. This delayed the start of construction by 1 year. Easement negotiations with the Washington State Parks, a major landowner, also took longer and cost more than expected. The water right change for reservoir filling required DOE review of the water right certificates, state SEPA and public comment. This resulted in a requirement to monitor the water use from Perrygin lake, which resulted in a complicated water measurement and monitoring scheme.

Construction: The final phase began in October 2013. Although winter weather was a factor during construction, the contractor was able to take advantage of low-snow conditions. The federal government shut down for 3 weeks at the beginning of the project and removed Reclamation engineers and observers during the shutdown. Fortunately, TU-WWP and VHE project managers contracted with Anchor QEA to help process the submittals and Requests for Information as they came in from the contractor.

Gallery

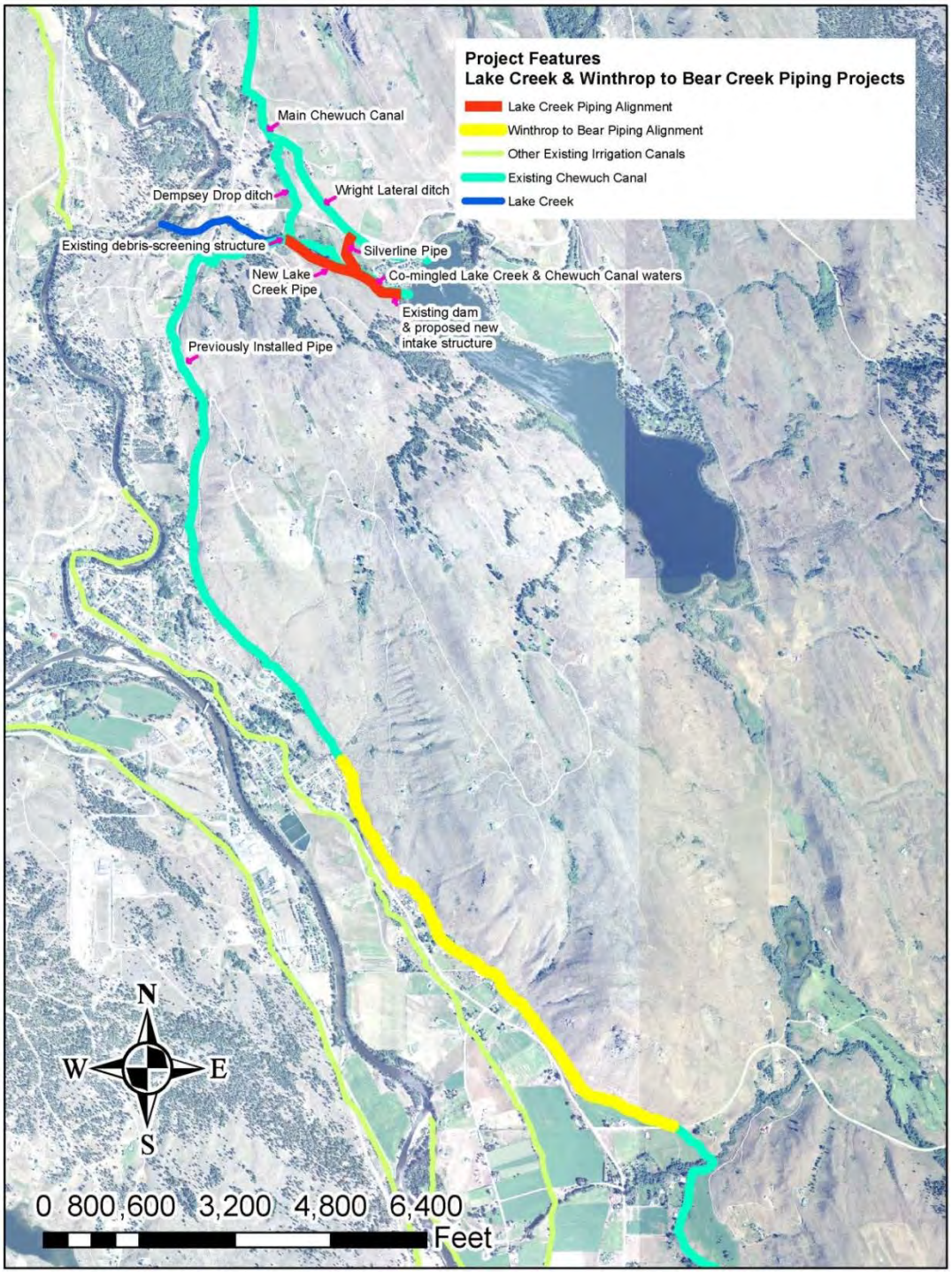


Figure 17. Location of Chewuch Canal features involved in the final project phase

Photograph 72. The Dempsey drop control structure in the Chewuch Canal is the start of the project.
The water is screened for trash and flows a short distance in twin HDPE pipes.

Photograph 73. The Silverline Control Structure screens the water as it enters the CCC pressure pipe system.
Water can also be delivered to irrigated land above Perrygin Lake from this structure.

Photograph 74. Outlet works/ inflow Structure at Pearrygin Lake is designed to fill or withdraw water from reservoir and allows a greater efficiency of the reduced diverted flows.

Middle Methow River Rock Reach (M2-3R) Floodplain and Side Channel Enhancement Project

Project Name: Middle Methow River Rock Reach (M2-3R) Floodplain and Side Channel Enhancement Project	
Project Action: Habitat complexity	
Project Sponsor: Methow Salmon Recovery Foundation	
Project Design: Inter-Fluve, Inc.	
Landowner(s): Private	
Partners: BPA, UCSRB, Methow Conservancy	**Reclamation Development Costs:** $142,900
Funding Source(s): BPA	**Implementation Cost:** $248,000
Project Location:	**State:** Washington **County:** Okanogan **Stream:** Methow
	Latitude: 48 25' 58.9" **Longitude: -**120 9' 29.1"
	Township: 34N **Range:** 21E **Section:** 24¼ **Section:** NW
Project Status: Construction complete; monitoring and adaptive will be required for 2+ years	
Project Phase: Site restoration, monitoring	
Milestones:	**Funding**: Secured **Design:** Complete **Permitting:** Complete **Construction Start Date:** July 16,2014 **Construction Completion Date:** September 29, 2014
Biological Benefit:	**Species:** UCR spring Chinook, UCR steelhead, CR bull trout
	Benefit Type: Juvenile rearing and migration, adult holding
Metric: Enhanced complexity of 1,250 feet of Middle Methow River, including 250 feet of spring-fed backwater alcove habitat by excavating, placing 20 logs in two structures and replanting with native plants; constructed three ELJs along 1,000 feet of mainstem Methow River; riparian revegetation on 1,000 feet of river bank.	

Project Objectives and Description:

Located at River Mile 47.9, the M2 3R project is part of the larger Middle Methow (M2) Project, a suite of habitat improvement projects designed for implementation within this segment of the river to enable reach-wide measurable aquatic habitat benefits. The M2 3R Project was developed to improve habitat conditions in the main channel, a seasonal side channel, and the adjacent floodplain. This project site is located between the M2 Whitefish Island Habitat project completed in 2012 and the M2 WDFW Floodplain project completed in 2013.

The objective of the 3R project is to restore natural processes to the greatest degree feasible while adding sustainable features that immediately improve habitat based on reach-level goals. The project is primarily targeted to rearing juvenile fish during low water, but project features are also intended to provide benefits for both juvenile and adult fish during all flows and to improve floodplain connectivity with the Methow River.

The 3R Project site was identified and prioritized in the Middle Methow Reach Assessment and is part of a reach-scale strategy to improve habitat and habitat forming processes in the following ways:

- Improve survival of ESA-listed spring Chinook and steelhead;
- Increase habitat complexity and connectivity of off-channel areas to improve rearing for juvenile spring Chinook salmon and steelhead;
- Reduce stranding and overwinter mortality by increasing duration of downstream connection from artificial pool in lower side channel;
- Provide additional hiding cover for rearing juvenile salmonids within existing groundwater-fed pools;
- Increase habitat complexity in main channel to provide hiding cover, refuge from high flows, and velocity breaks for juvenile spring Chinook and steelhead;
- Promote long-term wood recruitment, shade, and bank complexity by protecting existing riparian vegetation and reestablishing missing riparian vegetation;
- Support long term habitat forming processes by restoring floodplain/channel interaction; and
- Support habitat for Pacific lamprey by promoting and protecting fine sediment deposition and slow water habitat.

Design, Permitting, and Construction Issues:

Early in the planning process, the project concept shifted from using gravity-based structures to pile-supported structures. This change in design resulted in increased design and construction costs but reduced the construction disturbance and duration of construction significantly. The piles for the engineered logjams were installed using a vibratory pile driver, eliminating the need for de-watering of the site. Use of this equipment also significantly reduced the excavation footprint (surface and depth) compared to the original ballast stabilized and excavated structures constructed in previous M2 projects. The Contractor selected for this project purchased the vibratory driver in preparation for this project. As such, the project provided MSRF the first opportunity for actual field use of the vibratory pile driver. While placement of piles was slower than originally hoped, the on-site presence of the equipment supplier allowed the Project Sponsor and Contractor opportunity to experiment with alternate driving methods, which is expected to benefit future projects.

Gallery

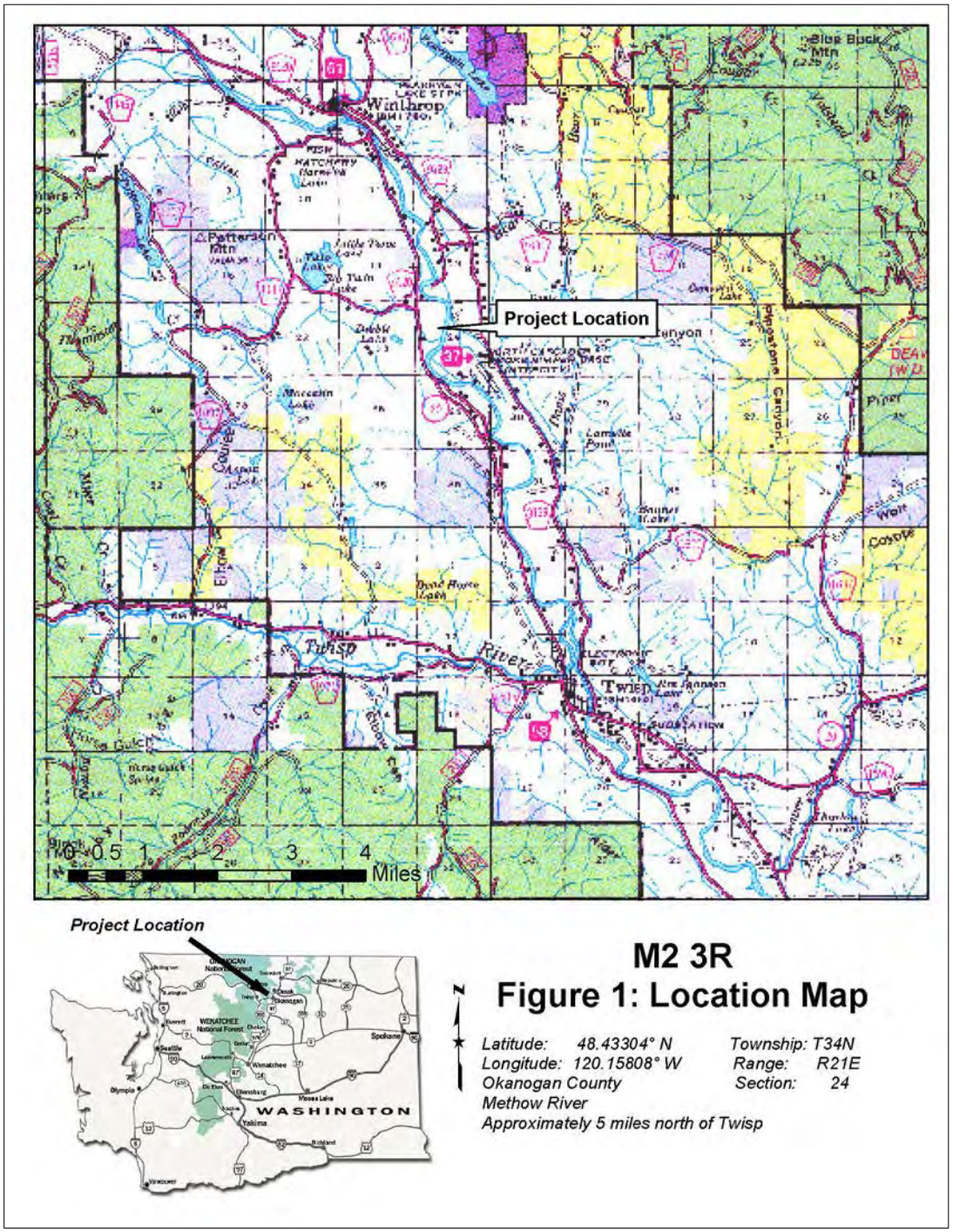


Figure 18. Location of Middle Methow River Rock Reach (M2-3R) Floodplain and Side Channel Enhancement Project

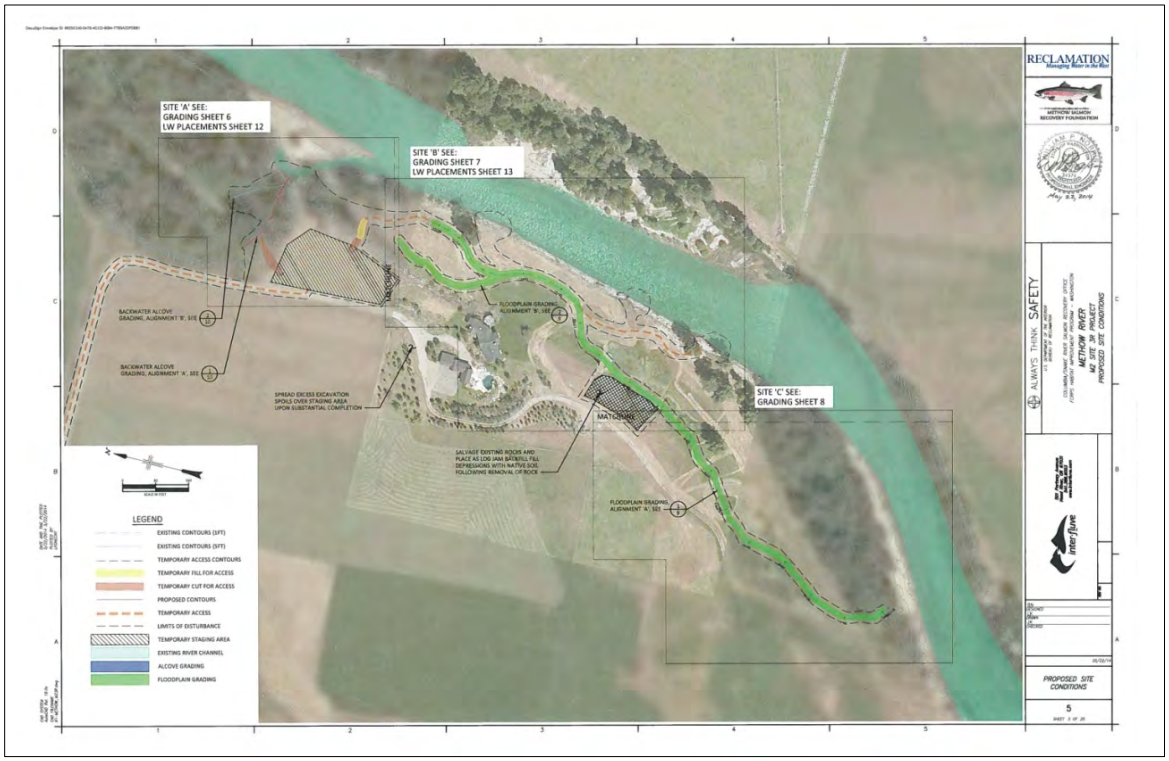


Figure 19. Details of project location

Photograph 75. View shows construction of one of the engineered log jams along the right bank of the Methow River in the project area.

Photograph 76. Vibratory pile driver at work placing vertical piles as part of the ELJs, which were constructed as project features to enhance fish habitat for juvenile salmon and steelhead.

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 PUD and Wenatchee Reclamation District. In 2014, three projects were completed in the subbasin.

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 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, 208-378-5057.

Projects

- Wenatchee - Beaver Creek Diversion Access Enhancement
- Coulter Creek Barrier Removal Access Enhancement Project
- Lower Nason RM 3.7-4.7 (N1) Habitat Enhancement Project

Sponsors

- TU – Washington Water Project
- Chelan County Natural Resources Department (CCNRD)

Partners

- Cascadia Conservation District
- WDFW
- CCNRD
- Reclamation

Funding Sources

- Reclamation
- National Fish and Wildlife Foundation (NFWF)
- USFWS
- Washington State Salmon River Funding Board
- Public Utility District No. 1 of Douglas County Habitat Conservation Plan Tributary Committee
- Washington State Recreation and Conservation Office (RCO)

Bureau of Reclamation Expenditures in 2014 on implemented projects

Subbasin	Expenditures
Wenatchee River	$119,000

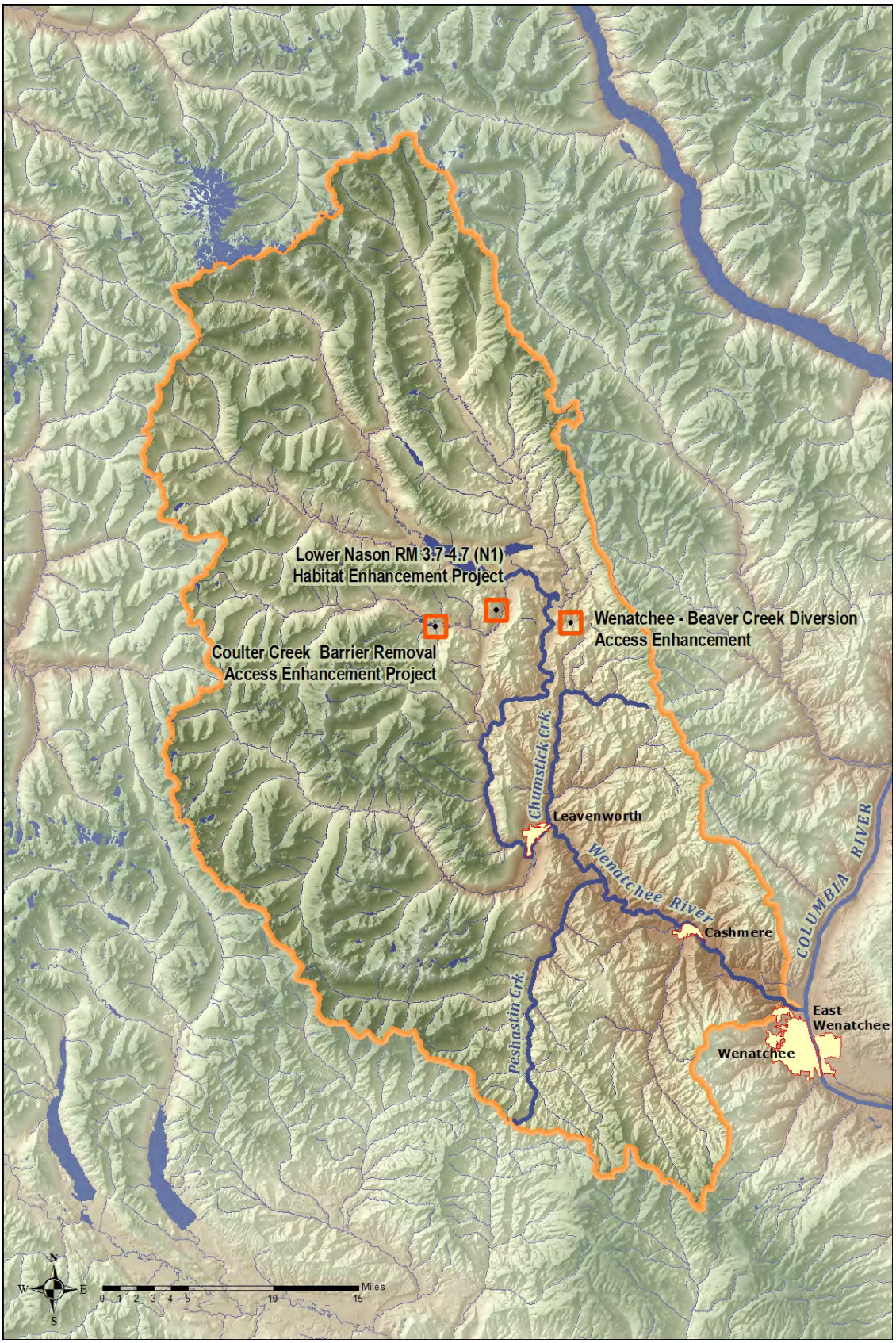


Figure 20. Location map of the projects completed in the Wenatchee River Subbasin in 2014

Wenatchee - Beaver Creek Diversion Access Enhancement

Project Name: Wenatchee - Beaver Creek Diversion Access Enhancement	
Project Action: Water Quantity and Passage	
Project Sponsor: Trout Unlimited – Washington Water Project (TU-WWP)	
Project Design: Trout Unlimited and USFWS	
Landowner(s): Alpine Acres	
Partners: CCD and WDFW	**Reclamation Development Costs:** $23,000
Funding Source(s): Reclamation, USFWS and NFWF	**Implementation Cost:** $46,500
Project Location:	**State:** Washington **County:** Chelan **Stream:** Beaver Creek
	Latitude: 47 46' 28.62" **Longitude:** -120 37' 57.25"
	Township: 26N **Range:** 18E **Section:** 6 ¼ **Section:** SE
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** December 10, 2013 **Construction Completion Date:** October 1, 2014
Biological Benefit:	**Species:** Spring Chinook, steelhead, bull trout, Coho **Benefit Type:** In-stream flow, passage
Metric: 0.5 CFS for one-half mile, one screen removed, one barrier removed, 2.5 miles of increased access, 1 acre riparian enhanced	

Project Objectives and Description: TU-WWP worked with property owners on Beaver Creek, Reclamation, Ecology, and WDFW since 2005 to switch landowners from a surface diversion on Beaver Creek to a groundwater well to improve in-stream flow in this critical tributary. Removal of the surface diversion and fish screen enhanced in-stream flow by more than 0.5 cfs, improved passage at the critical riffle near the confluence with the Wenatchee River, and provided unimpeded passage upstream by removing the channel-spanning diversion. The project improves habitat for ESA-listed Chinook salmon, steelhead and bull trout in Beaver Creek.

TU-WWP successfully secured the water right change with Ecology in late 2013 and subsequently worked with the landowner to install a well. The new water source and all infastrucuture were completed by late spring 2014. TU then worked to complete the historic diversion abandonment by permanently decommissioning the Beaver Creek ditch and removing the fish screen. The project included removal of the diversion structure and restoring the stream bank. All the diversion removal and site work around the creek was accomplished with hand tools to minimize impacts.

Design, Permitting, and Construction Issues: The biggest challenge on this project was permitting the point-of-diversion change. The process was held up for years because of

administrative rules within Ecology that prohibited change authorization without signatures from all of the landowners within the place of use described on the water right. With Reclamation support, TU-WWP was persistent and finally received authorization from the landowners to install a well. The rest of the project went more smoothly and TU-WWP conducted most of the work in-house. The diversion headgate structure was composed of wood, hand-placed rocks and cobbles, plastic sheeting and sand bags. The wood and sand bags were removed, while the rocks and cobbles were resituated in the channel to create salmonid habitat. The fish screen was removed and the 10-inch and 8-inch main-line pipes were cut off above the high-water elevation and capped. TU-WWP also installed a biology revetment to protect the soft spot on the bank where the diversion was removed, and willows and grass seed mix were planted to improve stability and habitat condition.

Gallery

Photograph 77. Diversion structure and fish screen before removal

Photograph 78. This shows the creek after the diversion was removed and channel was restored

Photograph 79. Riparian enhancement by installing willow plantings

Photograph 80. The site after the project was well-drilled and completed

Coulter Creek Barrier Removal Access Enhancement Project

Project Name: Coulter Creek Barrier Removal Access Enhancement Project	
Project Action: Replace barrier culvert with properly sized CMP arch	
Project Sponsor: Chelan County Natural Resources Department	
Project Design: RTS	
Landowner(s): Ralph Byther	
Partners: CCNRD, Reclamation	**Reclamation Development Costs:** $40,000
Funding Source(s): SRFB and HCP Tributary Committee	**Implementation Cost:** $60,000
Project Location:	**State:** Washington **County:** Chelan **Stream:** Coulter Creek (Tributary to Nason Creek)
	Latitude: 47 45' 57.87" **Longitude:** -120 48' 05.49"
	Township: T26N **Range:** R16E **Section:** 11 **¼ Section:** SE
Project Status: Active	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** November 12, 2014 **Construction Completion Date:** November 21, 2014
Biological Benefit:	**Species:** Steelhead **Benefit Type:** Barrier removal
Metric: 1.6 miles access	

Project Objectives and Description: The objective of this project was to replace an existing fish-passage barrier culvert at RM 0.4 with a bottomless arch structure. The completed project increases access to rearing habitat for steelhead and salmon in Nason Creek and the Wenatchee Subbasin. This project complements the larger Nason Creek Lower White Pine (LWP) Reconnection Habitat Enhancement Project, which reconnected 14.9 percent of the Upper Nason Creek Basin and included the reestablishment of stream connectivity of the Coulter Creek drainage to the mainstem Nason Creek. The replacement of the barrier culvert with a bottomless arch structure greatly improved salmonid access to 1.6 miles of stream, which includes 0.32 acres of stream/wetland rearing habitat.

Design, Permitting, and Construction Issues: Much of the planning work for this project was covered under the Lower White Pine Project. The project required significant re-design in April 2014 to address WDFW permitting issues. The culvert was enlarged to accommodate a larger bankfull width. Section 106 compliance delayed construction of the project, which resulted in difficult environmental conditions to build in (frozen soils). The Chelan County Natural Resources Department (CCNRD) advertised for bids and conducted a pre-bid project walkthrough with prospective construction contractors on September 26. Bids were opened on October 6, with Olin Excavation LLC submitting the low bid. In order to reduce project costs and ensure that the replacement culvert would be delivered on time, the CCNRD purchased the

replacement culvert from Northwest Construction Supply. Delivery was completed October 23. Work began on November 12. De-fishing took place, and a creek bypass system was installed. Construction continued with the contractor working 10-hour days and on Saturdays during freezing temperatures. Olin installed new underground power and phone conduit as required by Chelan County PUD. Work was substantially completed on November 21, 2014. The Project has some final site cleanup work to be completed in spring along with planting.

Gallery

Photographs 81 and 82. The contractor and field engineer discussing progress and installation of second half of the arch pipe

Photographs 83 and 84. The large culvert was placed low enough to allow the contractor to install engineered streambed material to create a more natural passage channel through the large culvert.

Photograph 85. The completed project allows for fish passage at all flows and all life stages.

Lower Nason RM 3.7-4.7 (N1) Habitat Enhancement Project

Project Name: Lower Nason RM 3.7-4.7 (N1) Habitat Enhancement Project	
Project Action: Floodplain fill removal and oxbow enhancement	
Project Sponsor: Chelan County Natural Resources Department	
Project Design: ICF	
Landowner(s): U.S. Forest Service and Weyerhauser	
Partners: Landowners and Funders	**Reclamation Development Costs:** $56,000 (2013-2014 Task orders)
Funding Source(s): Reclamation and RCO	**Implementation Cost:** $175,000
Project Location:	**State:** Washington **County:** Chelan **Stream:** Nason Creek
	Latitude: 47° 46' 57.201" **Longitude:** -120° 43' 33.3084"
	Township: 26N **Range:** 17E **Section:** 9 **¼ Section:** SW
Project Status: Complete	
Project Phase: Monitoring	
Milestones:	**Funding**: Secured **Design:** Completed **Permitting:** Completed **Construction Start Date:** July 14, 2014 **Construction Completion Date:** October 31, 2014
Biological Benefit:	**Species:** Steelhead and spring Chinook **Benefit Type:** Peripheral and transitional habitat and channel structure and form (in-stream complexity)
Metric: Removal of 0.75 acres of floodplain fill and placement of 28 logs to enhance 0.7 acre of oxbow side channel habitat for 0.1 miles of side channel	

Project Objectives and Description: The following text describes the specific habitat functions gained by each of the project elements:

1. **Bridge-abutment fill removal (Nason Creek RM 4.7):** This action removes 1,325 cubic yards (0.14 acre) of fill associated with a relic abutment of an historical bridge. This action restores channel migration potential and natural stream channel processes. Removing the bridge-abutment fill will enhance activation of a nearby side channel, restore the confluence of a tributary just upstream of the abutment fill, and allow greater river migration to river left.
2. **Road-approach floodplain fill removal (Nason Creek RM 4.6):** This action removes 0.61 acre (1,825 cubic yards) of fill in the Nason Creek floodplain and restores floodplain wetland conditions. The fill-removal area is surrounded by wetland and a small intermittent creek that runs north along SR 207 and then around the fill area before flowing into Nason Creek. Hydraulic modeling conducted by ICF indicated that removing the fill would allow the area to be

inundated at approximately the 5-year event and higher. Thus, most of the time, this area would function primarily as a stream and wetland complex. However, during higher flows (5-year event and higher), this fill removal area provides increased flood prone area and increased flood-storage capacity. In addition, the stream channel through this area will provide high-flow refuge habitat for spring Chinook and steelhead when it is backwatered by Nason Creek.

3. **Oxbow enhancement (Nason Creek RM 3.9):** The oxbow was hydrologically reconnected by the CCNRD via the installation of two 12-foot-diameter culverts along SR 207 in 2007. When this feature was hydrologically reconnected to Nason Creek in 2007, the connection was made without additional habitat enhancement work in the existing oxbow. Since 2007, monitoring efforts have shown that the oxbow is used by juvenile and adult salmonids as off-channel refuge, rearing, and spawning habitat. Given the abundant juvenile fish use, the completed action from this project have improved habitat in the upstream area of the oxbow where wide, shallow habitats that lack cover have persisted since the 2007 reconnection. The installation of large wood in the upstream area has increased structure and, in the future, should alter sediment deposition patterns to make some wide, shallow areas narrower and deeper. Sediment deposition adjacent to the large wood structures will create slightly higher areas on the edges that can be planted to increase vegetation structure at the water's edge adding edge complexity and overhanging vegetation, as well as in-stream cover to improve fish rearing and refuge habitat.

Design, Permitting, and Construction Issues:

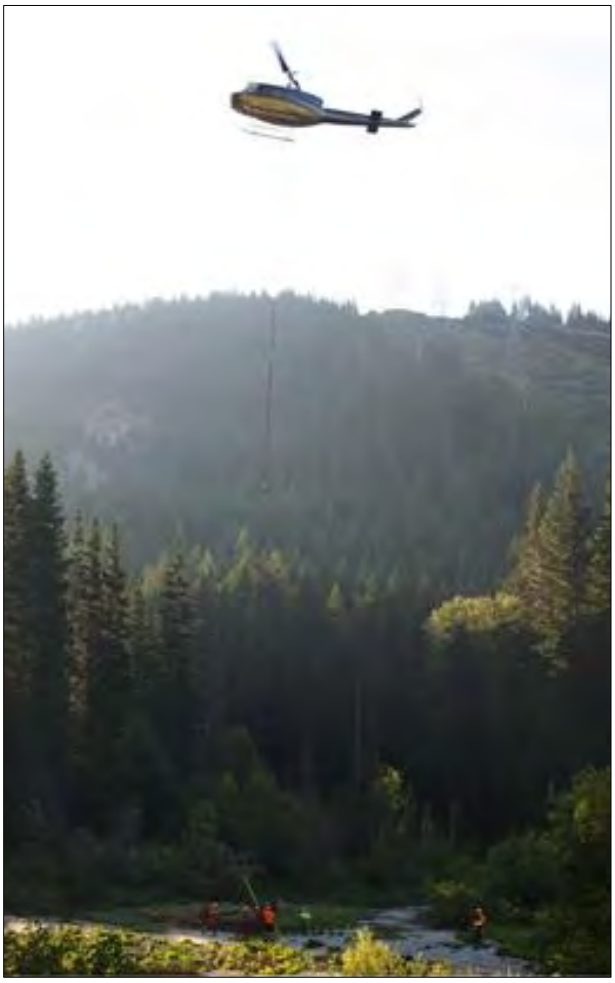
Design – Stakes were not placed in the field prior to construction staking. Some design revisions were made based upon construction staking; they did not affect cost or function, but the late changes created some problems.

Permitting – There was discussion about whether to install a cofferdam for the bridge abutment removal. Without the cofferdam, there would not have been a Corps permit for the project, since the project was all fill removal and placement of organic material. Without a Corps permit, there was no Section 401 coverage for the project. The NWP 33 for placement of a cofferdam provided the DOE statewide programmatic coverage for the Section 401 water quality certification. WDFW supported the need for a cofferdam because of the request for a later in-water work window, and because the project was near spring Chinook spawning. In the end, the presence of the cofferdam allowed for minimal sediment releases.

Construction – CCNRD advertised for bids, held a pre-construction walkthrough with potential bidders, and opened bids on July 7. EcoGrind Site Solutions submitted the low bid. After a pre-construction conference with WDFW, CCNRD, and EcoGrind, work began on the parking lot fill removal area on July 14. The Chiwaukum Creek Fire started soon after construction began, and the contractor was subject to Forest Service fire-hazard restrictions, covering work hours, type of equipment, and a complete ban on any helicopter activity. A waiver was granted, allowing the contractor to deliver the logs on July 28. Log delivery and placement was completed within 3 hours. After meeting with the Weyerhaeuser Forester, work began on the bridge-abutment removal portion of the project. The contractor installed a cofferdam and CCNRD staff removed fish on August 4. EcoGrind mobilized additional

equipment to allow simultaneous work on the parking lot removal and bridge abutment areas. Construction staking and turbidity monitoring was provided by CCNRD staff. All earthwork and log placement work was completed on August 15. Site re-vegetation was completed in October 2014.

Gallery



Photograph 86. Flying logs into the oxbow Project

Photograph 87. Logs placed by helicopter lessened the construction impacts of the project while increasing the work efficiency.

Photograph 88. Anthropogenic fill in the floodplain was removed to allow Nason Creek greater access to the flood plain.

Photograph 89. Nason Creek was able to access the lower flood plain during a 2-year flow event.

Photograph 90. Removal of the old bridge abutment allowed Nason Creek flows to access the area during a 2-year flow event.