



Project Completion Report

For the

Wallowa River

Baker Habitat Restoration Project

Project #1992-026-01

**Report covers work performed under BPA Contract #72951
August 2016-December 2017**

**Colleen Fagan and Winston Morton, ODFW, La Grande, Oregon
January 2018**



Google Earth Imagery of Wallowa-Baker Project, July 15, 2017

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Project Name

Wallowa River – Baker Habitat Restoration Project

Project Location

45.593592,-117.570003

Township 1N, Range 42E, Willamette Meridian, Wallowa County, Oregon:

NE¼SW¼ and NW¼SE¼ of Section 4

Participating Landowner(s) and Project Partners

John and Tarrah Baker (Landowners)

Oregon Department of Fish and Wildlife

Bonneville Power Administration

Grande Ronde Model Watershed

Northern Wasco County People's Utility District, as Trustee of the McNary Fisheries

Mitigation Irrevocable Trust Fund

Oregon Watershed Enhancement Board

Nez Perce Tribe

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Abstract

The Wallowa River-Baker Project is located 2.75 miles northwest of Wallowa, Oregon on the Wallowa River, tributary to the Grande Ronde River, at RM 21 (Figure 1). The project is located on private property in Wallowa Atlas Tier 1 habitat and encompasses 0.6 miles of the Wallowa River. The stream course and drainage patterns in the project area have been severely altered as a result of agricultural practices and road construction. Riparian forests have been converted to agricultural fields. Instream habitat and habitat complexity have been diminished by in-channel maintenance. Few pools are present and vertical, eroding banks limit floodplain interaction and hyporheic exchange. The project included placing 30.2 acres in a 15-year conservation easement and addressing limiting factors for ESA listed spring Chinook salmon, summer steelhead, and bull trout by improving riparian habitat and channel condition, floodplain and instream habitat creation, increasing habitat complexity, reducing sediment delivery, and contributing towards improved flow and water temperature regimes. Implementation funding was provided by the Bonneville Power Administration (BPA), the United States Fish and Wildlife Service (USFWS), and the McNary Fisheries Mitigation Irrevocable Trust Fund. The project included 1) constructing three side channels, 2) floodplain creation and reconnection, 3) 29 engineered habitat structures to improve habitat, increase habitat diversity, and provide bank stability, 4) riparian planting and seeding, and 5) riparian exclusion fencing. Phase 2 of the project will be completed in 2018, including one side channel, a fish screen and diversion device, installation of engineered wood structures, and additional planting (Figure 2).

Project partners include the Oregon Department of Fish and Wildlife (ODFW), Grande Ronde Model Watershed (GRMW), BPA, Nez Perce Tribe (NPT), USFWS, McNary Fisheries Mitigation Irrevocable Trust Fund, and Oregon Watershed Enhancement Board (OWEB).

Introduction

The Wallowa River provides migration, spawning and rearing habitat for federal Endangered Species Act (ESA) listed Snake River spring Chinook salmon and Snake River summer steelhead. Spring Chinook salmon and summer steelhead spawning, summer rearing, and overwinter rearing occur in the project reach. ESA listed bull trout, Pacific lamprey, Coho, Oregon state sensitive species redband trout, and other native resident fish species also utilize this section of the Wallowa River at various times and life history stages.

The Interior Columbia Technical Recovery Team rates abundance/productivity for the Wallowa River spring Chinook salmon population as high risk and below viable status. Spatial structure/diversity risk is rated as moderate. Abundance/productivity of the Wallowa River summer steelhead population remains unconfirmed because of insufficient data, but rated at moderate risk.

Wallowa Watershed Problems

Both current and historic land management practices contribute to Wallowa Subbasin habitat degradation and pose threats to recovery of the Wallowa River spring Chinook salmon and summer steelhead populations. Abundance, productivity, and spatial distribution of Wallowa River spring Chinook salmon and summer steelhead are limited by lack of habitat quantity and diversity (primarily a lack of pools and large woody debris), excess fine sediment, poor water quality (high summer water temperature), water quantity (low flows, high flows, and alteration of the hydrograph), and passage barriers (irrigation diversions and culverts). Impaired habitat

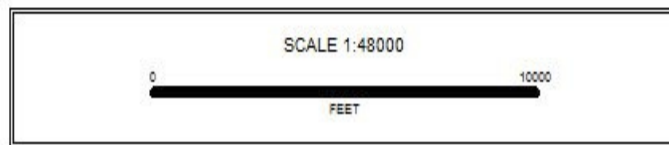
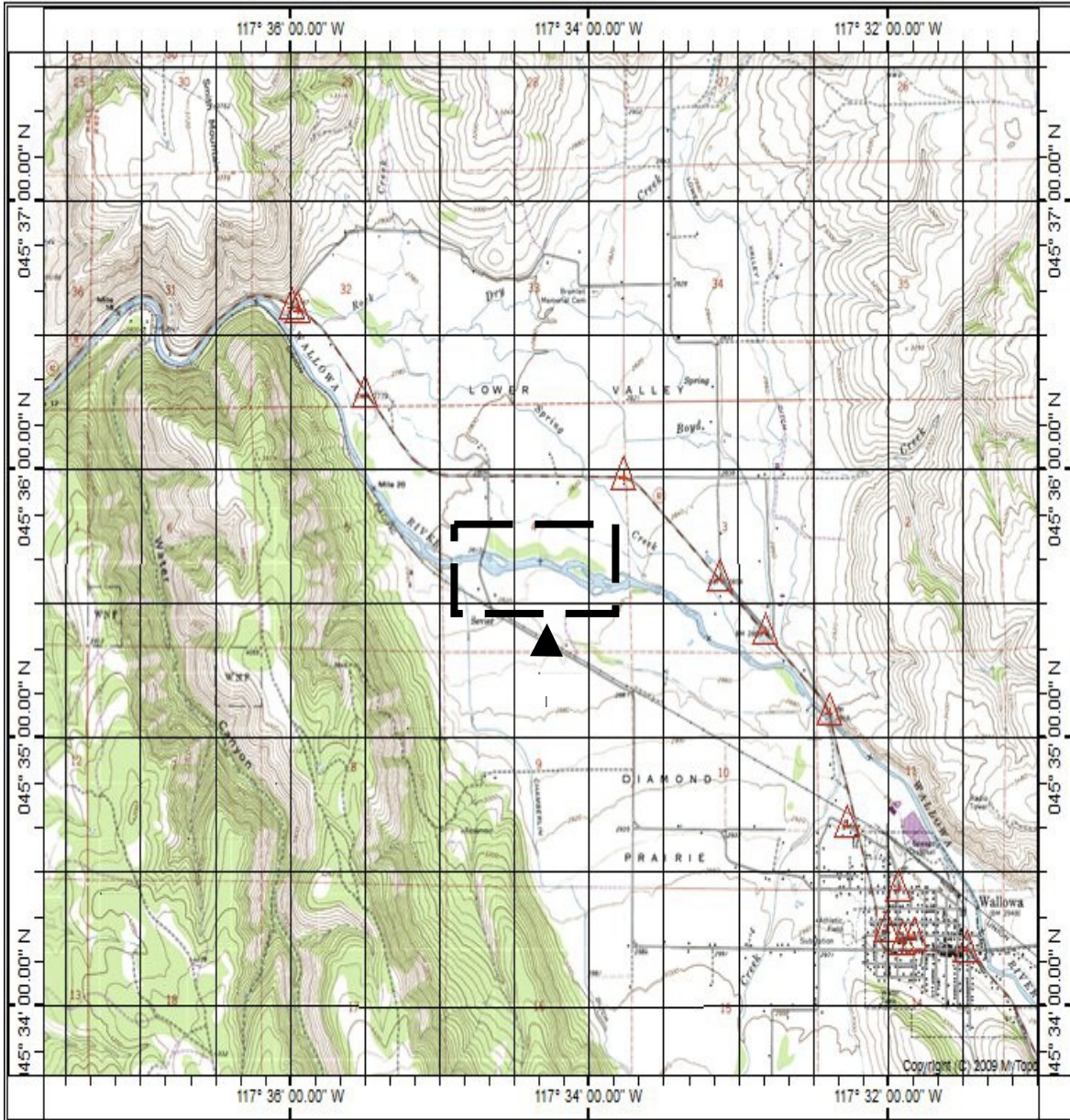


Figure 1. Location of the Wallowa River-Baker Fish Habitat Restoration Project, as denoted by the dash lined box above the arrow. Project is located in Township 1 North, Range 42 East, Section 4, Willamette Meridian, Wallowa County, Latitude 4.594011 and Longitude -117.575855.



Figure 2. Wallowa-Baker Habitat Restoration Project. Phase 1 included side channels A, B and C and associated floodplain and habitat structures and seven mainstem habitat structures. Phase 2 includes side channel D and associated habitat structures, a fish screen and diversion device, and seven mainstem habitat structures.

conditions result from agricultural, forestry, and grazing practices, dams and other barriers, water withdrawals, roads, railroads and channel manipulations. Cumulatively, the effects of development and land use activities have altered watershed hydrology, reduced habitat quality and complexity, floodplain connectivity, and water quality, altered floodplain and upland processes, and contributed to sediment loads and elevated stream temperatures.

Pre Project Reach Conditions

Within the Project area, the stream course and drainage patterns have been simplified and severely altered as a result of agricultural practices and road construction. Riparian forests have been converted to agricultural fields and for livestock grazing. Instream habitat and habitat complexity have been diminished by in-channel maintenance, including gravel extraction. The pool density is low, reducing adult holding and juvenile rearing habitat. Due to the low density of pools, the gravels are not well sorted impacting adult spawning. Vertical, eroding banks limit floodplain interaction and hyporheic exchange. The width to depth ratio is greater than 35 and sinuosity is low (1.08), which results in wide, shallow flow, thereby increasing temperatures in the summer months. Long, over-widened riffles exist at various locations throughout the project reach. A bridge is located just downstream of the project site, and a non-regulated levee is present on both banks at the downstream end of the project. 303(d) parameters of concern are temperature, sedimentation, pH, habitat and flow modification, and bacteria. Summer steelhead spawning occurs in the spring creek ditch with trapping and stranding of juveniles.

There is no sign of floodplain connectivity on river left. The river left riparian area is very narrow and quickly turns into an agricultural field that is perched as high as 8 feet above the channel thalweg. The floodplain on river right exhibits connectivity and a series of robust cottonwood galleries and willow stands are present. Based on historic maps and photos, the project area on both streambanks historically contained a wide forested floodplain with a creek entering the Wallowa River from the south, within the project area. Between 1938 and 1956, the area on river left was cleared of the wooded forest and began to be farmed. Since 1956, the riparian area on river right has continued to grow in width, wooded material, and beaver activity and the riparian area on river left has progressively shrunk in size with notable bank erosion and reed canary grass choking out competing vegetation.

Past Restoration Efforts

Efforts to address channel stability within the project reach were completed in 1997 by the Natural Resources Conservation Service. These efforts consisted of installing stream barbs and planting on high banks. However, few of the plants survived and many of the instream structures exacerbated localized scour or deposition, causing accelerated lateral migration.

Wallowa-Baker Project Development

In 2007, ODFW and other partners were contacted by the landowner regarding bank erosion that was occurring on their property. The erosion was relatively localized at one location (Figure 3). In 2009, out-of-channel flows during runoff breached the narrow riparian area and began carving a new channel (Figure 4). Later in 2009, the active erosion on the Baker property created a new channel through the landowner's agricultural field (Figures 5 and 6). After high flows in 2011, the Wallowa River abandoned its new left bank channel and began to carve another new channel towards the right bank (Figure 7). Currently, this large left bank channel is only activated at higher flows (Figures 8 and 9).



Figure 3. Looking downstream from the Baker property at the localized bank erosion, April 2007.



Figure 4. Looking downstream from the Baker property, June 2, 2009. The Wallowa River is shown laterally migrating through the narrow riparian buffer, carving what would become the main channel by the end of runoff.



Figure 5. Looking downstream at the Wallowa River from the Baker Property, June 25, 2009. Location is close to Figure 4. As flows receded, this became the main channel.



Figure 6. Looking upstream from the left bank of the Baker property (July 2010). Looking towards the locations of Figures 4 and 5. The bank is over 500 feet long.



Figure 7. ODFW employees and the landowners surveying the abandoned left bank channel. This was the main channel in 2009-2012, and still activates at higher flows. Photo is taken from a location in proximity to the photo in Figure 6 (January 2012).



Figure 8. Aerial photo of Wallowa-Baker Project location looking downstream, 2010.



Figure 9. Aerial photo of Wallowa-Baker Project looking downstream, 2012. New channel carved on right bank and left bank channel now only activated at high flows.

Discussions were initiated with the landowner regarding a side channel creation and bank stabilization project in 2009. The project scope and concept developed by ODFW were approved by the landowners in 2013. Technical assistance and design funding was secured from BPA and the OWEB in 2014. Project design was completed in 2016. Phase 1 of the restoration project was completed in 2017.

Project Design

Anderson Perry & Associates, inc. (AP) was contracted to design the project. Project design was informed by historical maps and photographs, field data, topographic surveys, LiDAR, and hydraulic modeling. Hydraulic models were used to evaluate the river's hydraulics and shear stress through the project reach, to determine elevations in the mainstem, to evaluate sediment transport, and to determine elevations for inverts of side channels. The ordinary high water (OHW) recurrence of 1.5 years was used to set the floodplain level.

A restoration team was assembled and included the landowners and representatives from ODFW, GRMW, NPT, NMFS, USFWS, and AP. ODFW, as the project manager, oversaw the organization and regular meetings of the restoration team. Participating restoration team members developed project objectives and criteria and ensured that objectives and criteria were realized in the resulting restoration project design. The restoration team reviewed 15%, 30%, 60%, and 90% designs. Draft Final design plans were modified based on review by the GRMW technical team and OWEB's Region 5 review team recommendation to phase the project.

Site constraints for the project included a bridge located just downstream of the project site, a non-regulated levee on river left at the downstream end of the project, and the landowner located to the south of the upstream end of the project site. The bridge could not be altered as part of the project. Although the levees are not regulated, modifying any portion of the levee was not considered viable in order to not disrupt the approach to the bridge, thereby altering the hydraulics at the bridge. The property owner located to the south of the upstream end of the project was worried about losing agricultural production. Therefore, the design of bank protection on river left was more aggressive in nature to ensure that the river does not push into the landowner's agricultural area.

Project Goals and Objectives

Goals

The primary goal of this restoration project is to implement habitat protection and enhancement measures that address the primary limiting factors identified for all life stages of ESA listed spring Chinook salmon and summer steelhead in the Wallowa Basin. Additionally, to restore ecosystem function for three ESA listed, endemic fish species and to develop and implement a project that benefits native fish and their habitat and private landowners.

Objectives

Floodplain - Promote interaction of the Wallowa River and the floodplain by creating 11 acres of new floodplain through channel and floodplain excavation and lowering existing streambanks to floodplain level.

Create low gradient annually and perennially connected off-channel habitat by constructing 11 acres of floodplain and four side channels.

Habitat Diversity – Construct 22 habitat structures in side channels to create off-channel deep pool habitat, 5-7 feet deep, to provide salmonid holding habitat, overhead cover, zero velocity margin habitat for juvenile rearing, and promote sediment sorting for improved spawning habitat.

Increase both quantity and quality of summer and winter rearing habitat for native anadromous and resident salmonids by creating 33 off-channel pools with cover, floodplain connectivity, and zero velocity refugia on active channel margins.

Create mainstem holding, spawning, and rearing habitat for salmonids through construction of 7 mainstem, engineered wood structures that enhance scour pool habitat, cover, and floodplain connection, increase hydraulic complexity and zero velocity refugia on active channel, and facilitate water retention, gravel deposition and sorting, and LWD recruitment.

Install 29 engineered wood and habitat structures to help develop and maintain pools, provide habitat diversity, cover, and food source production, promote wood recruitment, and decrease unnatural rates of erosion.

Sediment – Stabilize and protect existing eroding banks through installation of engineered log jams, vegetation reestablishment, floodplain construction and increased floodplain interaction, and the addition of floodplain roughness elements.

Facilitate sediment sorting through construction of three side channels, 11 acres of floodplain, and 29 habitat structures to increase floodplain interaction and roughness, and create deep pool habitat.

Riparian - Improve the density, condition, and species composition of riparian vegetation within the 30.2 acre easement through seeding and planting of native, locally adapted vertical bundles, whips, and poles of black cottonwood, willows, alders, red osier dogwood, water birch, currants, and mock orange and protecting plantings from ungulate browsing.

Meet riparian planting objectives of 1) a 40% survival of planted cuttings and a 50% survival of transplanted clumps by year 2; 2) increasing woody plant percent cover along stream channels by 10% each year after year 2; 3) achieving tree heights of 8 feet or more over 10% of the new main channel length in 5 years; and 4) achieve 15% shade across channel after 3 years (at noon during the low flow season) and achieving 25% shade across channel after 5 years.

Riparian Fencing - Construct 3,000 feet of post and rail fence to preclude livestock use of the 30.2 acre project area and easement boundary. Construct fence to ODFW specifications.

Install 10 plant protection cages to protect plantings from ungulate browsing.

Temperature - Provide thermal refuge for holding adults, rearing juveniles, and migratory species via increased hyporheic exchange in three constructed side channels, creation of deep pool habitat with construction of 22 side channel habitat structures, improved floodplain connectivity, and increased shade from increased density and improved condition, function, and species composition of the riparian zone.

Contribute to decreasing summer water temperature by decreasing width/depth ratios, decreasing length of riffles, creating deep pool habitat, establishment and improvement of riparian zone and function, and improved floodplain connection and hyporheic exchange.

Project Funding

Project design funding was provided by OWEB and BPA. Implementation funding was provided by BPA, USFWS, and the McNary Fisheries Mitigation Irrevocable Trust Fund.

Project Implementation

Steve Lindley Contracting, Inc. was contracted to construct the project. Project construction began in February 2017. Phase 1 construction and clean up was completed in August 2017. Project planting was completed in November 2017. Project fencing will be installed in spring 2018. Fencing was delayed at the request of the landowner.

Project Modifications

The mouth of Side Channel A was moved upstream slightly to avoid the levee. To further protect the levee, and at the request of the Wallowa County Commission Chair, the levee was used minimally to provide access to the site for project construction. No other modifications to final project designs occurred.

Accomplishments

Three side channels, 3,500 of off channel habitat, were constructed and connected to the Wallowa River (Figures 10-13). Side Channel A maximizes water depth at low flows and is active at 95% exceedance in the Wallowa River (207 cfs). It is 2,300 feet long with a sinuosity of 1.2, with riffle-run-pool-glide sequences that mimic natural channel features. The width-depth ratio is approximately 7 at riffle sections, with a wetted depth that ranges from approximately 1 to 3.25 feet during flows ranging from low to OHW, respectively. A low flow channel in the riffle section allows for an increased wetted depth during lower flows. The 10 pools along this side channel are 7 feet deep during OHW flow and no less than 3.75 feet deep during lower flows. These deep pools should intersect hyporheic flows and cold water seeps and allow groundwater exchange in the pool throughout the year, thereby helping maintain cooler summer water temperatures and providing thermal refugia for rearing salmonids. In addition, the deep pool habitat will provide holding areas for adult Chinook salmon and summer steelhead as well as create sediment sorting for spawning areas.

Side channel B is a bleed through channel activated at 50% exceedance in the Wallowa River (380 cfs), and supplements Side Channel A with hyporheic flow. Side Channel B is 230 feet long, with a sinuosity of 1.2, a width to depth ratio of 12, and contains three 6-foot deep pools. Flow will be 170 cfs with a water depth 3.15 feet at OHW in the Wallowa River. Side Channel B was set six inches higher than Side Channel A so high flows will keep the alcove at mouth of Side Channel A cleaned out. A habitat structure designed to take the full brunt of the Wallowa River, was installed as an inlet structure for Side Channels A and B.



Figure 10. Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, April 12, 2017.



Figure 11. Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, April 12, 2017.



Figure 12. Connecting Wallowa-Baker Habitat Restoration Project Side Channel A to the Wallowa River, August 09, 2017.



Figure 13. Connecting Wallowa-Baker Habitat Restoration Project Side Channel B to the Wallowa River, August 10, 2017.

Side channel C is also activated at 50% exceedance in the Wallowa River. Side Channel C is 924 feet long, with a sinuosity of 1.2, a width to depth ratio of 12, and contains four 5-foot deep pools. Flow will be 75 cfs with a water depth of 2.2 feet at OHW in the Wallowa River. A 25-member habitat and intake structure, designed to take the full brunt of the Wallowa River, was constructed at the mouth. Based on the Wallowa River Annual Hydrograph below Water Canyon, Side Channels B and C are expected to be active annually March-July and intermittently in January, February, October, November, and December, based on water year.

An additional 8 acres of floodplain was created around newly constructed side channels. The floodplain was excavated to an average width of 80 feet along each side channel (Figure 14).

Vertical, eroding banks along the Wallowa River were regraded to increase floodplain connectivity and promote riparian development. Trees and woody material have been added to the floodplain to increase floodplain roughness and reduce overland flow velocities in order to induce sediment deposition. The floodplain has been planted with native riparian species to dissipate energy and develop a riparian forest buffer.

Twenty-nine engineered wood and habitat structures, eight different types, were constructed for the Wallowa River-Baker Project (Figures 15-18); 7 in the mainstem and 22 in the side channels.



Figure 14. Floodplain constructed at the Wallowa-Baker Habitat Restoration Project, March 31, 2017.

These structures were installed at specific locations throughout the project reach to 1) increase habitat complexity; 2) promote pool development and maintenance; 3) provide cover; 4) promote sediment sorting; 5) provide margin roughness; 6) decrease riffle lengths and width to depth ratios; 7) promote localized scour; 8) provide bank stabilization; 9) control side channel inlets from excessive scour and sedimentation; and 10) provide mainstem and side channel maintenance and desired configuration. Engineered wood and habitat structures installed on the mainstem Wallowa River are comprised of 113 logs and trees as members and 45 logs as racking material. Habitat structures constructed in side channels are comprised of 167 logs and trees as members and 77 logs as racking material.

All ground disturbed during construction has been reseeded and invasive plant species are being controlled.

BPA funding was used for environmental controls, work area isolation and water management, clearing and grubbing, floodplain and side channel excavation, seeding and planting, construction of 20 structures, and engineer oversight of construction as needed.

Maintenance

Project maintenance will be conducted annually by ODFW's Grande Ronde Fish Habitat Program, with funding received from BPA. Extensive maintenance of instream habitat enhancement structures and enclosure fencing is not anticipated. Each spring Program staff will inspect project structures, fences, and vegetation and conduct necessary maintenance. If major repairs are necessary requiring additional funding, staff will perform feasible maintenance and solicit additional funding for major repairs. From April–November, project inspection and minor maintenance will occur every 10-14 days. Maintenance of structures, fences, and vegetation, including implementation of a noxious weed management plan, will occur at a minimum for the duration of the 15-year easement.



Figure 15. Construction of Wallowa-Baker Habitat Restoration Project Side Chanel A habitat structure 11, May 30, 2017.



Figure 16. Construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 8, at the inlet of Side Channels A and B, July 31, 2017.



Figure 17. Wallowa-Baker Habitat Restoration mainstem habitat structure 8, at the inlet of Side Channels A and B, August 02, 2017.



Figure 18. Wallowa-Baker Habitat Restoration Project mainstem habitat structure 7, at the inlet of Side Channel C, July 26, 2017.

Monitoring

Monitoring will be conducted by ODFW's Grande Ronde Fish Habitat Program staff to conduct due diligence and evaluate project effectiveness at meeting objectives. Monitoring will include the following:

1. Measuring survival, growth, and cover of planted and desired woody vegetation for five years post construction and implementation;
2. Measuring percent shade along transects established in and around the stream channels the first five years post construction, and then in years 10 and 15;
3. Pre-project photo points were established in 2015 and photos taken prior to project construction. Photographs will be taken the first five years post project completion and then every subsequent three years to qualitatively document riparian and channel condition;
4. A pre-project aerial video was recorded by GRMW staff in 2014. Aerial videos will also be recorded by GRMW staff in years 1, 2, 3, 6, 10, and 15 years post construction;
5. Summer steelhead and spring Chinook salmon spawning ground surveys will be conducted 2-3 times annually to note presence or absence of spawning and to document redd locations;
6. Salmonid presence/absence surveys of juvenile rearing will be conducted post-project construction to document usage of project area;
7. Channel cross sections will be established along the restored channel to assess channel development and form over time. The number and location of cross-sections will be determined following project completion and will at a minimum be placed to characterize built features. Channel cross sections will be surveyed 1, 3, 5, 10, and 15 years post project completion; and
8. Topographical surveys of the as built project will be conducted 1, 3, 5, 10, and 15 years post project completion to develop a longitudinal profile of the channel and determine changes in mainstem and side channel stream profiles and morphology.

If due diligence or monitoring indicate project objectives are not being met, ODFW will convene the restoration team and project collaborators to discuss project performance. The restoration team will develop alternatives and identify next steps.

Deviations from Proposal

The project was divided into two phases for funding and construction. Phase 1 and part of Phase 2 was completed in 2017. The remaining Phase 2 project components will be completed in 2018. These include one side channel (D), a fish screen and diversion structure, side channel (11) and mainstem (7) wood structures, and additional planting. Project fencing will be completed in spring 2018 as requested by the landowner.

Difficulties

Late snow and heavy spring rains and high flows from snowmelt impacted project construction. Cutting and hauling of trees was delayed by heavy rains. Project site access was also affected with snow plowing required and a new access road constructed when maintenance of the primary access road became too onerous because of water. Side channel and wood structure construction was also affected by runoff from an adjacent landowner's field once irrigation season began (Figure 19). Additional pumps and round the clock pumping in some locations was required.



Figure 19. Landowners John and Tarrah Baker during Wallowa-Baker project construction, July 14, 2017. “Pond” formed from groundwater and irrigation run off from adjacent landowner.

Cost Savings and Overruns

The Phase 1 construction contract was awarded to Steve Lindley Contracting, Inc. The contract bid price was below available project funding by approximately \$44,800. This amount was 38% of the estimated amount needed to complete a portion of Phase 2 of the project. Therefore, ODFW sought and received additional funding from the GRMW Board necessary to complete part of Phase 2 in 2017. Phase 2 construction included Side Channel C and associated floodplain and five large wood structures.

Implementing construction of Phase 2 concurrently with Phase 1, with additional funding from the GRMW Board, saved approximately \$30,000 in Phase 2 construction costs. All of the necessary equipment was already mobilized and on site, and funding for environmental controls, dewatering, and site restoration was minimized.

The construction budget was modified to reflect lower construction costs for wood structures, but increased costs for project access and staging of materials resulting from access road flooding and new access road construction.

Lessons Learned

The principal lessons learned during the course of this project were:

- Due to overlapping jurisdictions and permitting requirements, it is essential to have a lead agency well versed in the laws, regulations and permitting processes required for river restoration, particularly where the river provides habitat to threatened and endangered

species. It is also important to engage regulatory agencies early in project design and permitting. The support provided by ODFW, USFWS, the National Marine Fisheries Service, Oregon Department of State Lands, Oregon Water Resources Department, and the Corps of Engineers was invaluable in this project.

- Weather is unpredictable and can have major implications for project costs. Ensure contingencies are in place for potential weather related delays and impacts to project construction. Keep landowners informed of all delays.
- It is important to work closely with adjacent landowners. Habitat structures adjacent to the landowner's property were designed and placed to allay some landowner fears with this project.
- Frequent communication with landowners, especially on a project of this scope and magnitude, is essential. Ensure the landowner is fully informed on project footprint and noise levels during construction.
- Set up clear lines of communication and roles and responsibilities. Hold detailed pre-project meeting to discuss these and ensure everyone knows who ultimately makes decisions. Discuss these with the landowners as well. Make sure the landowner is aware of contract requirements and that any agreements they may make with contractor are outside the scope of the contract and not the project manager responsibility.
- Pre-project consultation with landowners, contractors and companies that may have an interest in materials removed from the project site may decrease construction costs. If the values of the materials to be removed (top soil, gravel, etc.) are known in advance, along with the specifications for such material in local markets, the project may be able to generate income from the sale of such material, which could offset construction costs.
- Working with the GRMW and adjacent businesses to take removal materials reduced project costs. Approximately 60,000 cubic yards of material was removed and stored at the gun club across the road from the project. The material was then sold by the gun club.

Project Benefits

The Wallowa Atlas is a geo-spatial restoration prioritization plan developed in coordination with BPA by local fish biologists, researchers, engineers, hydrologists, practitioners, and stakeholders. The plan divides the Wallowa and Imnaha subbasins into biologically significant reaches (BSR) and prioritizes those reaches for restoration based on fish use, fish life stages, limiting factors, and floodplain availability. The Wallowa-Baker project area is within a Tier 1, highest priority, BSR.

Within the GRSP, the Mid Wallowa River is identified as the third highest priority restoration area in the Wallowa-Lostine subbasin for spring Chinook salmon and the fifth highest priority restoration area for summer steelhead. A high restoration ranking indicates that on-the-ground projects that result in improved aquatic/riparian habitat, reduced sediment delivery to the streams, and improved flow and water temperature regimes will provide a relatively large

increase in abundance, productivity and diversity of the species. This project addresses the identified limiting factors for ESA listed salmon and steelhead populations in the Wallowa River by improving aquatic/riparian habitat, reducing sediment delivery, improving flow and temperature regimes, and by improving the overall function of the Wallowa River ecosystem. Biological benefits include improved migration, rearing, and spawning habitat for ESA listed spring Chinook salmon, summer steelhead, and bull trout and other native fish species such as Pacific lamprey, Coho, redband trout, and whitefish.

Key habitat quantity was increased by construction of three side channels and off-channel habitat created along the side channels, and by floodplain expansion. Habitat diversity was increased by lowering the floodplain in key areas to promote floodplain interaction and riparian habitat development, placement of habitat structures throughout the project, and alcove construction. Bioengineered streambank protection will reduce streambank erosion. Pools along the main channel and side channels will induce natural sediment sorting and improve rearing, holding, and spawning conditions. Lowering the floodplain dissipates the energy focused in the main channel, thereby reducing the shear stress and excessive erosion on the main channel. Improving riparian health along river left by increasing floodplain habitat and floodplain connectivity and implementing a strategic Planting Plan increases shade in the reach, decreases the abundance of reed canary grass, and promotes food production. In addition, the project promotes hyporheic exchange in the side channels via deep pools cooling summer water temperatures.

Development and land use activities over the last one hundred plus years have altered watershed hydrology and reduced habitat quality and complexity, floodplain connectivity, and water quality. These alterations have affected salmon and steelhead abundance, productivity and spatial structure. To recover, the fish need streams with abundant cold water, plenty of clean gravel, pools where they can find food and shelter, and unhindered access to spawning and rearing areas. This project contributes to recovery by addressing the limiting factors and by protecting high quality habitat, restoring degraded habitats, and providing connectivity between functioning habitats, increasing instream habitat diversity, and by helping to restore the Wallowa River to within its natural form and function.

Project related photographs are attached.

WALLOWA – BAKER HABITAT RESTORATION PROJECT

CONSTRUCTION PHOTOGRAPS

FEBRUARY – AUGUST 2017



2012



2017



Trees harvested for use at the Wallowa-Baker Habitat Restoration Project, February 17, 2017.



Initiation of Wallowa-Baker Habitat Restoration Project construction, February 24, 2017.



Floodplain Cutting at the Wallowa-Baker Habitat Restoration Project, February 28, 2017.



Floodplain construction at the Wallowa-Baker Habitat Restoration Project, March 15, 2017.



Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, March 31, 2017.



Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, April 12, 2017.



Floodplain construction at the Wallowa-Baker Habitat Restoration Project, April 18, 2017.



Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, April 20, 2017.



Floodplain and side channel construction at the Wallowa-Baker Habitat Restoration Project, May 04, 2017.



Landowners John and Tarrah Baker during Wallowa-Baker project construction, July 14, 2017. "Pond" formed from groundwater and irrigation run off from adjacent landowner.



Groundwater removal from Wallowa-Baker Habitat Restoration Project Side Channel A, July 14, 2017.



Groundwater in side channels A and C, constructed for the Wallowa-Baker project, July 18, 2017.



Construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 6, July 18, 2017.



Mainstem habitat structure 12, at the upstream end of the Wallowa-Baker project, July 24, 2017.



Wallowa-Baker Habitat Restoration Project mainstem habitat structure 7, at the inlet of Side Channel C, July 26, 2017.



Wallowa-Baker Habitat Restoration Project mainstem habitat structure 3A, upstream of the inlet of Side Channel C, July 27, 2017.



Construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 6, on the right bank of the Wallowa River, July 26, 2017.



Isolation for construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 8, at the inlet of Side Channels A and B, July 27, 2017.



Isolation for construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 8, at the inlet of Side Channels A and B, July 27, 2017.



Construction of Wallowa-Baker Habitat Restoration Project mainstem habitat structure 8, at the inlet of Side Channels A and B, July 31, 2017.



Construction of mainstem habitat structure 8 at the inlet of Side Channels A and B, August 01, 2017.



Wallowa-Baker Habitat Restoration mainstem habitat structure 8 at the inlet of Side Channels A and B, August 02, 2017.



Connecting Wallowa-Baker Habitat Restoration Project Side Channel A to the Wallowa River, August 09, 2017.



Connecting Wallowa-Baker Habitat Restoration Project Side Channel A to the Wallowa River, August 09, 2017



Connecting Wallowa-Baker Habitat Restoration Project Side Channel B to the Wallowa River, August 10, 2017.



Access road to Wallowa-Baker Habitat Restoration Project regarded to original elevation following project construction in 2017.