RECLAMATION

Managing Water in the West

RECLAMATION'S 2009 ANNUAL REPORT OF TRIBUTARY HABITAT PROJECTS COMPLETED FOR THE *2008 FEDERAL COLUMBIA RIVER POWER SYSTEM BIOLOGICAL OPINION*

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGIONAL OFFICE
COLUMBIA-SNAKE SALMON RECOVERY OFFICE
BOISE, IDAHO

DECEMBER 2010

On the Cover: Oro Dell Diversion Fish Passage Enhancement Project (near La Grande, Oregon): The top two weirs and the reconstructed sill are shown during construction. The project objective was to improve fish passage at the Oro Dell Diversion Structure near La Grande on the mainstem Grande Ronde River by providing a step-pool configured rock structure that met National Marine Fisheries Service criteria.

MISSION STATEMENTS

The mission of the Department of the Interior is to protect and provide access to our Nation's natural and cultural heritage and honor our trust responsibilities to Indian Tribes and our commitments to island communities.

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.

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ACKNOWLEDGMENTS

The major credit for the success to date of Reclamation's efforts to fulfill its habitat responsibilities and requirements under the 2008 FCRPS BiOp is due to the participation and cooperation of many partners — public and private. These include local and state agencies, non-profit organizations and interest groups, Tribes, and other federal agencies. Some have provided their resources of time and money for single projects, others for multiple activities throughout a subbasin. The following is an ever-growing list of these "Sponsors, Landowners, Partners, and Funding Sources."

Subbasin abbreviations: *Entiat, ENT; Grande Ronde, GR; John Day, JD; Lemhi, LEM; Methow, MET; Pahsimeroi, PAH; Upper Salmon (includes East Fork and Yankee Fork), UPS; Wenatchee, WEN.*

Sponsors, Landowners, Partners, and Funding Sources	Subbasin(s)
Barkley Irrigation Company	MET
Beartooth Capital (landowner)	PAH
Blair Kauer, irrigator	LEM
Bob Amonson (landowner)	LEM
Bonneville Power Administration (Portland, OR)	**All subbasins**
Bureau of Reclamation, Pacific Northwest Region offices	**All subbasins**
Cascadia Conservation District (Wenatchee, WA)	ENT, WEN
Chelan County Natural Resources Department (Wenatchee, WA)	WEN
Chelan County P.U.D. (Wenatchee, WA) — as Mid Columbia HCP Tributary Fund	ENT, WEN
Chewuch Basin Council (Winthrop, WA)	MET
Chewuch Canal Company and "unincorporated CCC" (nine non-member water buyers)	MET
Columbia Basin Water Transactions Program, ***Washington Water Project***	MET
Confederated Tribes Warm Spring Reservation of Oregon (CTWRSO)	JD
Custer Soil and Water Conservation District (Challis, ID)	PAH, UPS
Douglas County P.U.D. No. 1 (East Wenatchee, WA) — also as Mid Columbia HCP Tributary Fund	MET
Fulton Ditch Company (Winthrop, WA)	MET
Grant County P.U.D. (Ephrata, WA) — as Priest Rapids Coordinating Committee	WEN
Grant Soil and Water Conservation District (John Day, OR)	JD
Icicle-Peshastin Irrigation District (Cashmere, WA)	WEN
Idaho Department of Fish and Game	LEM, PAH, UPS
Idaho Office of Species Conservation	LEM, PAH, UPS

Sponsors, Landowners, Partners, and Funding Sources	Subbasin(s)
Karl Tyler (landowner)	LEM
Lemhi Irrigation District (Salmon, ID);	LEM
Lemhi Soil and Water Conservation District (Salmon, ID)	LEM
Merrill Beyeler (landowner)	LEM
Methow Salmon Recovery Foundation (Twisp, WA)	MET
Methow Valley Irrigation District (Twisp, WA)	MET
Mid Columbia HCP Tributary Fund (Chelan County P.U.D. and Douglas County P.U.D.)	ENT, WEN
National Marine Fisheries Service (NOAA Fisheries)	LEM, MET, PAH, US
Okanogan County Electric Cooperative (Winthrop, WA)	MET
Okanogan County Public Works Department (Okanogan, WA)	MET
Oregon Department of Fish and Wildlife	JD
Oregon Department of Transportation	JD
Oregon Watershed Enhancement Board	GR, JD
Oro Dell Ditch Company (La Grande, OR)	GR
Pacific Coast Salmon Recovery Fund (NMFS)	LEM
Priest Rapids Coordinating Committee (Grant County P.U.D)	WEN
Salmon Recovery Funding (SRF) Board, Washington State Recreation and Conservation Office (RCO) (Olympia, WA)	ENT, MET, WEN
Trout Unlimited	LEM
U.S. Fish and Wildlife Service	**All subbasins**
U.S. Forest Service	MET
U.S. Natural Resources Conservation Service	LEM, MET, PAH, US
Union Soil and Water Conservation District (La Grande, OR)	GR
Upper Salmon Basin Watershed Program (Salmon, ID)	LEM, PAH, US
Washington Department of Ecology	MET
Washington Department of Fish and Wildlife	ENT, MET
Washington Department of Transportation, Division of Aeronautics	MET
Washington Rivers Conservancy (Wenatchee, WA)	WEN
Washington Water Project (WWP) of ***Trout Unlimited*** (Wenatchee, WA)	MET
Yakama Nation [Confederated Tribes and Bands of the Yakama Nation]	WEN

CONTENTS

FIGURES

"Figures" — including location maps and photographs — are captioned specific to their respective projects, so are not listed here individually.

Tables

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1. INTRODUCTION

For the past decade, the Bureau of Reclamation (Reclamation) has been involved in habitat improvement throughout the Columbia River Basin. Our efforts have involved various authorities and agreements, in cooperation with a wide array of sponsors, landowners, partners, and funding source in eleven subbasins. This document is the annual report for calendar year 2009.

1.1 BACKGROUND

Three "Action Agencies" — the U.S. Army Corps of Engineers (ACOE), the Bonneville Power Administration (BPA), and Reclamation — are responsible for the operation and maintenance (O&M) of the Federal Columbia River Power System (FCRPS).

The Action Agencies contribute to the implementation of salmonid habitat improvement projects in some Columbia River Basin tributaries to help meet commitments contained in the 2008 FCRPS Biological Opinion (BiOp) (NOAA 2008).[1/] This BiOp includes a "Reasonable and Prudent Alternative" (RPA) — a suite of actions — to protect listed salmon and steelhead across their life cycle. Habitat improvement projects in various Columbia River tributaries are one aspect of this RPA. 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. Project summaries in this report not only include results from Reclamation involvement, but also include results from other partners so that pertinent project details are located in one place. Reclamation's contributions to habitat improvement are all meant to be within the framework of the RPA or related commitments.

[1] *Remand of 2004 Biological Opinion on the Federal Columbia River Power System (FCRPS) including 19 Bureau of Reclamation Projects in the Columbia Basin (Revised pursuant to court order, NWF v. NMFS, Civ. No. CV 01-640-RE (D. Oregon)* (FCRPS BiOp); *Operations and Maintenance of the USBR Upper Snake River Basin Projects above Brownlee Reservoir* (Upper Snake BiOp); *Impacts of US v OR Fisheries in the Columbia River in years 2008-2017 on ESA listed Species and Magnuson-Stevens Act Essential Fish Habitat* (Harvest BiOp); and a final *Supplemental Comprehensive Analysis of the Federal Columbia River Power System and Mainstem Effects of the Upper Snake and other Tributary Actions* (SCA). May 5, 2008, F/NWR/2005/05883 [NOAA, 2008] http://www.salmonrecovery.gov/BiologicalOpinions/FCRPS/2008Biop.aspx

1.2 TRIBUTARY HABITAT PROGRAM CONTACTS

Staff officers in the subbasins listed below work with project sponsors, landowners, partners, and funding sources. For more information, please contact the appropriate person at the phone number provided below.

River Subbasin(s)	Bureau of Reclamation		
	Office Location	**Liaison**	**Phone Number**
Entiat and Wenatchee	Wenatchee, WA	Steve Kolk	509-667-8494
John Day — Upper, North Fork, and Middle Fork	John Day, OR	Mark Croghan	541-575-3033
Lemhi, Pahsimeroi, and Upper Salmon (including East Fork and Yankee Fork)	Salmon, ID	Brian Hamilton Al Simpson	208-756-6052 208-756-6054
Grande Ronde	La Grande, OR	Darrell Dyke	541-963-0724
Methow	Twisp, WA	Jennifer Molesworth	509-997-0640
Columbia-Snake Salmon Recovery Office	*Boise, ID*	*Jeff Peterson Habitat Manager*	*208-378-5093*

2. ENTIAT SUBBASIN, WASHINGTON

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 an area of about 1520 square miles. It has only two significant tributaries: Mad River (RM 10.7) and the North Fork Entiat (RM 34.5). The mouth of the river is about nine miles upstream from the Rocky Reach Dam (Columbia RM 474.5); the dam impounds Lake Entiat and is owned and operated by the Chelan County Public Utility District (Wenatchee, WA).

ESA anadromous species include Upper Columbia River (UCR) spring Chinook salmon (endangered) and UCR steelhead trout. Beginning in 2011, the Entiat National Fish Hatchery will begin releasing UCR summer Chinook salmon (which are not endangered), switching from spring Chinook.

2.1 ENTIAT RIVER, DITCH CONSOLIDATION — KW DIVERSION

Project Objectives and Description: The Knapp-Wham Irrigation Diversion Improvement represented the final component of the greater Knapp-Wham Hanan-Detwiler (KW/HD) Irrigation Ditch Consolidation Project. It replaced a push-up dam with a permanent diversion for the KW ditch on the right bank about Entiat RM 5.8.

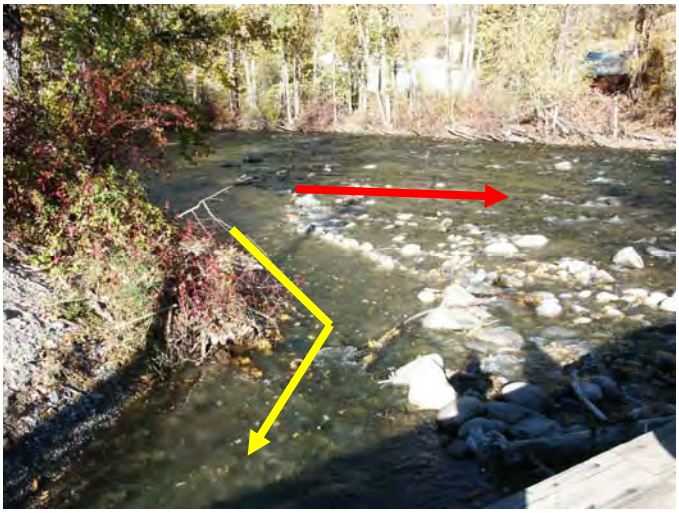
One of a series of projects to eliminate fish-passage barriers, improve fish habitat, and improve water supply reliability, in the Entiat River watershed, the work was coordinated and performed by the Cascadia Conservation District (CCD) on behalf of the Entiat Watershed Planning Unit (EWPU). The Knapp-Wham diversion directs water from the Entiat River to an irrigation system serving agricultural landowners along the southwest bank of the Entiat River valley. The original diversion created obstacles for fish passage and failed regularly, requiring annual maintenance that disturbed fish spawning and rearing habitat.

The new structure is a wing-dam design with an innovative fish wash constructed in the wing dam. GeoEngineers, Inc. and the CCD were awarded a 2010 “Best in State Bronze Award” for engineering excellence by the Washington State Chapter of ACEC (American Council of Engineering Companies).

Design, Permitting, and Construction Issues: The left bank landowner pulled out of the project, requiring a significant re-design at the last minute. Project had previously been delayed, and screen rebuilt separately, because of same issue. The final design was not funded by Reclamation because of timing and landowner issues.

Project Name: KW/HD (Knapp-Wham/Hanan-Detwiler) Consolidation — KW Diversion	
Project Type: Screening, Passage, Complexity, Instream flow	
Sponsor: Cascadia Conservation District (Wenatchee, WA) on behalf of Entiat Watershed Planning Unit	
Project Design: GeoEngineers, Inc.	
Landowner(s): Jon Small	Partners:

Funding Source(s): BPA	Implementation Cost: $113,000
Project Location:	State: WA County: Chelan Stream: Entiat River Lat 47° 41′ 27″ N; Long 120° 19′ 05″ W. Local Landmark: RM 5.8 Township: 26N Range: 20E Section: 3 ¼ Section: SW
Project Status: Completed September 2009	
Project Phase: Monitoring	
Milestones	Funding: 2008
	Design: August 2009
	Permitting: August 2009
	Construction: September 2009
Contracting	Construction Contractor: Columbia Valley Excavation
	Site Rehabilitation Contractor: Columbia Valley Excavation
Biological Benefit	Species: UCR spring Chinook salmon, UCR steelhead trout
	Benefit Type: Passage
Metric: partial barrier	



Entiat, KW (Knapp-Wham) Diversion Consolidation, Photo 1 — before construction. The yellow arrow indicates the diversion inlet. The red arrow shows direction of stream flow. Heavy equipment had to work in the stream channel to rebuild the push-up dam with rocks from the streambed wherever the river had washed them away. This activity could disturb fish using the area. *(undated)*

Entiat, KW (Knapp-Wham) Diversion Consolidation, Photo 2 — after construction. The yellow arrow indicates the new rock wall to the right of the diversion channel. The red arrow shows the direction of stream flow. Large diameter rocks protect structure during high stream-flow events and significantly reduce the need for maintenance by heavy equipment in the stream channel resulting in less disturbance to fish. *(September 2009)*

2.2 ENTIAT RIVER, MOODY CANYON ENGINEERED LOG JAM

Project Objectives and Description: This project used active rehabilitation techniques, through the placement of instream structures, to rehabilitate habitat complexity (juvenile edge refugia, cover, and resting pools) for the benefit of Chinook salmon and steelhead. It also promoted localized recruitment and retention of spawning gravels along channel margins which primarily was to benefit the adult steelhead observed spawning in large numbers in the lower Entiat.

The in-channel features utilized in this project include a rock diversion, boulder clusters, large woody material (LWM) complexes, and an engineered log jam (ELJ) below the Keystone Bridge near Moody Canyon. The rock diversion is intended to promote deposition of bedload material that might be beneficial for spawning activities, create localized scour pools, and divert water for agricultural purposes,. Boulder clusters are to modify the local hydraulic conditions to create velocity, depth, and substrate diversity (pocket pool habitat) as well as hydraulic cover. LWM complexes and the ELJ will provide scour, cover, refuge, and energy dissipation.

There were no **Design, Permitting, and Construction Issues.**

Project Name: Moody Canyon ELJ (below the Keystone Bridge)		
Project Type: Screening, Passage, Complexity, Instream flow		
Project Sponsor: Cascadia Conservation District, Wenatchee, WA (Mike Rickel, 509 664-9345)		
Project Design: Reclamation's Technical Service Center (TSC) for alternative evaluation report; Anchor QEA for final design		
Landowner(s): WDFW (left bank), Dale Foreman (right bank)		Partners: Salmon Recovery Funding Board, Mid Columbia HCP Tributary Fund, BPA
Funding Source(s): SRF Board, Mid Columbia HCP Tributary Fund, BPA		Implementation Cost: $304,000
Project Location:	State: WA County: Chelan Stream: Entiat River 47° 39′ 48″ N, 120° 15′ 1″ W. Local Landmark: Just downstream of Keystone bridge ≈ RM 1.3 Township: 25N Range: 21E Section: 18 ¼ Section: NE, SE	
Project Status: River work completed October 2009; irrigation works completed in February 2010		
Project Phase: Completed		
Milestones	Funding: December 2008, January 2009	
	Design: March 2009	
	Permitting: June 2009	
	Construction: River work completed 10/31/2009	
Contracting	Construction Contractor: Award Construction, Inc.	
	Site Rehabilitation Contractor: Washington Conservation Corps	
Biological Benefit	Species: UCR spring Chinook salmon, UCR steelhead trout	
	Benefit Type: Habitat /Passage/Refuge	
Metric: 0.15 miles complexity, partial barrier removal, 1 screen (1500 GPM), instream flow (2 cfs, associated with KW/HD consolidation)		

Moody Canyon, Photo 1 — Left Channel, completed boulder cluster. (*undated)*

Moody Canyon, Photo 2 — Left Channel, completed engineered log jam. (*undated)*

3. GRANDE RONDE SUBBASIN, OREGON

The Grande Ronde River is tributary to the Snake River (at RM 168.7) and has a drainage area of about 3950 square miles. Its major tributaries include the Wallowa River (RM 81.4) and Catherine Creek (RM 143.9). Minam River is tributary to the Wallowa River (RM 10.1).

Endangered and threatened anadromous species include Snake River steelhead trout (threatened), Snake River sockeye salmon (endangered), Snake River spring/summer Chinook salmon (threatened), and Columbia Basin bull trout.

Subbasin	HUC [1/]	RM	Area (sq. mi.)
Upper Grande Ronde	17060104	from headwaters (≈ RM 188) to Wallowa River confluence RM 81.4	1650
Catherine Creek	—	at Grande Ronde RM 143.9	411
Wallowa	17060105	confluence at Grande Ronde RM 81.4	950
Minam	—	confluence at Wallowa RM 10.1	240
Lower Grande Ronde [2/]	17060106	from Wallowa River confluence (RM 81.4) from to confluence at Snake River RM 168.7	1530

1/ HUC = USGS "hydrologic unit code"; see http://water.usgs.gov/GIS/huc.html

2/ Not assigned to Reclamation for rehabilitation

3.1 ORO DELL DIVERSION FISH PASSAGE ENHANCEMENT

Project Objectives and Description: The project objective was to improve fish passage at the Oro Dell Diversion Structure near La Grande on the mainstem Grande Ronde River (about RM 159) by providing a step-pool configured rock structure that met NMFS criteria. The improved fish passage allows juvenile fish and adult salmonids to pass upstream during low flow periods reducing the risk of salmonids being trapped below the rock sill weir in the large scour hole that is located just below the weir.

This project replaced the rock sill weir with four full-span, rock cross-vanes to improve fish passage and modified the intake structure at the Oro Dell Diversion to allow sediment to pass through a sluice. As built, the cross-vanes are full channel width and placed at intervals of approximately 75′ to 100′. The vanes were constructed using 48″ rock boulders keyed into the streambed and banks for extra stability. The vanes were placed to pass fish at all flow conditions and gradually step the channel up to the proper grade.

The installed sediment sluice was designed to carry sediment — deposited during high flows — past the Oro Dell Diversion intake structure in order to prevent the build-up of fine silt that occurs every year at the old structure. This will reduce the need for the Oro Dell Ditch Company to operated heavy equipment in the stream channel annually to clean the area in

front of the head gate. Periods of temporary turbidity, created while shoveling sediment out of the intake structure, will be reduced or eliminated.

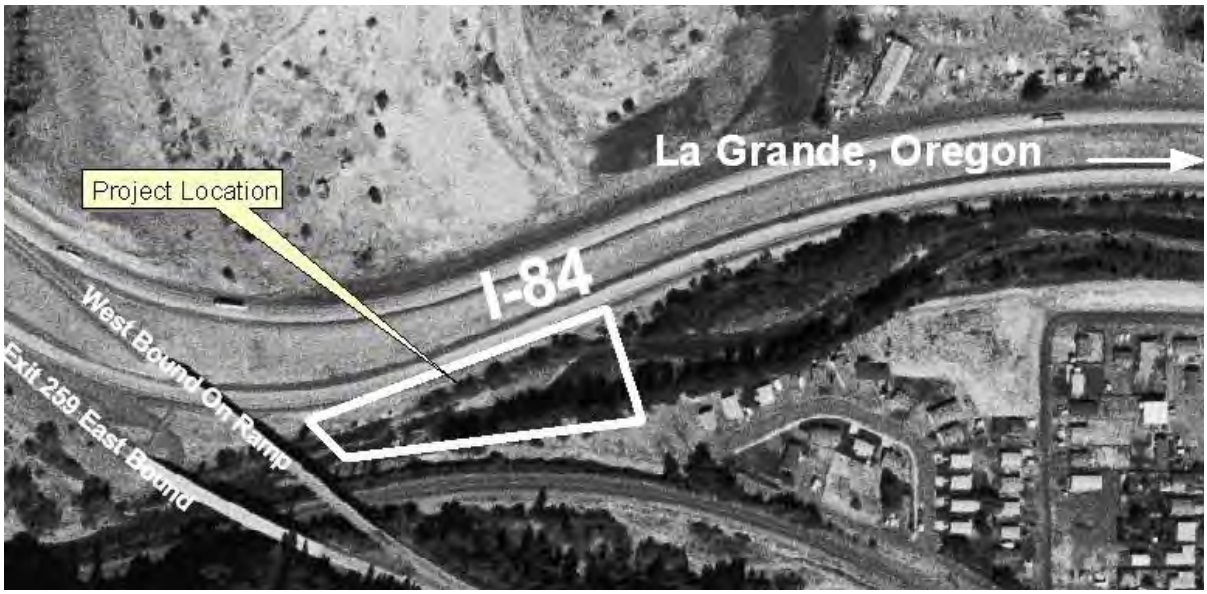
The project treated or enhanced over 500 feet of stream channel.

Design, Permitting, and Construction Issues: Designs were limited, mainly consisting of typical drawings with limited dimensions. This left design interpretation up to the COR (contracting officer representative), the Reclamation "observer," or the contractor. These periods of interpretation resulted in short delays while the design engineer was contacted for his interpretation. After construction, it was noted that the rock weirs had a lower-than-anticipated profile. There is concern the lower profile may lead to erosion of the diversion islands that the ditch companies now use to pull water to their headgates. This is an issue that will need to be monitored over the next few years.

Permitting delays led to late implementation of the project. The project was slated to be constructed in 2008 but instead was constructed in September 2009. No additional costs were incurred except in finalizing the permits.

Partney Construction LLC completed the project on time with minimal problems. The contractor worked well with the BOR Observer and was professional in his communications and construction.

Project Name: Oro Dell Diversion Fish Passage Enhancement Project		
Project Type: Passage		
Project Sponsor: Union Soil and Water Conservation District, La Grande, OR		
Project Design: Anderson-Perry & Associates (LaGrange, OR), Brett Moore		
Landowner(s): Irrigation Canal Company (LaGrande, OR)		Partner(s): Union SWCD, Oro Dell Ditch Company, OWEB, FWS
Funding Source(s): OWEB, FWS		Implementation Cost: $170,844 for construction; $88,000 for design and permitting
Project Location:	State: Oregon; County: Union; Stream: Grande Ronde River; Local Landmark: Oro Dell Diversion (RM 159) 45° 20′ 31″ N, 118° 06′ 50″ W. T2S; R38E; Section: 18; ¼ Section: 31 SWSW	
Project Status: Completed Project Phase: Monitoring		
Milestones	Funding: OWEB, December 2008; FWS, January 2009	
	Design: March 2008	
	Permitting: June 2009	
	Construction complete: October 2009	
Contracting	Construction Contractor: Partney Construction LLC	
	Site Rehabilitation Contractor: In-kind from Oro Dell Ditch Company	
Biological Benefit	Species: SR steelhead trout and SR spring/summer Chinook salmon	
	Benefit Type: Passage	
Metric: opened 29 miles of mainstem from new diversion structure to headwaters		



Oro Dell Diversion Fish Passage Enhancement — Location Map.

Oro Dell, Photo 1 — Oro Dell Diversion prior to construction in the winter of 2000.

Oro Dell, Photo 2 — Oro Dell Diversion showing the top two weirs and the reconstructed sill during construction. *(undated)*

4. JOHN DAY SUBBASINS, OREGON

The John Day River is tributary to the Columbia River at RM 204, entering about 13 miles upstream from the ACOE′s John Day Dam. Within the John Day River watershed, Reclamation has responsibility in three "subbasins" — the Upper John Day, the North Fork John Day, and the Middle Fork John Day. For purposes of this report, they are collectively called the John Day Subbasins.

Anadromous species present include Middle Columbia River (MCR) steelhead trout (threatened) and MCR spring-run Chinook salmon (not listed). Lamprey are also present.

The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) have holdings in the Upper John Day and the Middle Fork John Day subbasins, and work in strong cooperation with other local stakeholders and Reclamation.

John Day Subbasin	HUC [1/]	RM	Area (sq. mi.)
Upper John Day	17070201	from headwaters to RM 184	2130
North Fork John Day	17070202	confluence at RM 184	1830
Middle Fork John Day	17070203	confluence at North Fork RM 32	785
Lower John Day[2/]	17070204	from RM 184 to confluence at Columbia	3160
John Day River drainage	*170702*	*Columbia RM 204*	*7910*

1/ HUC = USGS "hydrologic unit code"; see http://water.usgs.gov/GIS/huc.html
2/ Not assigned to Reclamation for rehabilitation

John Day River Subbasins — Location Map (from *Programmatic Environmental Assessment, Mid-Columbia River Steelhead ESU – Action 149 Implementation;* May 2003, Bureau of Reclamation).

4.1 JOHN DAY MIDDLE FORK, BEAVER CREEK TO RAGGED CREEK, ROCK REMOVAL AND LWD INSTALLATION

Project Description: The Beaver to Ragged rock-removal project is on a portion of the Oxbow Conservation Area owned by CTWSRO. The project is located on a reach between tributaries Beaver Creek and Ragged Creek (Middle Fork John Day River RM 56.2 to RM 55.6).

In the 1970s, riprap barbs were placed on this part of the property to stabilize the banks. Consequently, the river has been locked in place with limited complexity. The property was heavily grazed for many decades, resulting in virtually no woody species present. CTWSRO purchased the property in 2000 with funding from BPA and began rehabilitation actions, including the removal of cattle from the riparian area. The stream banks have recovered with dense grasses and forbs but very few woody species. While Chinook salmon spawning is present in this reach, there is very limited rearing of juvenile steelhead and Chinook salmon due to high water temperatures and lack of deep pools and cover.

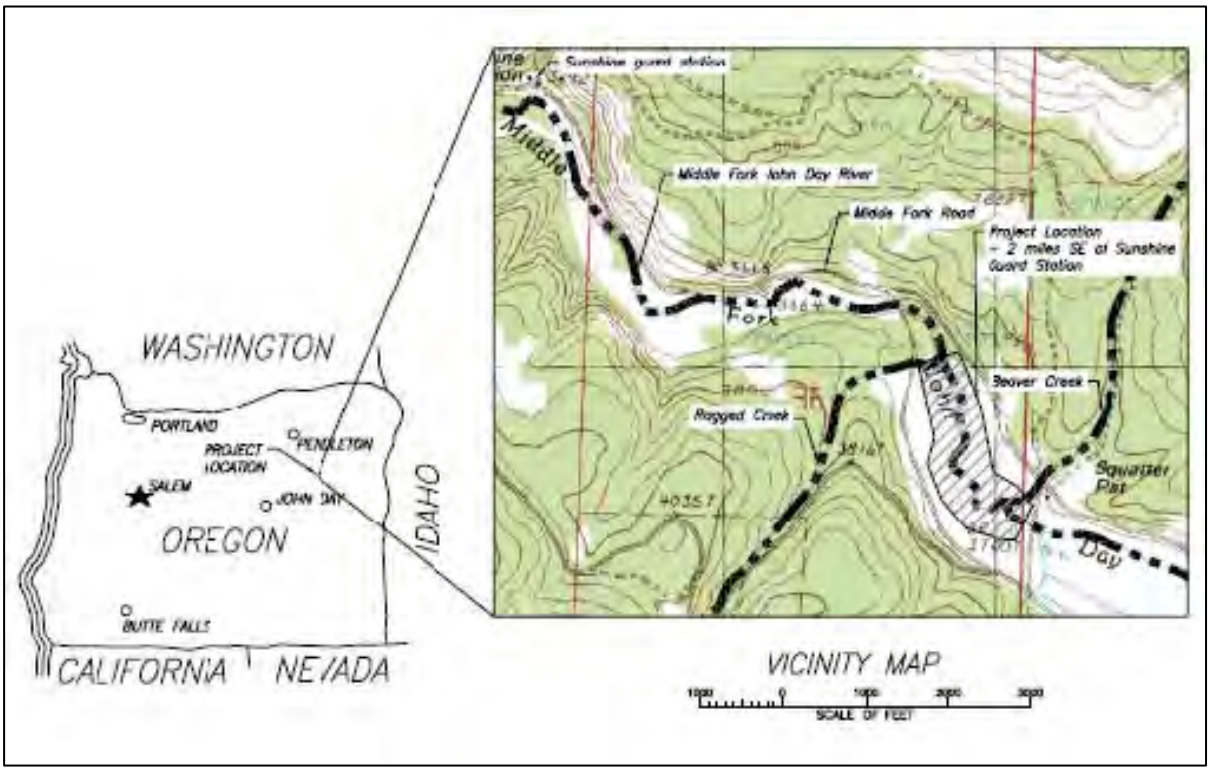
This project removed approximately thirty-three rock barbs and replaced them with variety of root wads, fifteen engineered log jams (ELJ), and two constructed two. Along with providing cover and complexity, the ELJ were designed to enhance existing pools and create new pools at suitable locations. One log jam spanned the entire channel in order to encourage the river to recapture an old meander bend. Pools were excavated 4′ to 6′ deep as part of the installation process. Removal of the rock will allow the river to return to more natural process. Two islands were constructed as a demonstration to see if it would be effective in narrowing the river channel where it has over-widened.

Willow cuttings provided by CTWRSO were inserted into the excavated trenches before placement of the log jams. The tribe also planted native grass seed mixtures after construction and planted additional seed in the spring of 2010.

Oregon Department of Fish and Wildlife (ODFW) provided the logs, which had been transferred from the Oregon Department of Transportation (ODOT). The logs were removed from ODOT land where a gravel pit was to be developed.

Design, Permitting, and Construction Issues: The project was designed by Reclamation. NEPA and ESA consultations were provided by FWS through programmatic consultations. The ACOE fill-and-removal permit was completed under a Nationwide Permit and the Oregon Department of State Lands (ODSL) fill-and-removal permit was completed under a general authorization. Construction took place in late July and early August 2009 during the instream work-window under the contract supervision of the Grant SWCD and construction management by CTWSRO staff.

Project Name: Beaver to Ragged rock removal/LWD Installation		
Project Type: Instream Complexity		
Project Sponsor: Confederated Tribes Warm Spring Reservation of Oregon		
Project Design: Bureau of Reclamation		
Landowner(s): CTWRSO	Partner(s): ODFW, Grant SWCD, FWS, ODOT, BPA, OWEB	
Funding Source(s): BPA, OWEB, FWS	Implementation Cost: $179,329	
Project Location	state: Oregon; county: Grant; stream: Middle Fork John Day; Local Landmark: Beaver Ck Lat 44° 39′ 08″ N; Long 118° 40′ 39″ W.	
Project Status	Phase: Site Rehabilitation/monitoring	
	Year Began: 2007	
	Year Completed: August 2009	
	Status: Adaptive management/monitoring	
Contracting	Construction Contractor: David Brush Construction	
	Site Rehabilitation Contractor: CTWRSO	
Biological Benefit	Species: MCR spring Chinook salmon, MCR steelhead trout, bull trout	
	Benefit Type: Rehabilitate stream function by removing rock barbs. Increase habitat complexity with cover and pool formation using logs/rootwads.	
Metric: 0.6 miles		



Middle Fork John Day, Rock Removal and LWD Installation — Location Map

Beaver to Ragged rock removal, Photo 1 — Channel-spanning structure. ***(24 July 2009)***

Beaver to Ragged rock removal, Photo 2 — Typical rootwad structure and deep pool installed.
(10 August 2009)

Beaver to Ragged rock removal, Photo 3 — Rootwad structure replacing rock barb.
(10 August 2009)

4.2 JOHN DAY UPPER MAINSTEM, CUMMINGS RIVER DITCH DIVERSION REPLACEMENT

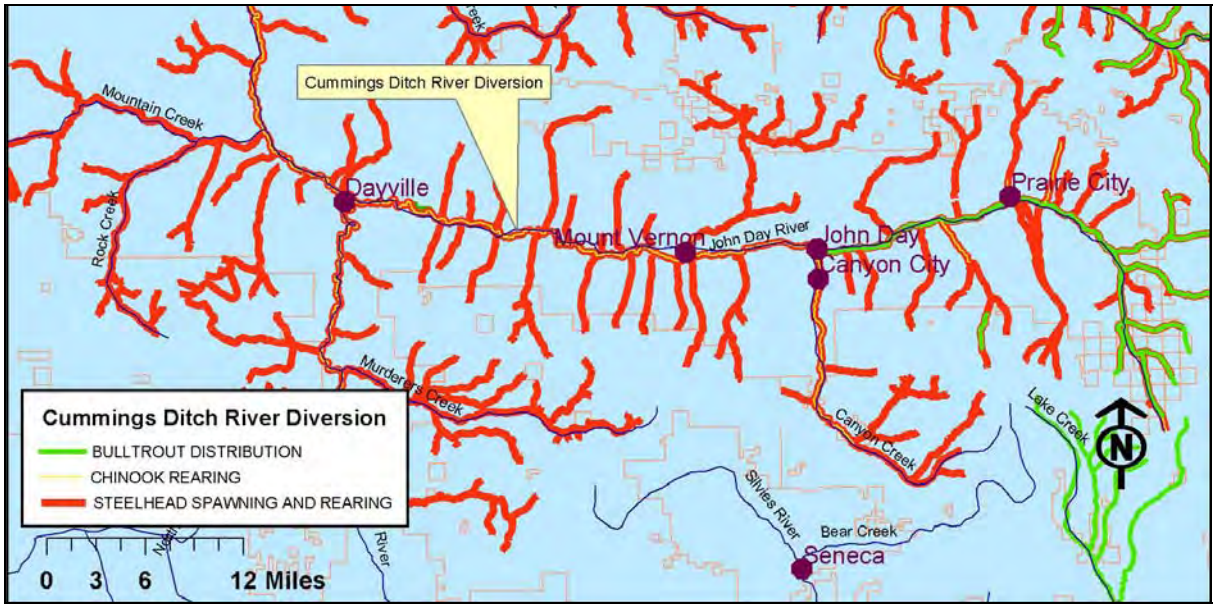
Project Objectives and Description: The Cummings River Ditch Diversion is located 12 miles west of the community of Mt. Vernon at John Day RM 226. The diversion structure was a typical gravel-and-large-rock pushup dam which had to be constructed and maintained by operating heavy equipment in the stream channel. One slide headgate controlled flow into the ditch. Preliminary review of the water rights indicated this diversion has a water right for diversion of 2.74 cfs. At low flows, the structure was a full barrier to all life stages; at higher flows when the dam was partially washed out, it was a partial barrier.

The objective of the project was to replace the pushup dam with a lay-flat-stanchion dam with a dedicated fish passage channel through the dam. The design used pre-fabricated concrete cattle-guard boxes from a local manufacturer buried flush with the channel bottom as the base of the structure. Interlocking steel sheet piling forms the wing walls and a cutoff wall across the channel above the concrete boxes. Folding stanchions were bolted to the concrete boxes to create supports for the flash boards. A fish ladder was constructed with prefabricated concrete boxes forming a pool-and-chute configuration. During the non-irrigation season, the stanchions will be folded down flat onto the channel bottom, leaving an un-obstructed cross-section for fish passage as well as passage of debris and bedload materials. The headgates were designed such that throughout the first part of the season no flash boards will need to be installed. As river flow drops during the irrigation season, the stanchions will be raised by hand and flash boards placed against the stanchions. Once the flash boards are in place, water automatically starts flowing through the fish ladder.

Design, Permitting, and Construction Issues: The project was designed by the Grant SWCD through contract funding from Reclamation. A biological assessment covering multiple diversion replacement projects was completed by CTWSRO on behalf of BPA (as lead federal agency). The BA was for ESA consultation with NMFS and FWS. Grant SWCD completed ACOE and ODSL fill-and-removal permits as part of the design process. Construction took place in between July 15 and August 31, 2009 during the instream work window under the contract supervision of Grant SWCD.

Project Name: Cummings River Ditch Diversion Replacement	
Project Type: passage	
Project Sponsor: Confederated Tribes Warm Spring Reservation of Oregon (CTWSRO)	
Project Design: Grant SWCD (John Day, OR); funded by Reclamation	
Landowner(s): Private Lands	Partner(s): Grant SWCD, FWS, BPA, OWEB
Funding Source(s): BPA, OWEB	Implementation Cost: $ 134,031
Project Location	state: Oregon; county: Grant; stream: Upper John Day; Local Landmark: Lat 44° 26′ 07″ N. Long 119° 18′ 56 W.

Project Status	Phase: Site Rehabilitation/monitoring Year Began: 2008 Year Completed: August 2009 Status: Operating/monitoring
Contracting	Construction Contractor:
	Site Rehabilitation Contractor: CTWRSO
Biological Benefit	Species: MCR spring Chinook salmon, MCR steelhead, CR bull trout, lamprey
	Benefit Type: Passage for all life stages
Metric: 7 miles to next pushup dam	



Cummings Ditch River Diversion — Location Map.

Cummings Ditch River Diversion replacement, Photo 1 — The yellow arrow shows the push-up dam. The red arrow indicates the direction of flow. *(undated)*

Cummings Ditch River Diversion replacement, Photo 2 — Shown under construction are the downstream entrance to the headgates and positive fish passage. ***(12 August 2009)***

Cummings Ditch River Diversion replacement, Photo 3 — Completed structure with stanchions raised (red arrow) during irrigation season with positive fish passage on the far bank (yellow arrow). ***(03 September 2009)***

Cummings Ditch River Diversion replacement, Photo 4 — Looking upstream at completed structure with stanchions laid flat for winter and downstream end of positive fish passage on the far bank (yellow arrow). Direction of flow is shown by red arrow. ***(01 October 2009)***

4.3 JOHN DAY UPPER MAINSTEM, EDDINGTON DITCH DIVERSION REPLACEMENT

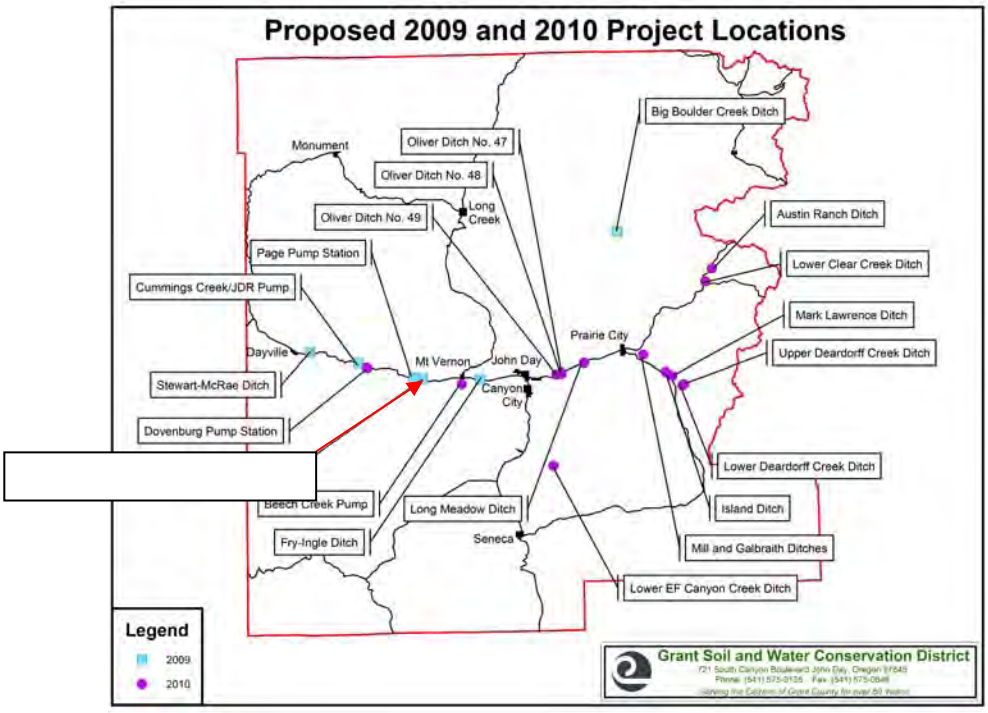
Project Objectives and Description: The Eddington Ditch Diversion is located 6 miles west of the town of Mt. Vernon at John Day RM 233. The diversion structure was a typical gravel pushup dam which had to be constructed and maintained by operating heavy equipment in the stream channel. One partially functioning slide headgate controlled flow into the ditch. Preliminary review of the water rights indicated this diversion had a water right for diversion of 7.4 cfs. At low flows, the structure was a full barrier to all life stages; at higher flows when the dam was partially washed out, it was a partial barrier.

The objective of the project was to replace the pushup dam with a lay-flat-stanchion dam with a dedicated fish passage channel through the dam. The design used pre-fabricated concrete cattle guard boxes from a local manufacturer buried flush with the channel bottom as the base of the structure. Interlocking steel sheet piling forms the wing walls and a cutoff wall across the channel above the concrete boxes. Folding stanchions are bolted to the concrete boxes to create supports for the flash boards. A fish ladder was constructed with prefabricated concrete boxes forming a pool and chute configuration. During the non-irrigation season, the stanchions will be "laid-flat" (folded down) on the channel bottom; this will leave an unobstructed cross-section for fish passage as well as passage for debris and bedload materials. The headgates were designed such that throughout the first part of the season no flash boards need to be installed. As river flows drop during the irrigation season the stanchions are raised by hand and flash boards placed against the stanchions. Once the flash boards are in place water automatically starts flowing through the fish ladder.

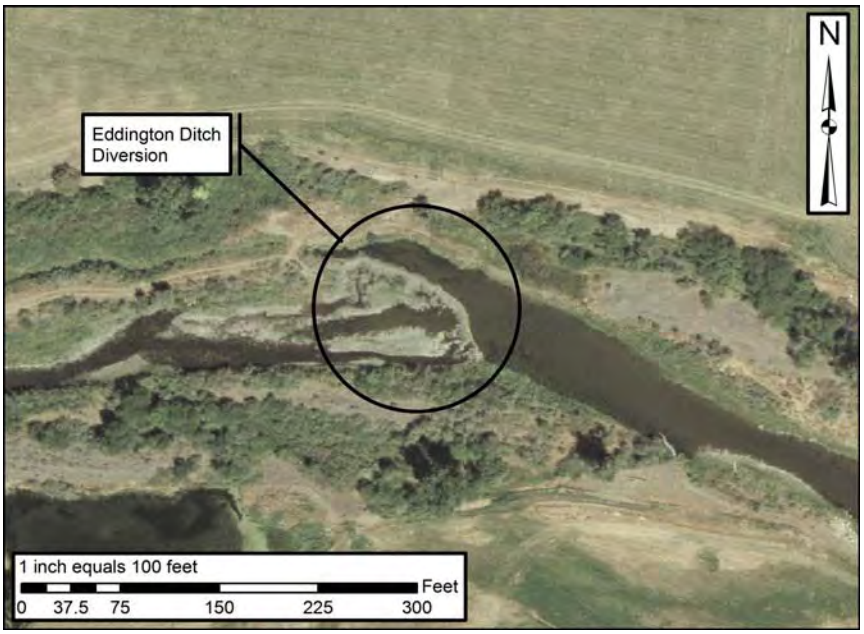
Design, Permitting, and Construction Issues: The project was designed by the Grant SWCD through contract funding from Reclamation. A biological assessment covering multiple diversion-replacement projects was completed by CTWSRO (on behalf of BPA, the lead federal agency) for ESA consultation with NMFS and FWS. ACOE and ODSL fill-and-removal permits were completed by the Grant SWCD as part of the design process. Construction took place in between July 15 and August 31, 2009 during the instream work window under the contract supervision of Grant SWCD.

Project Name: Eddington Ditch Diversion		
Project Type: passage		
Project Sponsor: Confederated Tribes Warm Spring Reservation of Oregon (CTWSRO)		
Project Design: Grant Soil and Water Conservation District (John Day, OR); funded by Reclamation		
Landowner(s): Private Lands		Partner(s): Grant SWCD, FWS, BPA, OWEB
Funding Source(s): BPA, OWEB		Implementation Cost: $ 156,958
Project Location	State: Oregon; county: Grant; stream: Upper John Day; local landmark: Lat 44° 25′ 04″ N. Long 119° 12′ 44″ W.	

Project Status	Phase: Site Rehabilitation/monitoring Year Began: 2008 Year Completed: August 2009 Status: Operating/monitoring
Contracting	Construction Contractor:
	Site Rehabilitation Contractor: CTWRSO
Biological Benefit	Species: MCR spring Chinook salmon, MCR steelhead trout, CR bull trout, lamprey
	Benefit Type: Passage for all life stages
Metric: 7 miles to next pushup dam	



Eddington Ditch Diversion –– Relative location to others within the John Day subbasins. *(Adapted from* Proposed 2009 and 2010 Projects Locations*, Grant SWCD, John Day, OR.)*



Eddington Ditch Diversion Replacement, Photo 1 — Aerial shot of project area and pushup dam prior to project. *(undated)*

Eddington Ditch Diversion Replacement, Photo 2— Looking downstream at (l. to r.) headgates and fish bypass during construction. *(24 July 2008)*

Eddington Ditch Diversion Replacement, Photo 3 — Completed structure with stanchions raised and boards in place during irrigation season; fish bypass is in foreground (hidden). *(August 2009)*

Eddington Ditch Diversion Replacement, Photo 4 — Looking upstream at completed structure with stanchions laid flat and boards removed for winter Fish bypass (between pilings at left-center of photo) is dry because in-river passage is not restricted in the winter. *(01 October 2009)*

4.4 JOHN DAY UPPER MAINSTEM, FRY-INGLE DITCH DIVERSION REPLACEMENT

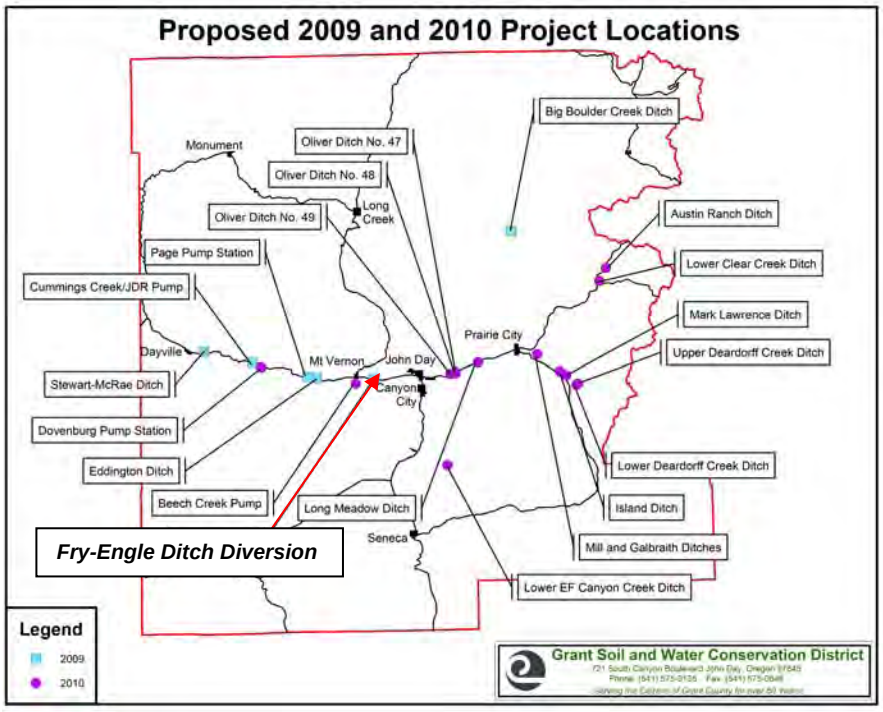
Project Objectives and Description: The Fry-Ingle Diversion is about 6 miles west of the city of John Day near John Day RM 241.5. Large boulders appear to stay in place year-round with additional gravels pushed up to complete the dam at lower flows. No headgate was present, so flow control was managed by blocking the culvert with boards and tarps. Preliminary review indicated this diversion had a water right for diversion of 5.4 cfs. This structure was a full barrier at low flows to all life stages but was a partial barrier at higher flows when the dam was partially washed out.

The objective of the project was to replace the pushup dam with a lay-flat-stanchion dam with a dedicated fish passage channel through the dam. The design used pre-fabricated concrete cattle guard boxes from a local manufacturer; these were buried flush with the channel bottom as the base of the structure. Interlocking steel-sheet piling now forms the wing walls and a cutoff wall across the channel above the concrete boxes. Folding stanchions are bolted to the concrete boxes to create supports for the flash boards. A fish ladder was constructed with prefabricated concrete boxes forming a pool and chute configuration. During the non-irrigation season, the stanchions will be folded down flat on the channel bottom leaving an unobstructed cross-section for fish passage as well as passage of debris and bedload materials. The headgates were designed such that throughout the first part of the season, no flash boards need to be installed. As river flow drops during the irrigation season, the stanchions are raised by hand and flash boards placed against the stanchions. Once the flash boards are in place water automatically starts flowing through the fish ladder.

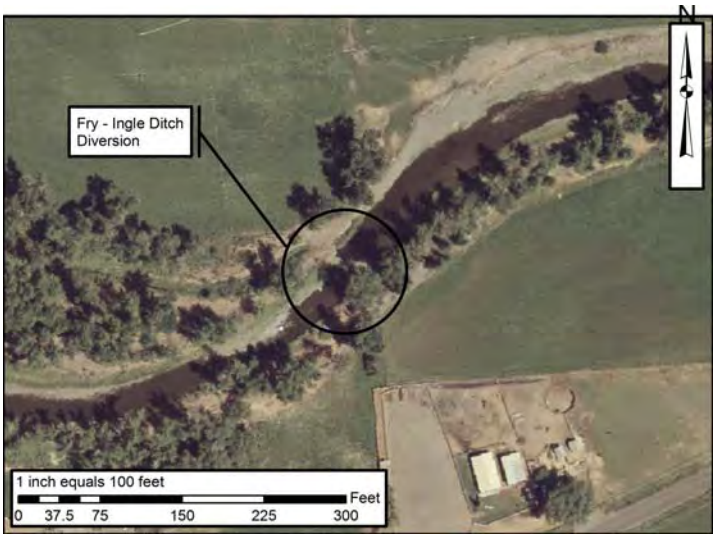
Design, Permitting, and Construction Issues: The project was designed by the Grant SWCD through contract funding from Reclamation. A BA covering multiple diversion replacement projects was completed by CTWSRO (on behalf of BPA, the lead federal agency) for ESA consultation with NMFS and FWS. ACOE and ODSL fill-and-removal permits were completed by Grant SWCD as part of the design process. Construction took place in between July 15 and August 31, 2009 during the instream work window under the contract supervision of the Grant SWCD.

Project Name: Fry-Ingle Ditch Diversion	
Project Type: passage	
Project Sponsor: Confederated Tribes Warm Spring Reservation of Oregon (CTWSRO)	
Project Design: Grant Soil and Water Conservation District (John Day, OR); funded by Reclamation	
Landowner(s): Private Lands	Partner(s): Grant SWCD, FWS, BPA, OWEB
Funding Source(s): BPA, OWEB	Implementation Cost: $ 108,796
Location:	State: OR County: Grant Stream: Upper John Day Lat 44° 24′ 54″ N. Long 119° 04′ 05″ W.

Project Status	Phase: Site Rehabilitation/monitoring Year Began: 2008 Year Completed: August 2009 Status: Operating/monitoring
Contracting	Construction Contractor:
	Site Rehabilitation Contractor: Warm Springs Tribe
Biological Benefit	Species: MCR spring Chinook salmon, MCR steelhead trout, CR bull trout, lamprey
	Benefit Type: Passage for all life stages
Metric: 7 miles to next pushup dam	



Fry-Engle Ditch Diversion — Relative location to others within the John Day subbasins. *(Adapted from* Proposed 2009 and 2010 Projects Locations, *Grant SWCD, John Day, OR.)*



Fry-Engle Ditch Diversion Replacement, Photo 1 — Aerial view of push-up dam. ***(Date unknown)***

Fry-Engle Ditch Diversion Replacement, Photo 3 — Boxes installed and headgates in background. Streamflow direction is shown by yellow arrow. ***(26 August 2009)***

Fry-Engle Ditch Diversion Replacement, Photo 4 — Looking upstream at completed structure with stanchions raised and boards in place (red oval). Fish bypass indicated by yellow arrow. ***(September 2009)***

4.5 JOHN DAY UPPER MAINSTEM, STEWART-MCRAE DITCH DIVERSION REPLACEMENT

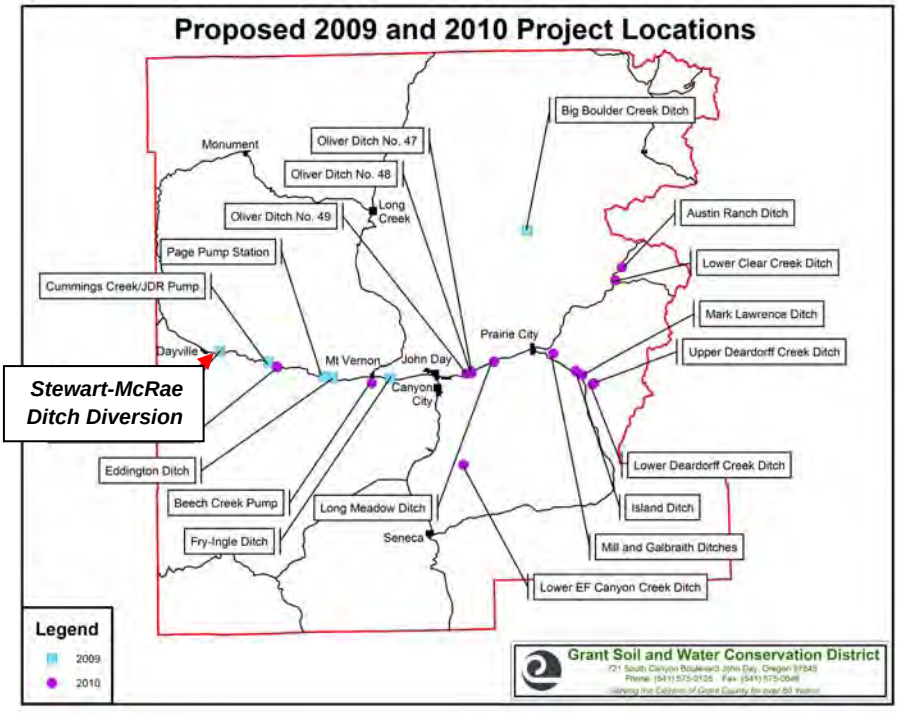
Project Objectives and Description: The Stewart-McRae (Stout) Diversion is located 24 miles west (downstream) of the town of Mt. Vernon on the John Day River at RM 214.3. The diversion was made up of two typical gravel pushup dams which were constructed and maintained by operating heavy equipment in the river channel. One pushup dam diverted flow from the main channel into a side channel; a second pushup dam further down in the side channel diverted flow into the irrigation ditch. One slide headgate controlled flow into the ditch. Preliminary review indicated this diversion had a water right for diversion of 5.8 cfs. This structure was a full barrier at low flows to all life stages but at higher flows when the dam is partially washed out, it was a partial barrier.

The objective of the project was to replace the pushup dams with a lay-flat-stanchion dam at the point-of-diversion with a dedicated fish passage channel through the dam and a flow-control weir at the head of the island to maintain flow into the side channel. The lay-flat-stanchion design used pre-fabricated, concrete cattle-guard boxes from a local manufacturer; the boxes were buried flush with the channel bottom as the base of the structure. Interlocking steel sheet piling formed the wing walls and a cutoff wall across the channel above the concrete boxes. Folding stanchions were bolted to the concrete boxes to create supports for the flash boards. A fish ladder was constructed with prefabricated concrete boxes forming a pool and chute configuration. During the non-irrigation season, the stanchions will be laid flat on the channel bottom leaving and un-obstructed cross section for fish passage as well as passage of debris and bedload materials. The headgates were designed such that throughout the first part of the season no flash boards would need to be installed. As river flow drops during the irrigation season, the stanchions will be raised by hand and flashboards placed against the stanchions. Once the flash boards are in place, water automatically starts flowing through the fish ladder.

The flow control weir was constructed from sheet piling and crosses the entire width of the river, across the top end of the island, and across the side channel. The elevation of the center of the weir at the center of the river and center of the side channel are lower in order to concentrate low flows for fish passage. The elevation of the weirs also ensures that flow will be maintained in the side channel suitable to meet the water right and fish bypass flows.

Design, Permitting, and Construction Issues: The project was designed by the Grant SWCD through contract funding from Reclamation. A BA for multiple-diversion replacement project was completed by CTWSRO (on behalf of BPA, the lead federal agency) for ESA consultation with NMFS and FWS. ACOE and ODSL fill-and-removal permits were completed by the Grant SWCD as part of the design process. Construction took place in between July 15 and August 31, 2009 during the instream work window under the contract supervision of Grant SWCD.

Project Name: Stewart-McRae Ditch Diversion		
Project Type: passage		
Project Sponsor: Confederated Tribes Warm Spring Reservation of Oregon (CTWSRO)		
Project Design: Grant Soil and Water Conservation District (Funded by Reclamation)		
Landowner(s): Private Lands		Partner(s): Grant SWCD, FWS, BPA, OWEB
Funding Source(s): BPA, OWEB		Implementation Cost: $ 99,412
Project Location	State: Oregon. County: Grant. Stream: Upper John Day Lat 44° 27′ 54″ N. Long 119° 29′ 32″ W.	
Project Status	Phase: Site Rehabilitation/monitoring	
	Year Began: 2008	Year Completed: August 2009
	Status: Operating/monitoring	
Contracting	Construction Contractor:	
	Site Rehabilitation Contractor: Warm Springs Tribe	
Biological Benefit	Species: MCR spring Chinook salmon, MCR steelhead trout, CR bull trout, lamprey	
	Benefit Type: Passage for all life stages	
Metric: 7 miles to next pushup dam		



Stewart-McRae Ditch Diversion — Relative location to others within the John Day subbasins. ***(Adapted from* Proposed 2009 and 2010 Projects Locations, *Grant SWCD, John Day, OR.)***

Stewart-McRae Ditch Diversion Replacement, Photo 1 — Aerial view of push-up dams prior to project. The river flow from upper right to lower left. *(August 2005)*

Stewart-McRae Ditch Diversion Replacement, Photo 2 — Boxes that form the base of the structure installed; the yellow are shows the upstream end of the fish bypass. The red arrow shows the direction of streamflow. *(26 August 2009)*

Stewart-McRae Ditch Diversion replacement, Photo 3 — Looking upstream at completed fish bypass in operation (yellow arrow). *(16 September 2009)*

5. METHOW SUBBASIN, WASHINGTON

The Methow River (HUC 17020008) is tributary to the Columbia River at RM 523.9 and has a drainage area of about 1820 square miles. The Wells Dam (at Columbia River RM 516.6) backs up into the Methow River drainage to Methow RM 2.0. Tributaries to the Methow include Gold Creek (RM 21.8), Beaver Creek (RM 25.2), Twisp River (RM 40.2), Chewuch River (RM 50.1), Early Winter Creek (RM 67.3), and the mainstem forms when West Fork Methow and Lost River meet at RM 73.

ESA fish species present include UCR spring run Chinook salmon (endangered), UCR steelhead trout (endangered), and CR bull trout (threatened). Also present are UCR summer/fall run Chinook salmon (not warranted).

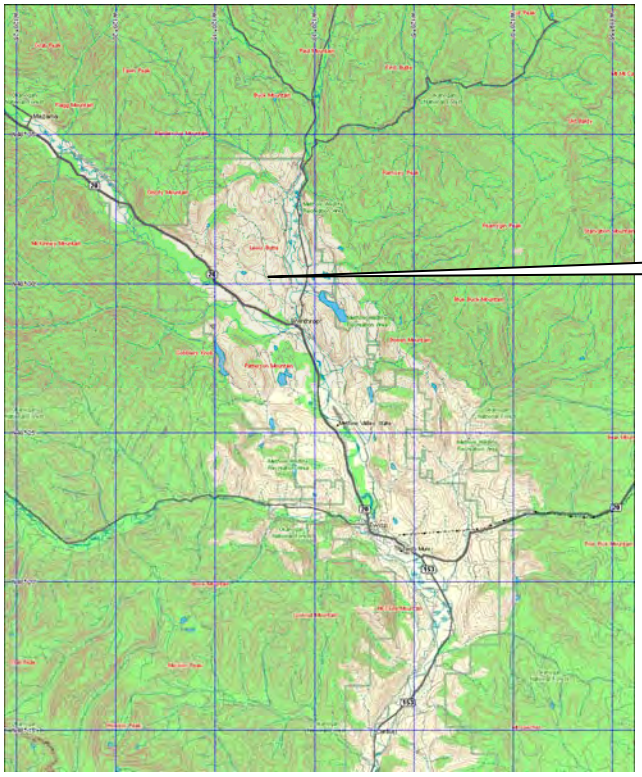
5.1 CHEWUCH, FULTON DAM LEFT BANK ADAPTIVE REPAIR

Project Objectives and Description: The objective of this project was to repair the failing left riverbank below the grouted crest of the Fulton Dam. The footprint of the repair work was entirely within the footprint of the original construction. Damage to private property was repaired and undersized riprap slope protection was replaced. The existing slope was excavated to a depth of 3′ to 4′ at a 2:1 slope for approximately 70 feet along the riverbank, and approximately 250 cubic yards of new 36-inch-minus diameter riprap was installed. The finished toe location of the new riprap does not extend below the "ordinary high water mark."

The addition of the larger rock was necessary to correct defective work (placement of undersized material) completed during construction of the renovated diversion dam structure in 2006. This effort was intended to prevent further damage to the private property and allows the rock ramp to continue to provide fish passage in the future. The rock protection was a critical component of the grouted rock crest; it should prevent river flow from outflanking the dam crest and eroding left bank properties. Such erosion would compromise operation of the low flow channel and irrigation intake structures.

Design, Permitting, and Construction Issues: The existing facility was designed and constructed in late fall 2005-winter 2006 to replace a boulder-and-concrete diversion dam that prevented fish passage at low flows. In 2008, the western wing of the rock ramp was repaired when it was discovered that the contractor had used undersized materials in the structure creating a scour hole that could undermine the dam. Although the new dam structure provided excellent fish passage and water delivery, the left bank began failing because the undersized rock. This project addressed the additional repairs needed to the left bank due to the bank failure which was undermining private property; the property included an underground irrigation system, lawn, well, and the private landowner′s house, which was within 100′ of the bank.

Project Name: Fulton Dam Left Bank Adaptive Repair		
Project Type: Passage		
Project Sponsor: Methow Salmon Recovery Foundation (Twisp, WA)		
Project Design: Bureau of Reclamation Design Group, Boise ID (Dave Jennings and Jesse Chan)		
Landowner(s): Private; Douglas County PUD #1.		Partners: NMFS, FWS, WDFW, Fulton Ditch Company, and Reclamation.
Funding Source(s): Reclamation ARRA and Washington RCO/SRFB.		Implementation Cost: $ 72,400 ($56,900 from ARRA)
Project Location:	State: WA County: Okanogan Stream: Chewuch River Lat 48° 29′ 1.7” N; Long 120° 10′ 54.3” W. Local Landmark: Chewuch River Township: 35N Range: 21E Section: 35 ¼ Section: SW	
Project Status: Adaptive Management		
Project Phase: Monitoring		
Milestones	Funding: Secured Design: July, 2009 Permitting: September, 2009 Construction: October, 2009	
Contracting	Construction Contractor: Lloyd Logging, Inc.	
	Site Rehabilitation Contractor: Methow Natives	
Biological Benefit	Species: UCR spring-run Chinook salmon, UCR steelhead trout, CR bull trout	
	Benefit Type: Passage	
Metric: Repair protected earlier investment in metrics already claimed		



Fulton Diversion Renovation Project — Location map.

Fulton Diversion Dam, Photo 1 — during construction: Overview of riprap replacement on left bank. Note undersized rock material near tracks. *(Undated)*

Fulton Diversion Dam, Photo 2 — Curb ready for backfill. *(September 15, 2009)*

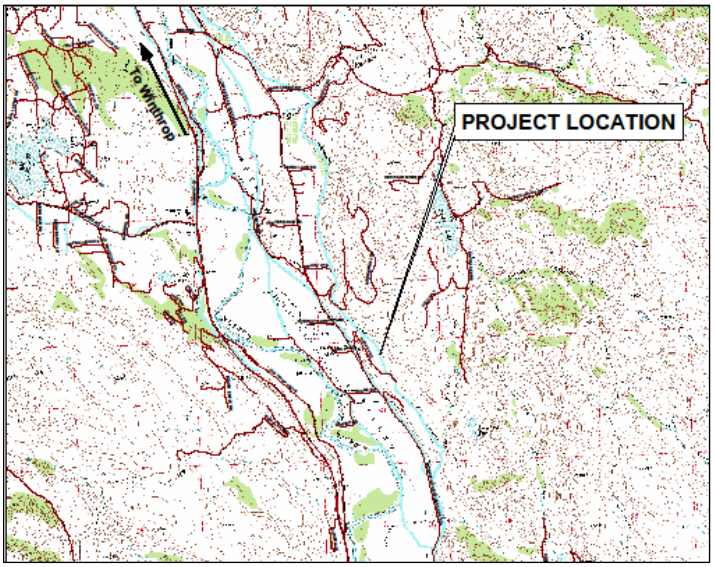
Fulton Diversion Dam, Photo 3 — Aerial showing left riverbank after completion, with curb replacement near completion. *(October 2009)*

5.2 CHEWUCH, LITTLE CHEWUCH PIPING PROJECT

Project Objectives and Description: The Little Chewuch Piping Project permanently reduced water diversion by 0.5 cfs at the Chewuch Canal Company (CCC) point-of-diversion (Chewuch RM 8.0). In addition, it completed improvements to the unincorporated Chewuch that allowed the water savings to occur and thereby increased permanent instream flows for the lower eight miles of the Chewuch River. This was accomplished by converting the "unincorporated portion" of the Chewuch Canal Company ditch from an open-canal system to 8965 feet of enclosed pipeline with diversions to each of nine private shareholders who are not members of CCC but buy water.

Design, Permitting, and Construction Issues: The final stages of this project were completed in the spring of 2010 with the installation of the nine diversions from the main pipe to the private shareholders, finishing the end of the pipe, cleaning out the area, and installing a flow-dissipation pad.

Project Name: Little Chewuch Piping Project		
Project Type: Instream flow		
Project Sponsor: Methow Salmon Recovery Foundation (Twisp, WA)		
Project Design: Bureau of Reclamation		
Landowner(s): nine private landowners (on the "unincorporated portion" of the CCC ditch)		Partners: Chewuch Canal Company (CCC) and "unincorporated" CCC, Washington Waters Project (Trout Unlimited), USFS, the Chewuch Basin Council, and Reclamation.
Funding Source(s): Columbia Basin Water Transactions Program (WWP), and WDOE.		Implementation Cost: $ 200,000
Project Location:	State: WA County: Okanogan Stream: Methow River Lat 120° 7′ 55.41" N, Long 48° 25′ 22.97" W. Local Landmark: Methow River Township: 34N Range: 22E Section: 30	
Project Status: Completed		
Project Phase: Monitoring phase		
Milestones	Funding: Secured	
	Design: August, 2009	
	Permitting: Completed	
	Construction: November 2009; final work completed April 2010	
Contracting	Construction Contractor: McHugh's Excavating, Inc.	
	Site Rehabilitation Contractor: MSRF seeded grass mix over disturbed areas.	
Biological Benefit	Species: UCR spring Chinook salmon, UCR steelhead trout, and CR bull trout	
	Benefit Type: Instream flow	
Metric: river permanently gains 0.5 cfs. Point-of-diversion is Chewuch RM 8.0.		



Little Chewuch Piping Project — Location map.

Little Chewuch Piping Project, Photo 1 — Looking downstream at road crossing at the piping of the Little Chewuch Ditch.
(05 November 2009)

Little Chewuch Piping Project, Photo 2 — Looking upstream at drain rock being placed over drain.
(05 November 2009)

5.3 METHOW, FENDER MILL FLOODPLAIN REHABILITATION PROJECT

Project Objectives and Description: The purpose of the Fender Mill Floodplain Rehabilitation project was to improve floodplain function, reduce the risk of fish stranding and improve rearing habitat for spring Chinook salmon, summer steelhead, and bull trout. By removing some remains of the Fender sawmill and the Rockview irrigation ditch from the floodplain, the project enhances natural river processes and floodplain function and reduces the post-freshet fish stranding risk. The overriding consideration throughout project development was to use the least intrusive methods possible to obtain these objectives.

The Fender Mill project incorporated six objectives:

- Eliminate potential stranding of juvenile Chinook salmon, steelhead, bull trout, and other aquatic species by blocking the intake to the abandoned Rockview irrigation ditch , obliterating the fish bypass and fish screen bay, and improving existing return channel to the Methow River.
- Improve off-channel rearing and refuge habitat for juvenile spring Chinook salmon, steelhead, bull trout, and other aquatic species.
- Extend and enhance the upstream reach-level benefits of the recently completed Hancock Springs rehabilitation project by the Yakama Nation.
- Improve riparian habitat by allowing river access and re-watering of riparian habitat along abandoned side channel.
- Maintain nearby quality off-channel habitat by improving and reconnecting wetlands, flood plains, side channels, and other off-channel habitat with increased floodwater dispersal.
- Allow for the continuation of riparian habitat improvement processes by eliminating the need for power-line maintenance access.

Project objectives were met by completing the following elements:

- Clearing and stripping vegetation as minimally as possible to complete project.
- Partial demolition of the fish screen by collapsing and burying the concrete walls in place (except the west wall remaining as a retaining wall for highway protection) and removing metal work around the screen and scattered in the project area.
- Excavating a channel through the old mill pond dam and removing remnants of the concrete spillway and using the excavated materials to protect the adjacent highway from high flows and cover the collapsed walls of the fish screen.
- Removing woody debris located within the existing channel to allow for stream flow, fish passage, and relocating debris in surrounding floodplain as habitat structures.
- Closing and permanently sealing abandoned headworks located upstream under the Weeman Bridge.
- Relocating power lines and poles out of seasonally active side channel.

Design, Permitting, and Construction Issues: The original project design called for the removal of the abandoned fish screen structure to address stranding issues related to backwatering of the fish return portion of the screen structure. Rather than removing the fish screen structure, the decision was made to collapse and bury the structure in place to avoid the potential for undermining the adjacent highway road prism. The source of material for burial was provided from the excavation spoils from the old mill pond channel and spillway. Additional material was imported to the site to completely cover the fish screen and grade the backfilled area to a safe condition and as near the existing grade as possible. The imported fill material was placed above the floodplain elevation on the highway abutment prism.

The project was completed in two discrete phases. The primary focus of the first phase was to address stranding associated with the abandoned fish screen structure and removal of remnants of the mill pond dike and other fill obstructing the floodplain channels. A secondary aspect of the project was to establish a minimally graded channel to encourage drainage of overbank flows back to the river. This channel will remain and serve as a secondary drainage channel feature on the site.

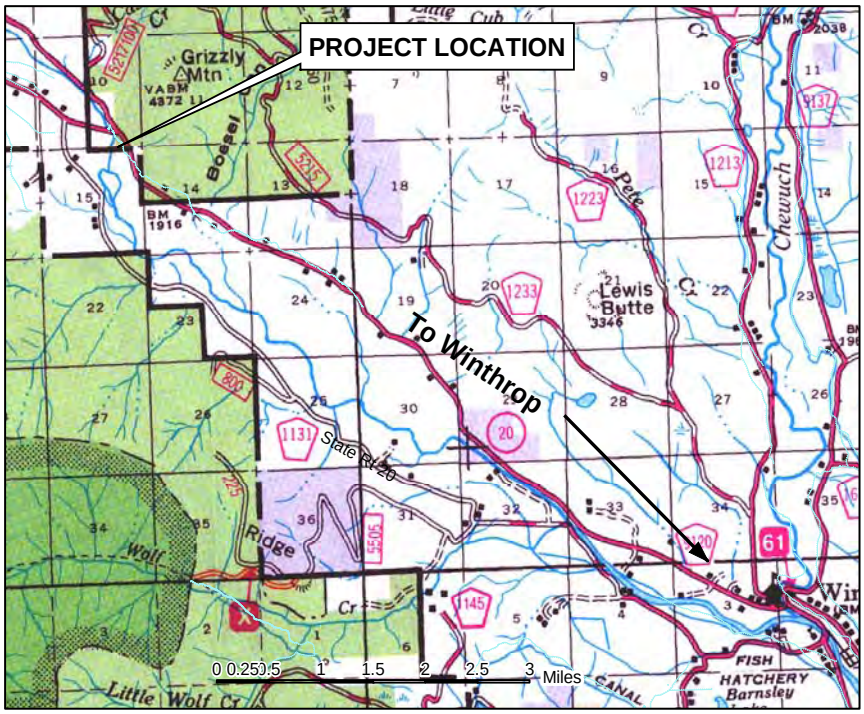
The second phase of the project was implemented later in the year after negotiation was completed with the Okanogan County Electric Co-op for relocation of the power-line segment in conflict with the historic Rockview canal. This canal was identified as the preferred channel due to its downstream connection with the Methow River. Relocation of the power lines was necessary to allow natural channel migration which would be able to occur from reconnected flood flows. Implementation of the project was funded through SRFB with matching funds provided by the Okanogan County Electric Co-op. The funds were used to relocate the power lines and poles and remove the extensive cottonwood debris that had been placed in the channel downstream of the irrigation headgate. Removal of the debris addressed stranding and avulsion risks and allowed reuse of the constructed return channel as functional side channel habitat. With the debris removed from the fish return channel, water entering the floodplain has a route to reach the river, providing high quality rearing and refuge habitat during spring high flows.

The final task to complete this project will occur in the spring of 2010 when electric power will be transferred to the new power lines and the old lines and poles will be removed. Minimal revegetation and site grading of disturbed areas will be completed as necessary.

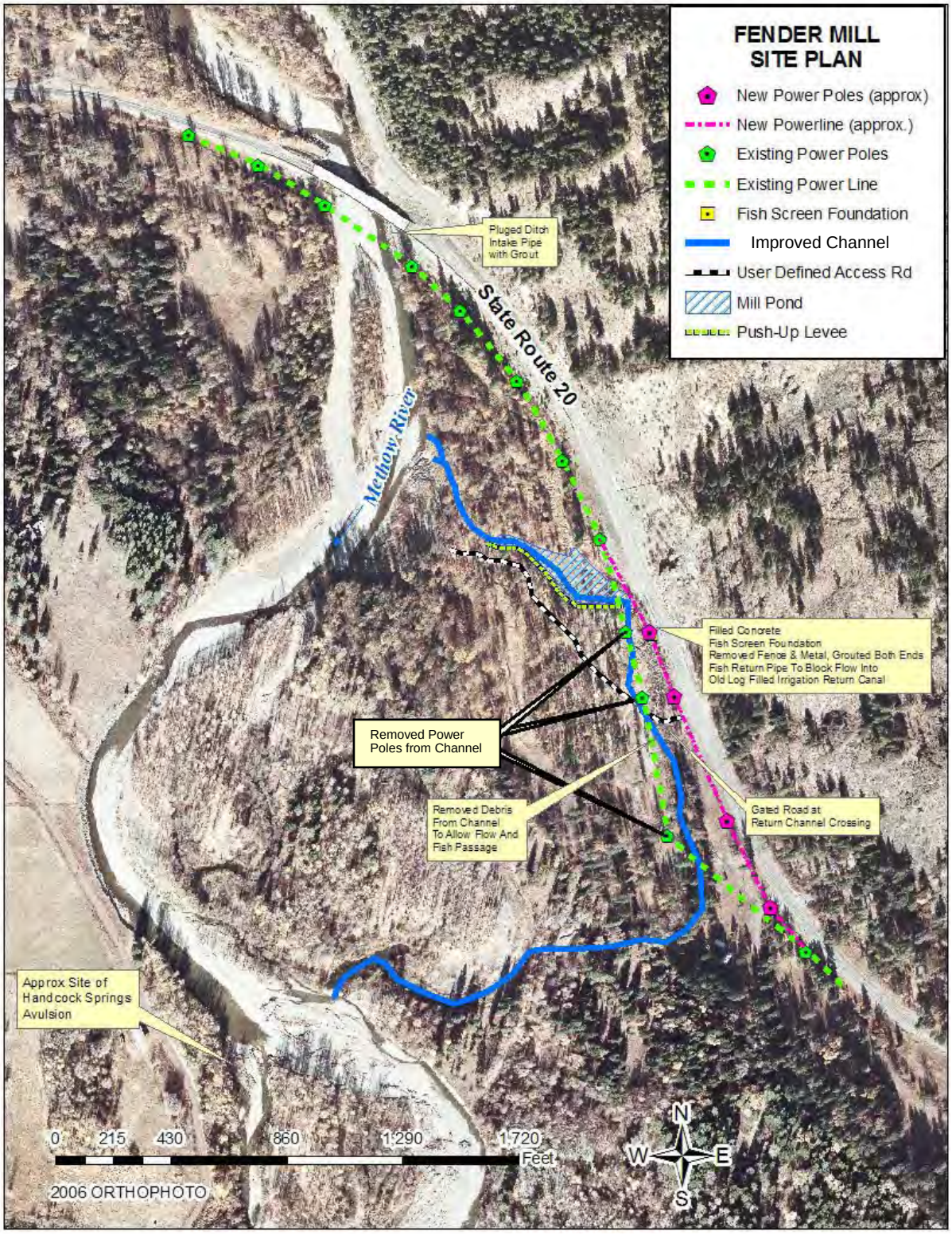
With the completion of this project, MSRF and Reclamation have met the objectives that this project addressed. The floodplain in this area, with its network of meandering side-channels and other habitat features, offers many continuing opportunities for further improvement of floodplain function and providing enhanced fish habitat. The Confederated Tribes and Bands of the Yakama Nation are pursuing future habitat complexity projects in this area.

As an additional benefit, approximately a half-dozen large, live trees with attached rootwads removed from this project site to clear the right-of-way for the new power line are now available for use in other habitat improvement projects needing large wood structures.

Project Name: Fender Mill Floodplain Rehabilitation	
Project Type: Preventing entrainment and adding complexity	
Project Sponsor: Methow Salmon Recovery Foundation (Twisp, WA)	
Project Design: Bureau of Reclamation (Jeff McLaughlin, Boise, ID)	
Landowner(s): WDFW	Partners: NMFS, USFWS, WDFW, WDOE, Okanogan County Electric Cooperative, and Reclamation.
Funding Source(s): BPA, Washington RCO/SRFB,	Implementation Cost: $54,500
Project Location:	State: WA; county: Okanogan; stream: Methow River Lat 48˚ 32′ 24” N Long 120˚ 19′ 5” W Local Landmark: Methow River near Weeman Bridge T35N R20E Sect. 10 (SE¼) and 15 (NE¼)
Project Status: Adaptive Management	
Project Phase: Site Rehabilitation, Monitoring	
Milestones	Funding: Secured; Design: July, 2008; Permitting: September, 2008; Construction: May, 2009
Contracting	Construction Contractor: Lloyd Logging & Palm Construction Site Rehabilitation Contractor: Methow Natives
Biological Benefit	Species: UCR spring-run Chinook, UCR steelhead trout, and CR bull trout.
	Benefit Type: Habitat and Preventing Entrainment
Metric: Less than 1.5 acres / 0.5 mile length of river	



Fender Mill Project — Location Map: project is about eight miles northwest of Winthrop.



Fender Mill Project — Site Plan

Fender Mill floodplain Rehabilitation, Photo 1 — Before: Mill Pond site during spring high-flows with dam in background indicated by red oval. *(June 2007)*

Fender Mill floodplain Rehabilitation, Photo 2 — Before: Mill Pond concrete spillway; red arrow shows direction of streamflow. *(June 2007)*

Fender Mill floodplain Rehabilitation, Photo 3 — After: Excavated overflow channel with spring high-flows in the floodplain; red arrow shows direction of streamflow. *(9 May 2009)*

Fender Mill floodplain Rehabilitation, Photo 4 — After construction looking upstream at Mill Pond showing remnant chunk of spillway concrete (yellow arrow), channel with excavated portion in the foreground, and natural channel in background with spring high-flows entering area. *(9 May 2009)*

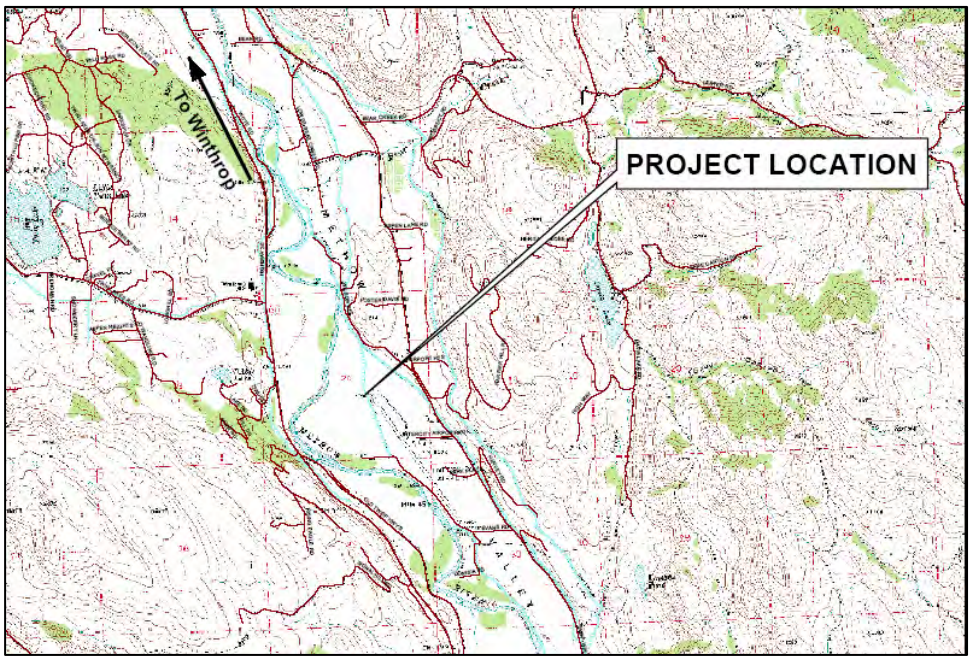
5.4 METHOW, LITTLE BARKLEY PIPING

Project Objectives and Description:

This project converted the Little Barkley portion of the Barkley Irrigation Company system from an open canal to an enclosed pipeline. The pipeline is 3,050 feet long and includes a headbox and debris screen at the outtake from the Barkley Canal. Four diversions from the main irrigation pipe to three landowners were also installed. This project allowed 0.5 cfs to permanently remain in the river.

There were no **Design, Permitting, and Construction Issues.** The final components of this project were finished in the spring of 2010.

Project Name: Little Barkley Piping		
Project Type: Instream flow		
Project Sponsor: Methow Salmon Recovery Foundation, 509-422-0300		
Project Design: Jesse Chan, Bureau of Reclamation		
Landowner(s): Private		Partners: Barkley Irrigation Company, NRCS, Reclamation, and Trout Unlimited (Washington Water Project)
Funding Source(s): NRCS and Trout Unlimited (Washington Water Project)		Implementation Cost: $30,000 plus pipe cost.
Project Location:	State: WA County: Okanogan Stream: Methow River Lat 120° 9′ 2.69”; Long 48° 25′ 50.21”. Local Landmark: Methow River. T 34N R21E Section: 24	
Project Status: Completed		
Project Phase: Site Rehabilitation completed		
Milestones	Funding: Secured	
	Design: August, 2009	
	Permitting: completed	
	Construction: Substantially completed November 2009; final work in April 2010	
Contracting	Construction Contractor: S & L Services	
	Site Rehabilitation Contractor: Ditch manager (Craig Boesel)	
Biological Benefit	Species: UCR spring Chinook salmon, UCR steelhead trout, and Columbia River bull trout.	
	Benefit Type: Instream Flow	
Metric: 0.5 cfs left in river permanently.		



Little Barkley Piping Project — Location map.

Little Barkley irrigation canal Photo 1 — Before piping. ***(15 July 2009)***

Little Barkley irrigation canal Photo 2 — During construction: End of pipeline. The project was completed in spring 2010 by completing connections and installing valves and end-cap. ***(15 December 2009)***

5.5 METHOW, MVID EAST DIVERSION MODIFICATION

Project Objectives and Description: The MVID East Diversion Modification Project reduced impacts to UCR spring Chinook salmon, UCR steelhead trout, and CR bull trout. This was done by improving the fish bypass, protecting the fish screens from flood flows, and reducing the need for annual in-water excavation by the irrigators. This final phase of the MVID East project modified the existing diversion intake structure and canal, headgate, sediment wasteway, and fish screen bypass. Previous efforts at the site include installation of new fish screens and fish bypass (2004) and removal of a channel-spanning diversion dam and dam foundation (2007-2008).

The project further improved the ability of the MVID East facility to divert water at low flows while reducing in-water maintenance needs. This project also improved the function of the existing fish bypass. In addition, by improving sediment management, it should increase the lifespan of the moving plastic-belt fish screens by decreasing wear.

The project included these work elements:

- Construction of a new river intake and trash rack;
- Replacement of existing open earthen intake canal with new twin 36-inch pipes;
- Modification of existing headworks and construct sediment wasteway;
- Modification of existing fish bypass facility;
- Rehabilitation of areas disturbed by construction.

Design, Permitting, and Construction Issues:

Design: Numerous agencies collaborated in the design phase of this project, with many design iterations, due to the project complexities. Those involved included Reclamation designers, Methow Salmon Recovery Foundation representatives, BPA, MVID board members, NMFS, FWS, and WDFW permit biologists. The final design was the result of a Value Engineering (VE) study. The study was a valuable process and highly recommended for use early in project design; it is essential to involve all stake holders in the development of design alternatives.

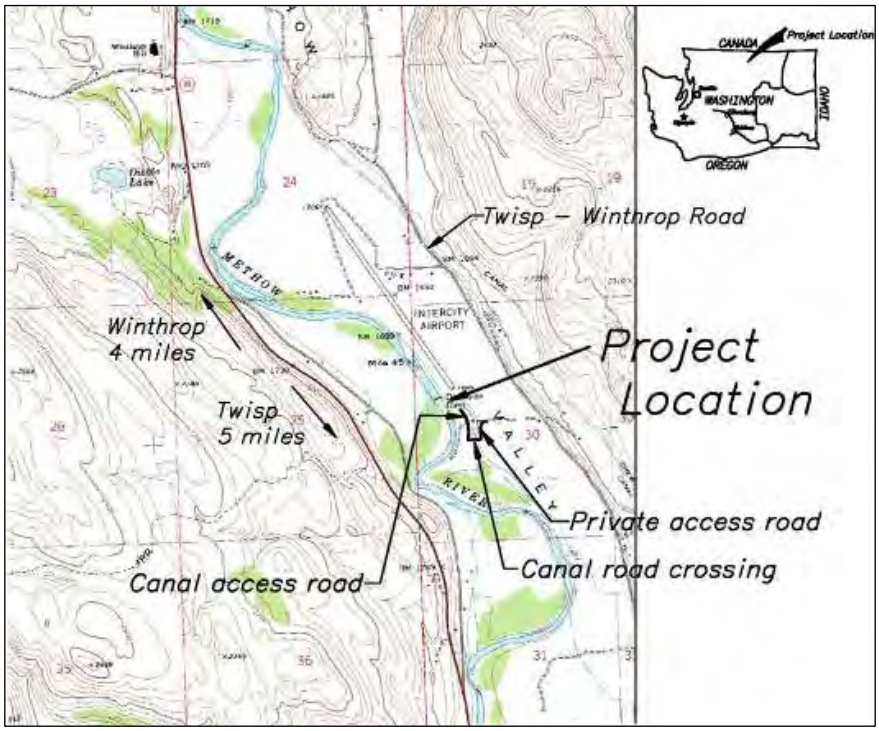
Permitting: Permitting issues were part of the reason that so many designs were rejected. Involving key permitting individuals in the VE process helped to move permits along. The NMFS programmatic consultation process (funded through BPA) was helpful. However, USFWS did not have a programmatic consultation process and required the action agency (BPA) to submit a lengthy and detailed BA so that USFWS could prepare a detailed BiOp. The BiOp was completed within the 120 days delivery deadline.

Construction: For a project of this type, the construction window is constrained by the end of irrigation season and the onset of winter. The MVID board did not grant final approval for the project until the end of September and did not allow the project to begin until October 7. The USFWS BiOp was received on October 2. The contractor began

construction on October 6 with dewatering. The dewatering task was underestimated in terms of effort and was not completed until October 16. A lesson learned is to assume that dewatering could be one of the most difficult tasks of the project.

Winter makes construction, including concrete pours, difficult; there were periods of single-digit temperatures, frozen ground, and frozen river bed; these led to tenting and heating for concrete pours. Luckily, the winter was mild in terms of limited snow and rain resulting in low river flows. The contractor and sub-contractors were responsive to challenging conditions and managed the project well.

Project Name: Methow Valley Irrigation District East Diversion Modification		
Project Type: Screening, passage, and complexity. Modification of irrigation diversion infrastructure to protect fish.		
Project Sponsor: Methow Salmon Recovery Foundation, 509-422-0300		
Project Design: HDR Engineering, Inc.		
Landowner(s): WDOT Division of Aeronautics, Okanogan County Public Works, and private.		Partners: MVID, Reclamation, WDFW, Okanogan County, WDOT.
Funding Source(s): BPA, Washington RCO/SRFB, and Reclamation ARRA.		Implementation Cost: $1,200,000 (includes $320,000 ARRA to MSRF)
Project Location:	State: WA County: Okanogan Stream: Methow River Lat 48˚ 25′ 09” N; Long 120˚ 8′ 25” W. Local Landmark: Methow River Township: 34N Range: 22E Section: 30 ¼ Section: NW	
Project Status: completed		
Project Phase: Site rehabilitation and monitoring		
Milestones	Funding: Secured	
	Design: June, 2009	
	Permitting: October, 2009	
	Construction: Substantially complete December 2009; completed June 2010	
Contracting	Construction Contractor: Lloyd Logging, Inc.	
	Site Rehabilitation Contractor: Methow Natives Co.	
Biological Benefit	Species: UCR spring-run Chinook salmon, UCR steelhead trout, and CR bull trout	
	Benefit Type: Passage, screening, and complexity.	
Metric: One partial passage barrier removed; one irrigation fish screen protected from flooding, and 1.2 acres of habitat improved.		



MVID East Diversion Modification — Project location map.

MVID East Diversion Modification, Photo 1 — Before construction showing aerial view of MVID East project area with beginning of diversion intake canal, wing dam extension, and access road on riverbank towards bottom of frame and fish screen facilities and channel spanning dam on the Methow River towards top of photo. *(2007)*

MVID East Diversion Modification, Photo 2 — Before construction: MVID East fish screen area, end of intake canal, and Methow River after dam removal. ***(June 2008)***

MVID East Diversion Modification, Photo 3 — Carpenters beginning to install the outside concrete forms for the intake structure footings at the upstream end. ***(22 October 2009)***

MVID East Diversion Modification, Photo 4 — Forming and placing rebar for sediment wasteway structure. ***(12 December 2009)***

MVID Diversion Modification, Photo 5 — Sandblasting and cleaning rock in fish bypass channel. ***(14 December 2009)***

5.6 METHOW, BEAVER CREEK, OPERSKALSKI COMPLEXITY REHABILITATION PROJECT

Project Objectives and Description: The objective of this project was to improve aquatic and riparian habitat along a 700′ reach of Beaver Creek degraded by LWD removal and livestock grazing that caused vegetation loss, bank shear and erosion, and channel widening.

To improve habitat complexity, the project included re-contouring the over-steepened, eroding banks to a gentler gradient, building instream wood habitat structures, directing high flows away from the eroding right bank and encouraging left bank inundation with log and rock structures, replanting native riparian vegetation in the area, and fencing to exclude cattle from the riparian area.

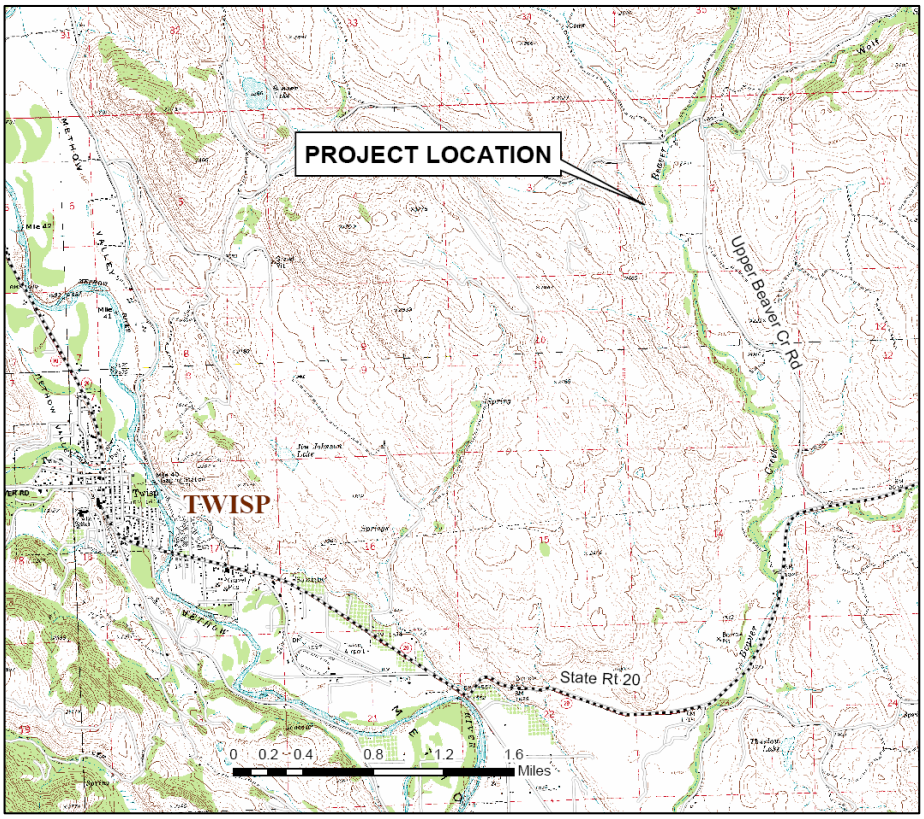
This project included the following objectives and work elements:

- To exclude cows from riparian areas, a barbed wire fence was installed at the top of the bench east of Beaver Creek and a gate across Beaver Creek at the southern property boundary.
- To provide water to cattle in the pasture, a water trough with a solar pump was installed.
- To encourage left bank high flow inundation, reduce erosion along right bank, and provide instream habitat complexity, three small, independent log structures and approximately 100′ of rootwad riprap were installed.
- To reduce flow into side channel during high flows, an instream turning rock structure was installed.
- To reduce over-steepened banks to a slope was re-contoured to steeper than 1.5:1 or less.
- To improve damaged riparian areas, they were re-vegetated with native plants.

Design, Permitting, and Construction Issues: A minor change during construction was the need for a smaller excavator bucket than originally planned for in order to facilitate revegetation efforts. It was also discovered that cattle, when located in the field on the eastern end of the property in late fall, are able to access Beaver Creek through a gate near the northern property boundary. To correct this and exclude cattle from the riparian area, an agreement to keep the gate closed once stock water is provided in the pasture was negotiated with the rancher who leases the pasture.

Project Name: Operskalski Complexity Rehabilitation Project	
Project Type: Complexity	
Project Sponsor: Methow Salmon Recovery Foundation, (Twisp, WA)	
Project Design: WDFW (Gina McCoy) and Reclamation (Jesse Chan)	
Landowner(s): Private.	Partners: WDFW and Reclamation.

Funding Source(s): BPA		Implementation Cost: $ 57,576
Project Location:	State: WA County: Okanogan Stream: Beaver Creek Lat 48° 22′ 56” N; Long 120° 02′ 58” W. Local Landmark: Beaver Ck. Township: 33N Range: 22E Section: 2 ¼ Section: SE	
Project Status: Adaptive Management		
Project Phase: Monitoring		
Milestones	Funding: Secured	
	Design: July, 2009	
	Permitting: September, 2009	
	Construction: October, 2009	
Contracting	Construction Contractor: Palm Construction	
	Site Rehabilitation Contractor: Methow Natives	
Biological Benefit	Species: UCR spring-run Chinook salmon, UCR steelhead trout, and CR bull trout	
	Benefit Type: Habitat complexity	
Metric: 1 acre project area plus a 5--acre cattle exclusion area; the stream complexity length is about 300 feet.		



Operskalski Complexity Rehabilitation Project — Location Map.

Operskalski Complexity Rehabilitation, Photo 1 — Before: Right bank erosion along Beaver Creek. *(November 2009)*

Operskalski Complexity Rehabilitation, Photo 2 — After: Upper work area after placement of rootwads and final grading. Planting bench elevation is between 1.5 and 2.5 feet above opposing bank. *(24 September 2009)*

Operskalski Complexity Rehabilitation, Photo 3 — After: Log structure in eddy. This structure is designed to provide habitat, break up eddy, and attract additional debris. *(24 September 2009)*

Operskalski Complexity Rehabilitation, Photo 4 — After: Rootwads were installed to provide bank stability which will allow riparian plantings time to establish. *(October 2009)*

5.7 TWISP RIVER, POORMAN CREEK CULVERT REPLACEMENT

Project Objectives and Description: The objective of this project was to improve access to habitat for threatened UCR steelhead trout and endangered UCR spring Chinook salmon by replacing a barrier road culvert on Poorman Creek with a bottomless steel-plate arch and engineered streambed. (Threatened bull trout have not been observed in Poorman Creek, but they are present in the Twisp River immediately downstream of the project area.) An irrigation diversion immediately below the culvert was also a partial barrier and was replaced with a rock weir structure that allows passage at all flows. The project also improves downstream habitat in the creek by improving bedload and wood transport through the culvert.

This project removed the last fish passage barrier on Poorman Creek. The project complements two prior fish passage barrier culvert replacements on National Forest lands upstream of this project site, thereby improving fish passage into Poorman Creek and creating access to 2 to 3 miles of habitat above the Reynaud Irrigation Diversion and Poorman culvert site.

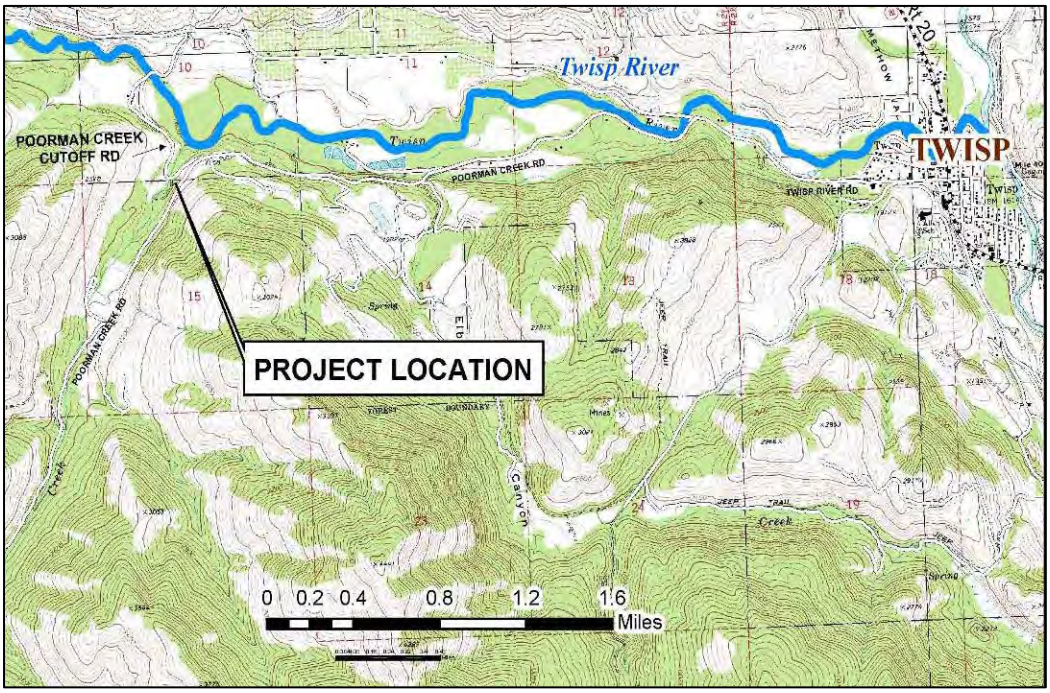
The project features included the following design elements:

- Installation of a bottomless steel plate arch under Poorman Creek Cutoff Road.
- Installation of pre-cast concrete footings.
- Construction of an engineered streambed through the project area, up to 150 feet in length.
- Reconstruction of the irrigation intake downstream of the culvert using large rocks to allow low flow passage.
- Reconstruction of the disturbed portion of Poorman Creek Cutoff Road.
- Revegetation of areas disturbed by construction.

Design, Permitting, and Construction Issues: Questions concerning property line and road easement locations were clarified and resolved through accurate surveying and discussions with landowners.

Project Name: Poorman Creek Culvert Replacement	
Project Type: Passage	
Project Sponsor: Methow Salmon Recovery Foundation (Twisp, WA)	
Project Design: Bureau of Reclamation (Jesse Chan)	
Landowner(s): Private and Okanogan County Public Works.	Partners: WDFW and Reclamation
Funding Source(s): Washington RCO/SRFB, PUD Tributary Funds,	Implementation Cost: $116,400

Project Location:	State: WA County: Okanogan Stream: Poorman Creek Lat 48° 22′ 02” N; Long 120° 12′ 03” W. Local Landmark: Poorman Creek Township: 33N Range: 21E Section: 10 ¼ Section: SESW
Project Status: Adaptive Management	
Project Phase: Monitoring	
Milestones	Funding: Secured
	Design: April, 2009
	Permitting: August, 2009
	Construction: October, 2009
Contracting	Construction Contractor: Lloyd Logging Inc.
	Site Rehabilitation Contractor: Methow Natives
Biological Benefit	Species: UCR steelhead trout and UCR spring Chinook salmon
	Benefit Type: Passage
Metric: Approximately 2 miles of access rehabilitation gained.	



Poorman Creek Culvert Replacement — Location map; project is 3.9 miles west of Twisp.

Poorman Creek Culvert Replacement, Photo 1 — Before construction: existing diversion structure and dam at low flow. *(Undated)*

Poorman Creek Culvert Replacement, Photo 2 — After construction: completed bottomless arch culvert with weir control structure. *(October 2009)*

Poorman Creek Culvert Replacement, Photo 3 — After construction: Poorman Creek culvert, weir, and diversion intake with flows returning through the project area. *(October 2009)*

6. SALMON RIVER SUBBASINS, IDAHO

There are four FRCPS designated subbasins in the Salmon River drainage area, which is within the Mountain Snake Ecological Province. From its headwaters in the Sawtooth Mountains, the river flows northerly about 180 miles (joined by the North Fork at RM 237), then heads westerly across Central Idaho until it enters the Snake River (at RM 188). On the east side of the state, the habitat subbasins for Reclamation are the Upper Salmon, the Pahsimeroi, and the Lemhi. The Upper Salmon subbasin includes the East Fork and Yankee Fork drainages.

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

Subbasin	HUC [1/]	RM	Area (sq. mi.)
Upper Salmon	17060201	from headwaters (≈ RM 410) to RM 304 (Pahsimeroi confluence)	2410
Yankee Fork Salmon River	—	at Salmon RM 367.1	195
East Fork Salmon River	—	at Salmon RM 343.0	540
Pahsimeroi	17060202	at Salmon RM 304.0	825
Middle Salmon-Panther [2/]	17060203	at Salmon RM 210.1	1810
Lemhi	17060204	at Salmon RM 258.5	1270

1/ HUC = USGS "hydrologic unit code"; see http://water.usgs.gov/GIS/huc.html

2/ Not assigned to Reclamation for rehabilitation.

6.1 EAST FORK, FLOW MEASURING DEVICES

Project Objectives and Description: Water measurement devices are tools that allow irrigators to better control their diverted flows. These devices also help subbasin planning process in determining actual diversion and the size of fish screen structures. Irrigation professionals estimate that diverted flows will decrease 2 to 10 percent when a measurement device is utilized. Idaho Department of Water Resources (IDWR) has begun requiring irrigators in the East Fork basin to have a measuring device in place. Reclamation is providing technical assistance to help the landowners determine a functional structure. BPA has been purchasing the structures, and the landowners have been paying to install them.

Water Measurement devices have been installed in the East Fork Basin on the diversions listed below. The 2009 installations are highlighted in yellow.

There were no **Design, Permitting, and Construction Issues.**

Project Name: East Fork Measuring Devices	
Project Type: Water Measurement/ Stream Flow Enhancement	
Project Sponsor: Custer Soil and Water Conservation District (Challis, ID); Landowners; BPA	
Project Design: Bureau of Reclamation	
Landowner(s): Multiple	Partner(s): Landowners; BPA; Custer SWDC
Funding Source(s): BPA; landowners	Implementation Cost: ≈ $39,000
Project Location: State: Idaho; county: Custer ; stream: East Fork of the Salmon River; Local Landmark: within the East Fork watershed at multiple locations.	
Project Status	Phase: Construction
	Year Began: 2003 Year Completed: multiple days, 2009
	Status: Ongoing
Contracting	Construction Contractor: multiple
	Site Rehabilitation Contractor: multiple
Biological Benefit	Species: SR spring/summer Chinook salmon, SR steelhead trout, CR bull trout
	Benefit Type: Instream Flow Improvement
Metric: Water flow data will help inform the planning of future projects	

East Fork Salmon River Table 1 — Flow Measurement Devices (2003–2009)

Name	Flow	Installed		Name	Flow	Year
EF-3	30 cfs	2009		EF-17	11 cfs	2003
EF-4	30 cfs	2009		EF-18	10 cfs	2009
EF-5	4 cfs	2009		EF-18A	7 cfs	2009
EF-7/8	20 cfs	2009		EF-21	4 cfs	2003
EF-9	11 cfs	2009		Big Boulder Creek 1	7 cfs	2009
EF-10/11	28 cfs	2003		Big Boulder Creek 2	7 cfs	2009
EF-15	15 cfs	2006				

East Fork Flow Measurement devices, Photo 1 — A typical ramp flume measuring device was installed at EF-15.

6.2 LEMHI, FLOW MEASUREMENT DEVICES

Project Objectives and Description: Water measurement devices are tools that allow irrigators to better control their diverted flows. These devices also help with the subbasin planning process in determining actual diversion and the size of fish screen structures. Irrigation professionals estimate that diverted flows will decrease 2 to 10 percent when a measurement device is utilized. These flows, when left in the river, provide habitat and passage benefits to endangered salmon and steelhead, as well as resident fish species. IDWR has begun requiring irrigators in the Lemhi watershed to have a measuring device in place. Reclamation is providing technical assistance to help the landowners determine a functional structure. Landowners have been purchasing the structures and paying to install them.

The following chart shows all Lemhi River diversions where water measurement devices were installed, the date of installation, the diversion decree when in regulation, and the amount allocated to each diversion during high flow.

There were no **Design, Permitting, and Construction** issues.

<table>
<tr><td colspan="3">Project Name: Lemhi River Measuring Devices</td></tr>
<tr><td colspan="3">Project Type: Water Measurement/ Stream Flow Enhancement</td></tr>
<tr><td colspan="3">Project Sponsor: Lemhi Irrigation District (Salmon, ID); Landowners</td></tr>
<tr><td colspan="3">Project Design: Bureau of Reclamation</td></tr>
<tr><td colspan="2">Landowner(s): Multiple</td><td>Partner(s): Landowners; Lemhi Irrigation District</td></tr>
<tr><td colspan="2">Funding Source(s): Landowners</td><td>Implementation Cost: ≈ $126,000</td></tr>
<tr><td colspan="3">Project Location: State: Idaho; county: Lemhi; stream: Lemhi River ; landmark: within the Lemhi River basin, multiple locations</td></tr>
<tr><td rowspan="3">Project Status</td><td colspan="2">Phase: Construction</td></tr>
<tr><td colspan="2">Year Began: 2004 Completed: multiple dates, 2009</td></tr>
<tr><td colspan="2">Status: Ongoing</td></tr>
<tr><td rowspan="2">Contracting</td><td colspan="2">Construction Contractor: multiple</td></tr>
<tr><td colspan="2">Site Rehabilitation Contractor: multiple</td></tr>
<tr><td rowspan="2">Biological Benefit</td><td colspan="2">Species: SR spring/summer Chinook salmon, SR steelhead trout; bull trout</td></tr>
<tr><td colspan="2">Benefit Type: Instream Flow Improvement</td></tr>
<tr><td colspan="3">Metric: Water flow data will help inform the planning of future projects</td></tr>
</table>

Lemhi River Table 1 — Flow Measurement Devices (2004-2009)

Diversion	**Decreed Flow** (cfs)	**High Flow** (cfs)	**Year Installed**
L-1	1.13	7.5	2009
L-2	0.66	6.1	2009
L-3	15.4	36	2008
L-3AO	2.03	9.3	2004
L-3A	3.62	20.3	2008
L-6	46.2	63.8	2008
L-7	23.2	53	2008
L-9	22.7	29.7	2004
L-10	26.01	31.8	2008
L-13	27.8	29.7	2006
L-14	1.85	10.6	2008
L-15	3.91	12.7	2008
L-20	10.6	26.9	2009
L-21	7.5	11.3	2008
L-22	18.4	25.2	2008
L-25	4.03	13.8	2008
L-26	2.07	6.9	2009
L-27	2.36	8.7	2009
L-28	12.4	16.4	2009
L-30	26.9	46.6	2008
L-30A	0.87	7.4	2008
L-31	7.59	19.2	2008
L-31A	5.97	25.4	2009
L-32	14.9	20.2	2008
L-34	0.58	2.2	2008
L-35	1.62	3.6	2008
L-35A	0.62	4.6	2008
L-37	2.61	8.2	2008
L-40	1.67	9.5	2008
L-43-A	0.7	7.8	2009
L-43-B	0.3	7.0	2009
L-45A	1.83	7.8	2008
L-45D	8.31	38.1	2008
L-46a	10.88	21.6	2008
L-52	4.6	13.1	2008
L-54	1.68	4.8	2008
L-57	2.0	5.1	2008
L-58	1.42	10.1	2008
L-58B	5.14	15.3	2008
L-61	3.33	12.7	2008
L-62	4.94	12.4	2009
Whitefish Cr.	2.0	12.0	2009

6.3 LEMHI, LITTLE SPRINGS CREEK CHANNEL REHABILITATION

Project Objectives and Description: Little Springs Creek is a spring-fed tributary to the Lemhi River in Lemhi County, Idaho. A one-mile reach of Little Springs Creek on the Amonson Ranch was degraded from years of cattle grazing in and adjacent to the riparian area. The landowner approached the non-profit organization Trout Unlimited (TU) about assistance with rehabilitating the stream; TU successfully applied for a grant from the Pacific Coast Salmon Recovery Fund (PCSRF) to rehabilitate that reach. Stream habitat treatments applied consisted of narrowing the channel; constructing pools, tailouts, and side-channel habitat; stabilizing banks; planting and seeding in the riparian area; removing a fish barrier and replacing it with fish-passable diversion weir in Little Springs that is associated with the Lemhi River's L-52 diversion.

(As part of a separate but related project, TU applied for and received funding from another source to construct a cattle exclosure fence adjacent to the rehabilitated section of Little Springs Creek.)

Design, Permitting, and Construction Issues: TU requested technical assistance from Reclamation for completion of a Cultural Resource Survey/SHPO [state historic preservation office] concurrence and for preparation of a biological assessment (BA) that analyzed the potential project effects to ESA listed species. An archeologist from Reclamation′s Snake River Area Office (SRAO) conducted the Cultural Resource Survey. A local consultant, Salmon Environmental Services, was hired by Reclamation to assist with preparation of the BA.

Trout Unlimited contracted with Westwater Consulting to develop the project design. TU obtained permits and coordinated NEPA and ESA compliance with the Idaho Office of Species Conservation (OSC).

Trout Unlimited administered the construction contract, provided oversight in the field and will monitor the project. Additional assistance during construction was provided by Gregory Aquatics and Westwater Consulting.

<table>
<tr><td colspan="3">Project Name: Little Springs Creek Channel Rehabilitation (Amonson Ranch)</td></tr>
<tr><td colspan="3">Project Type: Channel Complexity, Fish Passage</td></tr>
<tr><td colspan="3">Project Sponsor: Trout Unlimited</td></tr>
<tr><td colspan="3">Project Design: Westwater Consulting</td></tr>
<tr><td colspan="2">Landowner(s): Bob Amonson</td><td>Partners: Amonson, L-52 Irrigator, Trout Unlimited, NMFS, Idaho OSC, Reclamation,</td></tr>
<tr><td colspan="2">Funding Source(s): NMFS (PCSRF)</td><td>Implementation Cost: ≈ $190,000</td></tr>
<tr><td>Project Location:</td><td colspan="2">State: Idaho; county: Lemhi; stream: Lemhi River
44° 45′ 52.46″ N, 113° 30′ 57.14″ W. Local Landmark:</td></tr>
<tr><td colspan="3">Project Status: Completed by Trout Unlimited (November 2009)</td></tr>
<tr><td colspan="3">Project Phase: Post Construction Monitoring</td></tr>
</table>

Milestones	Funding: October 2007: TU received award from Idaho OSC for NMFS (Pacific Coast Salmon Recovery Funds)
	Design: Westwater Consulting, Gregory Aquatics
	Permitting: In 2009, Reclamation completed a Cultural Resources Survey and a BA for TU. Additional environmental compliance was completed by TU.
	Construction: Completed November 2009
Contracting	Construction Contractor: Tyler Excavation
	Site Rehabilitation Contractor: Tyler Excavation and TU
Biological Benefit	Species: SR spring/summer Chinook salmon, SR steelhead trout, CR bull trout
	Benefit Type: Habitat Improvement and Fish Passage
Metric: 1.25 miles	

Little Springs Creek, Photo 1. Location of Project Reach on Amonson Ranch. ***(Undated)***

Little Springs Creek, Photo 2 — Before: old wooden diversion structure. *(August 2007)*

Little Springs Creek, Photo 3 — Before: eroded streambank, excessively widened channel. *(August 2007)*

Little Springs Creek, Photo 4 — After: new rock-vane diversion. *(November 2009)*

Little Springs Creek, Photo 5 — After: lower reach of re-constructed stream channel. *(November 2009)*

6.4 LEMHI, UPPER LEMHI FLOW ENHANCEMENT VIA WHITEFISH DITCH MODIFICATION

Project Objectives and Description: Eighteenmile Creek is a headwater tributary of the Lemhi River (at RM 56.2). For many years at a location near its historic confluence with the Lemhi River(near Leadore, Idaho), the waters of Eighteenmile Creek were intercepted and channeled into a manmade ditch known locally as the Whitefish Ditch. Whitefish Ditch also intercepted Canyon Creek; during portions of the year, a control structure enabled the flows from both Eighteenmile Creek and Canyon Creek to be diverted for irrigation.

The Upper Lemhi Flow Enhancement via Whitefish Ditch Modification (also called the "Eighteen Mile Creek reconnection project") entailed construction of an earthen berm and closure of the Whitefish Ditch, at which point Eighteenmile Creek was allowed to establish its own channel and flow back to the Lemhi River. Whitefish Ditch (Eighteenmile Creek) water rights were transferred downstream to an existing point-of-diversion on the Lemhi River where a pump and pipeline were installed in the L-62 Ditch to convey Eighteenmile Creek water to irrigated land. According to the biological assessment submitted to NMFS and FWS, closure of the Whitefish ditch allows for Eighteenmile Creek to reconnect with the Lemhi River thus providing 5 cfs to 8 cfs of enhanced flow in the upper reach of the Lemhi River and anadromous fish access to 144 miles of historic habitat in Eighteenmile Creek and, eventually, Hawley Creek (dependent upon additional flow acquisition and barrier removal). Removal of the control structure at the confluence of Whitefish Ditch and Canyon Creek reportedly allows for reconnection of Canyon Creek and up to 22 cfs of flow in Canyon Creek to supplement the upper Lemhi River (at RM 55.1).

Reclamation′s participation in this project entailed completion of flow assessment studies (using a computer model called PHABSM) in Eighteenmile Creek, Canyon Creek, Hawley Creek, and the upper Lemhi River. The purpose of the studies were to ascertain how much flow would be necessary in the stream channels to sufficiently meet habitat and passage requirements of migrating fish. The PHABSM studies were completed in the upper Lemhi River and in Canyon Creek in 2006 and the studies in Eighteenmile and Hawley Creeks were completed in 2007. The results were provided to the proponents of the project for their use in project design and flow acquisition. Reclamation also provided the design for a water-measurement device (ramp flume) that was installed by the irrigator in the new Eighteenmile Creek Channel near its confluence with the Lemhi River.

Design, Permitting, and Construction Issues: Reclamation was not involved in the coordination, planning, design, NEPA/ESA compliance, or implementation of this project.

Project Name: Upper Lemhi Flow Enhancement via Whitefish Ditch Modification
Project Type: Passage, Flow Enhancement, Entrainment
Project Sponsor: Lemhi Soil and Water Conservation District (Salmon, ID)
Project Design: NRCS

Landowner(s): Merrill Beyeler		Partners: Lemhi SWCD, USBWP, IDFG, NRCS
Funding Source: NMFS (PCSRF)		Implementation Cost: funded in conjunction with **Big Timber Flow Improvement Project** (total $424, 130)
Project Location:	State: Idaho County: Lemhi Stream: Lemhi River Lat 44° 41′ 0.43″ N; Long 113° 21′ 19.11″ W. Local Landmark: Leadore T16N; R26E; Sect. 27;	
Project Status: Completed October 2009		
Project Phase: Monitoring by IDFG		
Milestones	Funding: PCSRF via Idaho OSC	
	Design: NRCS	
	Permitting: USBWP	
	Construction: Landowner, IDFG	
Contracting	Construction Contractor: Landowner (Merrill Beyeler) utilized backhoe to complete ditch closure and flume installation. Pump Installation: IDFG	
	Site Rehabilitation Contractor: Landowner	
Biological Benefit	Species: SR spring/summer Chinook salmon, SR steelhead trout, bull trout	
	Benefit Type: Passage, Entrainment, Flow	
Metric: 144 miles in Eighteenmile Creek and Hawley Creeks, plus 22 miles in Canyon Creek		

Upper Lemhi Flow Enhancement, Photo 1 — ramp flume installed in new Eighteenmile Creek channel. *(undated)*

Upper Lemhi Flow Enhancement, Photo 2 — Abandoned Whitefish Ditch (closure berm in the foreground). *(undated)*

6.5 LEMHI, BIG TIMBER CREEK FLOW ENHANCEMENT

Project Objectives and Description: Big Timber Creek (BTC) is a tributary to the Lemhi River (at RM 55.0) in Lemhi County near Leadore. The Flow Enhancement Project is located in the upper reach of the Lemhi River and lower reach of the creek. This project involved the second portion (Phase 2) of a multi-phase effort to improve flow and anadromous fish passage connectivity between the Lemhi River and the BTC drainage. Prior to Phase 2, a 0.75-mile reach of lower BTC was historically dewatered during the irrigation season as a result of irrigation diversion upstream. The BTC flow enhancement project entailed transferring BTC irrigation water rights downstream to a new point-of-diversion (POD) on the Lemhi River and withdrawing them via a pump and pipeline thus leaving 4.5 cfs of water in the lower reach of BTC creek for fish. Project features included construction of an access road, rock weir in the Lemhi River, installation of a pump, pipeline, and pivot.

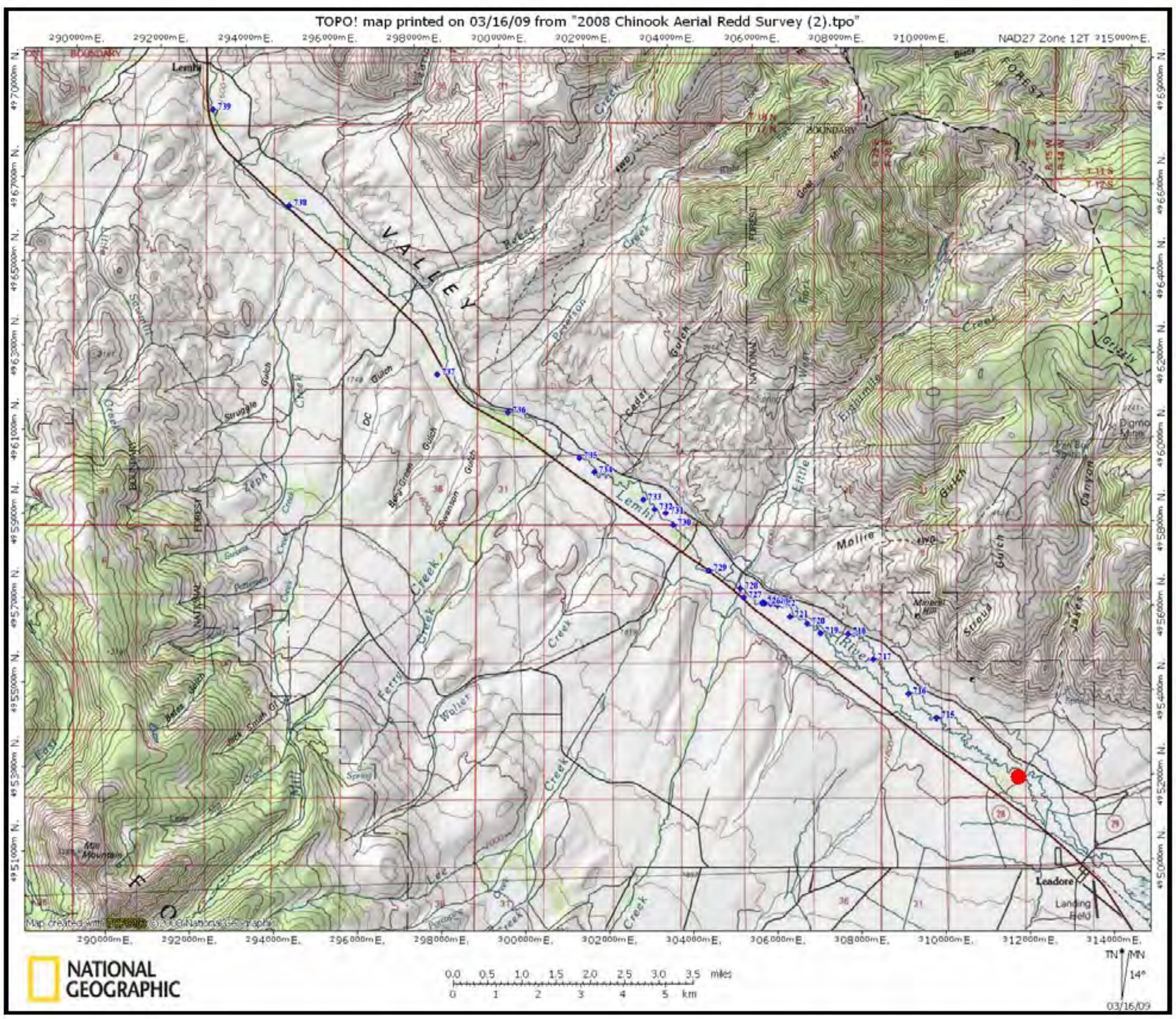
To facilitate implementation of Phase 2, Reclamation provided technical assistance prior to and for Phase 1 project efforts. Reclamation installed a temporary gage station in 2003 and conducted a PHABSM flow study on Big Timber Creek to ascertain how much flow was needed for fish passage in the flow deficient reaches. Study results were used for planning and design of Phase 2. During Phase 1, Reclamation provided technical assistance with design and construction of the L-63 irrigation siphon under the creek. (The siphon replaced a wooden check structure in BTC that if not removed would have captured Phase 2 flow-augmentation water in the L-63 ditch, blocked fish passage, and allowed for entrainment of fish into the ditch system).

Future Phases of the project will entail acquisition of additional water, removal of upstream fish-passage barriers, and screening irrigation ditches.

Design, Permitting, and Construction Issues: Reclamation was not involved in the design, permitting, or construction of flow-augmentation phase of Big Timber Creek reconnection.

Project Name: Big Timber Creek Flow Enhancement	
Project Type: Passage and Flow	
Project Sponsor: Idaho Department of Fish and Game	
Project Design: NRCS and IDFG	
Landowner(s): Karl Tyler	Partners: Lemhi SWCD, USBWP, NRCS, Landowner, IDWR
Funding Source(s): NMFS	Implementation Cost: $424,130 (combined funding with Upper Lemhi Flow Enhancement via Whitefish Ditch Modification)
Project Location:	State: Idaho County: Lemhi Stream: Lemhi River Latitude 44° 42′ 4.36″ N; Longitude 113° 22′ 57.39″ W. Local Landmark: Leadore T16N; R26E; S 20; ¼ Section: NESE
Project Status: Phase 2 Completed. Phase 3 pending removal of upstream diversions and additional flow acquisition.	

Project Phase: Monitoring by IDFG	
Milestones	Funding: (NMFS) Pacific Coast Salmon Recovery Fund and Idaho OSC
	Design: NRCS and IDFG
	Permitting: USBWP, IDFG , IDWR
	Construction: NRCS and IDFG
Contracting	Construction Contractor: IDFG
	Site Rehabilitation Contractor: IDFG
Biological Benefit	Species: SR Chinook salmon, SR steelhead, CR bull trout
	Benefit Type: Passage and Flow
Metric: 2 miles retaining previous flow levels; no additional flows until completion of Phase 3.	



Big Timber Creek Flow Enhancement — Location Map

6.6 PAHSIMEROI, DUCK CREEK RECONNECT

Project Objectives and Description: Duck Creek is a small, spring-fed channel in the Pahsimeroi Valley, Idaho. Historically, the creek was intercepted midway by the "Cross Ditch," a channel that delivered water from Big Springs Creek to the Pahsimeroi River, from where it was then diverted for irrigation. Conservation projects have been completed to eliminate the need for the Cross Ditch diversion structure, and this water now stays in Big Springs Creek. The Cross Ditch channel is now dry from Big Springs Creek downstream to where Duck Creek is intercepted.

This project reconnected the upper portion of Duck Creek with the lower channel instead of allowing it to run into Cross Ditch. The lower portion of Duck Creek has had water from springs below Cross Ditch. The upper portion of Duck Creek has a base flow of 2 to 3 cfs. During the week following construction, however, the flow was measured to be 4.5 cfs. Connecting the upper portion of the creek with the lower will allow fish access to about 0.6 mile of new spring channel habitat, plus enhance the lower 0.7 mile of Duck Creek by adding the additional flow.

A sod plug was placed at the point of interception between Duck Creek and Cross Ditch; approximately 225 feet of new channel was constructed to reconnect upper Duck Creek with its original channel. Special attention was paid to ensuring that the new banks looked as natural as possible and would vegetate quickly.

There were no **Design, Permitting, and Construction issues**.

Project Name: Duck Creek Reconnect		
Project Type: Side Channel Habitat		
Project Sponsor: Custer Soil and Water Conservation District (Challis, ID)		
Project Design: Bureau of Reclamation		
Landowner(s): Beartooth Capital		Partner(s): Beartooth Capital, BPA, Custer SWCD
Funding Source(s): BPA		Implementation Cost: $3,100
Project Location	State: ID County: Lemhi Stream: Duck Creek Lat: 44° 35′ 48.4″ N; Long: 113° 56′ 34.5″ W. Local Landmark: west of May	
Project Status	Phase: construction began 2009; Completed 8/12/2009. Status: completed	
Contracting	Construction Contractor: Getty Excavating	
	Site Rehabilitation Contractor: Getty Excavating	
Biological Benefit	Species: SR spring/summer Chinook salmon, SR steelhead trout, CR bull trout	
	Benefit Type: Habitat improvement	
Metric: Allowed access to 0.6 miles of Duck Creek channel above the Old Cross Ditch, improved flows and habitat in 0.7 miles of Duck Creek below the Cross Ditch.		

Duck Creek Reconnection, Photo 1 — Approximately 225 feet of new channel was constructed to reconnect upper Duck Creek with its original channel. *(undated)*

6.7 Upper Salmon, Flow Measurement Devices

Project Objectives and Description: Water measurement devices are tools that allow irrigators to better control their diverted flows. These devices also help subbasin planning process in determining actual diversion and the size of fish screen structures. Irrigation professionals estimate that diverted flows will decrease 2 to 10 percent when a measurement device is utilized. These flows, when left in the river, provide habitat and passage benefits to endangered salmon and steelhead, as well as resident fish species. IDWR has begun requiring irrigators in the Upper Salmon subbasin to have a measuring device in place. Reclamation is providing technical assistance to help the landowners determine a functional structure. Landowners have been purchasing the structures and paying to install them.

There were no **Design, Permitting, and Construction** issues.

Water measurement devices have been installed on the following diversions on the Upper Salmon River.

Upper Salmon River Table 1 — Flow Measurement Devices (2006-2009)

Location	Flow	Year Installed
4th of July Creek 3	9.5 cfs	2009
Gold Creek 2/3	3 cfs	2008
Gold Creek 4	3 cfs	2008
S-23	190 cfs	2007
S-40	28 cfs	2006
S-41	30 cfs	2008
S-42	29 cfs	2008
Iron Creek 5/6/7	6 cfs	2007
Williams Creek 1	1 cfs	2008
Williams Creek 2/3	7 cfs	2008
Williams Creek 4	4 cfs	2008

Project Name: Upper Salmon River Measuring Devices		
Project Type: Water Measurement/ Stream Flow Enhancement		
Project Sponsor: Landowners		
Project Design: Bureau of Reclamation		
Landowner(s): Multiple		Partner(s): Landowners
Funding Source(s): Landowners		Implementation Cost: ≈ $40,000
Project Location	State: ID; county: Custer; stream: Salmon River; landmark: within the Upper Salmon subbasin. Multiple sites.	

Project Status	Phase: Construction Year Began: 2006 Year Completed: multiple dates, 2009 Status: Ongoing
Contracting	Construction Contractor: multiple
	Site Rehabilitation Contractor: multiple
Biological Benefit	Species: SR spring/summer Chinook salmon, SR steelhead trout, CR bull trout
	Benefit Type: Instream Flow Improvement
Metric: Water flow data will help inform the planning of future projects	

7. WENATCHEE SUBBASIN, WASHINGTON

The Wenatchee River (HUC 17020011) is tributary to the Columbia River at RM 468.4 and has a drainage area of about 1350 square miles. Several rivers and major streams are tributary to the Wenatchee; these include Mission Creek (RM 10.5), Peshastin Creek (RM 17.9), Chumstick Creek (RM 23.5), Icicle Creek 25.6), Chiwawa River (RM 48.4), Nason Creek (53.6), and White River 58.6). Chelan County P.U.D. owns and operates Rock Island Dam (Columbia RM 453.4) and Rocky Reach Dam (Columbia RM 464.4); in addition, there is a diversion weir at Wenatchee RM 17.5 serving the PUD and Wenatchee Reclamation District. Major communities include Wenatchee, Cashmere, and Leavenworth.

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

7.1 WENATCHEE, CASHMERE PONDS

Project Objectives and Description: The goal of the project was to add habitat complexity to the Wenatchee River; this was to improve spawning and rearing habitat quantity and quality for native endangered fish species, including spring Chinook salmon and steelhead trout. The objectives of the Cashmere Pond Off−Channel Habitat Project were to prevent fish stranding in the pond and address the lack of off-channel habitat which is the primary habitat limiting factor for juvenile steelhead trout and spring Chinook salmon on the lower river.

Design, Permitting, and Construction Issues: During design, the funding entities did not support the use of rock spurs or other structures to protect the outlet channel of the pond from Wenatchee River lateral erosion; they also reduced the amount of wood structure placed in pond. There was difficulty in de-fishing the pond; this was handled by doing several sample areas of the pond and, in absence of finding any listed species, complete de-fishing was not required; however, the area was monitored during the drawdown of the water surface and during construction. A nearby landowner claimed that dewatering the pond caused shallow wells to be impacted; Chelan County worked with the owner of the shallow well to dig it deeper and satisfy the owner.

Project Name: Cashmere Ponds	
Project Type: Complexity	
Project Sponsor: Chelan County Natural Resources Department (Wenatchee, WA)	
Project Design: Jones and Stokes	
Landowner(s): Washington DOT	Partners: WDFW
Funding Source(s): Priest Rapids Coordinating Committee, SRF Board, Mid Columbia HCP Tributary Committee	Implementation Cost: $325,000

Project Location:	State: WA County: Chelan Stream: Wenatchee River Lat: 47° 31′ 27″ N, Long: 120° 28′ 26″ W; just upstream of Applets Way Bridge T23N R19E Section 4 NW, 5NE; T24N R19E Section 32 SE, 33 SW
Project Status	Completed; Project Phase: Monitoring
Milestones	Funding: Winter 2009; Design: March 2009; Permitting: March 2009; Construction: 10/31/2009
Contracting	Construction Contractor: Columbia Valley Excavation
	Site Rehabilitation Contractor: Same
Biological Benefit	Species: UCR spring Chinook salmon, UCR steelhead trout
	Benefit Type: Off channel habitat, high flow refugia
Metric: 0.3 miles	

Cashmere Pond, Photos 1 and 2 — Channel Inlet, Before and After. *(undated)*

Cashmere Pond, Photos 3 and 4 — Channel Outlet, Before and After. *(undated)*

Cashmere Pond, Photos 5 and 6 — Channel, Before and After. *(undated)*

7.2 WENATCHEE, CHUMSTICK DRIVEWAY CULVERTS

Project Objectives and Description: The objective of this project was to open up seven miles of passage for UCR steelhead trout by removing 17 barrier culverts in Chumstick Creek and replace them with 16 bridges

Design, Permitting, and Construction Issues: Three contractors were used during construction, requiring significant observation resources.

Project Name: Chumstick Driveway Culverts		
Project Type: Passage,		
Project Sponsor: Chelan County Natural Resources Dept. (Mike Kane, planning and design; Alan Schmidt, construction; Mike Kaputa, Department Manager, 509 667-6584)		
Project Design: CCNRD (Skillings/Connolly)		
Landowner(s): Various		Partners: BPA, FWS, Yakama Nation
Funding Source(s): BPA, FWS, YN		Implementation Cost: $2.5 million
Project Location:	State: WA County: Chelan Stream: Chumstick Creek Lat: 47° 41′ 00″ N, Long: 120° 38′ 22″ W. T25 N R18E Sect. 7, 20, 21 ¼ Section: Multiple locations within a 7-mile-long reach.	
Project Status: Completed		
Project Phase: Monitoring		
Milestones	Funding: winter 2008	
	Design: summer 2009	
	Permitting: summer 2009	
	Construction: 9/30/2009	
Contracting	Construction Contractor: Pivetta Bros., Morgan & Sons, Rayfield Bros.	
	Site Rehabilitation Contractor: N/A	
Biological Benefit	Species: UCR steelhead trout	
	Benefit Type: Passage/	
Metric: 7 miles		

Chumstick Driveway Culvert Project — *These photographs were taken at the Dolozycki site and show a typical process of culvert removal and bridge installation.*

Photo 1 shows the excavation and removal of the existing culvert, a barrier to fish passage. *(undated)*

In Photo 2, the passage area has been formed and graded, and large cobble has been placed to mimic a natural streambed. *(undated)*

Photo 3 shows one of two concrete span being lowered into place. *(undated)*

8. ABBREVIATIONS, ACRONYMS, AND GLOSSARY TERMS

Note: term in ***bold italics*** indicates separate entry

In Text	Full Citation
ACOE	Army Corps of Engineers
Action Agencies	Army Corps of Engineers Northwest Division (Portland, OR), Bonneville Power Administration (Portland, OR), and Bureau of Reclamation Pacific Northwest Region (Boise, ID)
ARRA	American Recovery and Reinvestment Act of 2009
BPA	Bonneville Power Administration (Portland, OR) of the U.S. Dept. of Energy
CTWRSO	Confederated Tribes of the Warm Springs Reservation of Oregon
DPS	distinct population unit (used by ***FWS***)
ELJ	engineered log jam
ESA	Endangered Species Act
ESU	ecologically significant unit (used by ***NMFS***)
FWS, USFWS	Fish and Wildlife Service of the U.S. Department of the Interior
IDFG	Idaho Department of Fish and Game
LSWCD	Lemhi Soil and Water Conservation District (Challis, ID)
LWM, LWD	large woody material, large woody debris
MSRF	Methow Salmon Recovery Foundation
MVID	Methow Valley Irrigation District
NMFS, NOAA Fisheries	National Marine Fisheries Service of the National Oceanic and Atmospheric Administration of the U.S. Department of Commerce
NRCS	Natural Resources Conservation Service of the U.S. Dept. of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ODSL	Oregon Department of State Lands
OSC	Idaho Office of Species Conservation
OWEB	Oregon Watershed Enhance Board
PHABSM	Physical Habitat Simulation for Fishery Studies Model
POD	point-of-diversion, point of diversion
P.U.D.	Public Utility District
Reclamation	Bureau of Reclamation of the U.S. Department of the Interior
SWCD	Soil and Water Conservation District
TSC	Bureau of Reclamation Technical Service Center (Denver, CO)
TU	Trout Unlimited, a national organization with regional programs and chapters

In Text	Full Citation
UCR	Upper Columbia River
USBWP	Upper Salmon Basin Watershed Project
VE	value engineering
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WDOT	Washington Department of Transportation
WWP/TU	Washington Waters Project of ***Trout Unlimited*** (Wenatchee, WA)