GRANDE RONDE MODEL WATERSHED

Watershed Enhancement Project Proposal

1. **Project Name:** Wallowa River-Baker Project

2. **Applicant:** Oregon Department of Fish and Wildlife

3. **Participating Landowner(s) and Agencies:**
   John and Tarrah Baker - landowners
   Oregon Department of Fish and Wildlife
   Grande Ronde Model Watershed
   Nez Perce Tribe
   Oregon Department of Transportation

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5. Project Location:

This Wallowa River-Baker Project is located approximately 2.75 miles Northwest of Wallowa, Oregon on the Wallowa River, a tributary to the Grande Ronde River, at river mile 21. The legal description of this project is Township 1 North, Range 42 East, Section 4, Willamette Meridian, Wallowa County, Oregon. GPS coordinates for this location are Latitude: 45.594011 and Longitude: -117.575855. The project is located on private property and Oregon Department of Transportation land and encompasses 0.6 miles of the Wallowa River (Figure 1).

6. Project Objectives:

The Wallowa River provides migration, spawning and rearing habitat for federal Endangered Species Act (ESA) listed Snake River spring/summer Chinook salmon and Snake River summer steelhead. Spring/summer Chinook salmon and summer steelhead spawning and overwinter rearing have been documented in the project reach. Federal ESA Listed Bull Trout also utilize this section of the Wallowa River at various times and life history stages.

Simplified and altered stream course and drainage patterns from agricultural practices and road construction in this reach of the Wallowa River have resulted in

- Lack of channel complexity;
- Lack of riparian vegetation from riparian forest conversion to agricultural fields and livestock grazing;
- Poor streambank stability and erosion from riparian forest conversion to agricultural fields and livestock grazing;
- Poor channel stability from in-channel maintenance and gravel extraction; and
- Stranding in spring creek/irrigation ditch from lack of screening.

The main limiting factors for ESA listed Snake River spring/summer Chinook salmon and Snake River summer steelhead identified in this section of the Wallowa River during the 2012 expert panel process are displayed in the pie map “2012 FCRPS Biological Opinion Habitat Conditions Represented Using Standardized NOAA Limiting Factors Lower Grande Ronde Subbasin, Oregon and Washington and

Wallowa Subbasin, Oregon" on the Bureau of Reclamation website (http://www.usbr.gov/pn/fcrps/habitat/panels/piemaps/2012/LowerGrandeRonde_Chinook_XLS_20130530_20130719.pdf). These limiting factors include
Section WLC3 – Snake River Spring/Summer Chinook – Wallowa Subbasin
6.2 Channel Structure and Form: Instream Structural Complexity (LF* Weight: 25%)
7.2 Sediment Conditions: Increased Sediment Quantity (LF Weight: 20%)
6.1 Channel Structure and Form: Bed and Channel Form (LF Weight: 15%)
Section WRS6 – Snake River Steelhead – Wallowa Subbasin
6.2 Channel Structure and Form: Instream Structural Complexity (LF Weight: 25%)
4.1 Riparian Condition: Riparian Vegetation (LF Weight: 25%)
6.1 Channel Structure and Form: Bed and Channel Form (LF Weight: 15%)
(*Limiting Factor)

Within the Grande Ronde Subbasin Plan (GRSP) and Supplement, 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. The Key limiting factors identified in the Supplement by EDT analysis for Wallowa-Lostine spring/summer Chinook salmon are habitat diversity and key habitat quantity and key habitat quantity for summer steelhead. The priority attributes identified are:

- Key Habitat Quantity (channel condition, wetted width)
- Habitat Diversity (reduced wood, riparian function)
- Sediment
- Temperature (riparian condition and/or low flows)
- Flows

This project was designed to address identified limiting factors and priority attributes and to also meet the following goal:

> **Restore the Wallowa River to within its natural form and function, promoting natural, stable stream channels and instream habitat diversity.**

Specific objectives to achieve this goal were developed by a technical work group comprised of staff from ODFW, GRMW, NPT, ODOT, Anderson Perry & Associates, and the landowners and include:

Landowner
Improve habitat for native fish species while increasing property value and providing recreation opportunities.

Floodplain
Promote interaction of the Wallowa River and the floodplain by creating 8.71 acres of new floodplain through channel and floodplain excavation and lowering existing streambanks to floodplain level.

Habitat Diversity
Create floodplain and low gradient annually and perennially connected off-channel habitat and side channels with a sinuosity of 1.2 +/- and width depth ratio 12 +/- (Side Channels A, B, and C) and a sinuosity of 2.5 +/- and low width/depth ratio (Side Channel D). Habitat creation is designed to promote floodplain interaction, increase hyporheic exchange, form deep pools, provide cover, promote sediment sorting, and improve adult holding and juvenile summer and winter rearing habitat.

Place 54 engineered wood and habitat structures to help develop and maintain pools, provide habitat diversity, cover, and food source production, control side channel inlets, promote wood recruitment, and decrease unnatural rates of erosion.

Sediment
Stabilize and protect existing eroding banks through installation of three 55 foot long engineered log jams consisting of 49 logs plus racking material, vegetation reestablishment, and floodplain construction.

Facilitate sediment sorting through construction of three side channels with 17 deep pools (>5 feet), construction of an additional 8.71 acres of floodplain, and increasing floodplain interaction by lowering existing streambanks.

Riparian
Improve the density, condition, and species composition within the 30.2 acre easement through seeding and planting vertical bundles, whips, and poles of black cottonwood, willows, alders, red osier dogwood, water birch, currants, and mock orange.

Temperature
Provide thermal refugia for holding adults and rearing juveniles, and migratory species via increased hyporheic exchange in four constructed side channels through creation of 10 seven-foot deep pools in side channel A, 3 six-foot deep pools in side channel B, 4 five –foot deep pools in side channel C, and 11 two to three-foot pools in Side Channel D, and shade from increased density and improved condition and species composition of riparian zone.

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

Flows

Increase flow in 1,600 feet of the Wallowa River by constructing a tributary/side channel, which connects to newly constructed Side Channel A, with a minimum flow of 4 cfs and a bank full flow of 15 cfs.

Screening

Install fish screen and diversion structure to divert spring creek/irrigation return ditch into newly constructed tributary/Side Channel D and prevent juvenile passage and stranding in the spring creek/irrigation return ditch.

7. Project Description

Introduction

The Wallowa River, as it flows through the Baker property, is an aggrading section of river. This, combined with habitat alterations, has resulted in poor streambank and channel stability, diminished instream habitat complexity, and loss of fish habitat and riparian vegetation. The project will place 30.2 acres in a 15-year conservation easement and include riparian, floodplain, and instream habitat creation. Funding will be used for 1) constructing four side channels to increase stream complexity; 2) installation of 54 engineered wood and habitat structures and other wood features to increase habitat complexity and stabilize streambanks; 3) riparian restoration through planting and seeding; 4) reducing sediment delivery to the stream through streambank stabilization, riparian plantings, and increased floodplain area and connectivity; 5) promoting aquifer recharge with floodplain reconnection; and 6) preventing juvenile salmonid stranding. Post-project monitoring to determine effectiveness at meeting project objectives will be conducted using photo points, aerial photos, spawning surveys, and surveys/longitudinal profiles. Project maintenance will occur annually. The project addresses the primary limiting factors for federal ESA listed spring/summer Chinook salmon and summer steelhead in this section of the Wallowa River and will also benefit native bull trout, Pacific lamprey, and resident fish populations. Partners include the Grande Ronde Model Watershed, landowners John and Tarrah Baker, Nez Perce Tribe, National Marine Fisheries Service, US Fish and Wildlife Service, and Oregon Department of Transportation.

Existing condition

Lands adjacent to the project are private agricultural grounds, except a small piece of ground owned by the ODOT, currently managed by ODFW as a Wildlife Management Area with a public fishing pond. The landowners, John and Tarrah Baker, have committed to enrolling approximately 30.2 acres (0.30 miles of the Wallowa River) of their Wallowa River property into a conservation easement with ODFW, and allow riparian, floodplain, and instream habitat creation. The upstream landowner, Dan Baremore, has also expressed interest in putting his 65 acres of riverside property (0.36 miles of the Wallowa River) into a conservation easement with ODFW.

The stream course and drainage patterns in the project area have been simplified and 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", including gravel extraction. Few pools are present and vertical, eroding banks limit floodplain interaction and hyporheic exchange. Due to these habitat alterations, the Wallowa River within this project reach has experienced a loss of riparian vegetation, exhibits poor streambank and channel stability, and lacks habitat complexity, negatively impacting fish and their habitat (Figures 2-6).

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.

In 2007, ODFW and other partners were contacted by the landowner regarding bank erosion that was occurring on their property. At that time, it was relatively localized at one location (Figure 2). In 2009, out-of-channel flows during runoff breached the narrow riparian area and began carving a new channel (Figure 3). Later in 2009, the active erosion on the Baker property created a new channel through the landowner's agricultural field (Figures 4 and 5). At that time, discussions began with the landowner about taking a portion of their agricultural field/pasture out of production, putting it into a conservation easement, fencing it off, and planting it with native vegetation. Conceptual ideas for a side channel creation and bank stabilization project were later discussed. 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 6). Currently, this large, new left bank channel is only activated at higher flows (Figures 7 and 8).

Also, within historical photographs, there appears to be a spring fed creek that ran through the proposed project area. This creek has been transformed into an irrigation ditch, supplemented with Wallowa River and Bear Creek water delivered from other irrigation ditches. The Bakers are the last water users on this irrigation system and any remaining water returns to the Wallowa River. The creek/ditch, which flows throughout the year, follows Lower Diamond Road for approximately 0.25 miles. Fish can access this creek/ditch and the stranding potential is high (Figure 9).

Links to three videos from UAV flights on April 03, 2014 are attached.

Specific Actions

Task 1 – Floodplain creation and increased floodplain connectivity

The existing floodplain is approximately 11 acres. An estimated 57,000 cubic yards of material will be excavated to create an additional 8.71 acres of floodplain around newly constructed side channels and engineered wood and habitat structures. The floodplain will be excavated to an average width of 80 feet. Vertical, eroding banks along the Wallowa River will also be layed back to increase floodplain connectivity. Trees and woody material will be added to the floodplain as roughness elements.

The floodplain will be planted with native riparian species to dissipate energy and develop a riparian forest buffer.

Task 2 – Construction of four side channels

The Wallowa River in the project reach has a 95% exceedance flow of 207 cfs, a 50% exceedance flow of 380 cfs, and a 5% exceedance of 1,807 cfs. The ordinary high water flow is estimated to be 2,960 cfs. To increase habitat diversity, increase available salmonid holding, spawning, rearing, and migration habitat, improve riparian vegetation, and decrease sediment loading four side channels have been designed by Anderson Perry & Associates for the Wallowa River-Baker Project (Engineered Plans Sheets 4, 5, 7-10). HecRas Modeling was used to determine elevations in the mainstem and to determine elevations for inverts of side channels.

Task 2 a – Construction of Side Channel A

Side Channel A was designed as a Type C Rosgen main channel and to maximize water depth at low flows. Side channel A was designed to be active at 95% exceedance in the Wallowa River (207 cfs). As constructed, Side Channel A will be 2,300 feet long with a sinuosity of 1.2, a width to depth ratio of 12, and contain 10 pools approximately 7 feet deep (Engineered Plan Sheets 2, 4, 7-8). These deep pools should intersect hyporheic flows and cold water seeps and provide thermal refugia for rearing salmonids. Side channel A has been designed for ordinary high water of 185 cfs (water depth 3.25 feet), high flow (5% exceedance) of 110 cfs (water depth 2.6 feet), 50% exceedance of 3 cfs (water depth 0.5 feet), and a low flow of 12 cfs (water depth 1 foot).

Task 2b – Construction of Side Channel B

Side channel B has been designed as a bleed through channel activated at 50% exceedance in the Wallowa River (380 cfs) and to supplement Side Channel A with hyporheic flow (Engineered Plan Sheets 2, 5, 9). As constructed, Side Channel B will be 230 feet long, with a sinuosity of 1.2, a width to depth ratio of 12, and contain three 6-foot deep pools. Flow will be 170 cfs with a water depth 3.15 feet at OHW in th Wallowa River. Habitat Structure Type 8 is a 46 member structure at the intake of Side Channels A & B and will take the full brunt of the Wallowa River. Side Channel B will be set six inches higher than Side Channel A so high flows will keep alcove at mouth of Side Channel A cleaned out.

Task 2c – Construction of Side Channel C

Side channel C has also been designed to be activated at 50% exceedance in the Wallowa River. As constructed, Side Channel C will be 924 feet long, with a sinuosity of 1.2, a width to depth ratio of 12, and contain four 5-foot deep pools (Engineered Plan Sheets 2, 5, and 9). Flow will be 75 cfs with a water depth of 2.2 feet at OHW in the Wallowa River. A 25 member Type 7 habitat and intake structure, designed to take the full brunt of the Wallowa River, will be 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.

Task 2d – Construction of Side Channel D

Side Channel D has been designed as a tributary and to mimic a meadow stream with steep, narrow banks and deep water providing undercut banks and overhanging vegetation for juvenile salmonid rearing (Rosgen Type E). A new fish screen and diversion designed and constructed by ODFW will divert flows to Side channel D and prevent juvenile passage and stranding in the spring creek/irrigation return channel. Side Channel D has been designed for a bank full flow of 15 cfs at a water depth of 2 feet and a minimum flow of 4 cfs at a water depth of 0.75 feet (Engineered Plan Sheets 2, 5, and 10). Maximum flow is anticipated to be 60 cfs. As constructed, Side Channel D will be 1,300 feet long and have a sinuosity of 2.5. Eleven pools approximately 2.5 feet deep will be created with the addition of engineered wood and habitat structures. The adjacent floodplain will be constructed to handle the full high flow of 60 cfs and prevent flooding on adjacent landowner's property. Wood is being added to the constructed floodplain to dissipate energy and to create habitat and channel structure. Side Channel D is expected to flow year round.

Task 3 – Construction of 54 engineered wood and habitat structures

Fifty-four engineered wood and habitat structures, twelve different types, will be constructed for the Wallowa River-Baker Project, including: 4 Type 1, 3 Type 1A, 4 Type 2, 4 Type 3, 5 Type 3A, 3 Type 4, 2 Type 5, 9 Type 6, 1 Type 7, 1 Type 8, 4 Type 9, 2 Type 10, 9 Type 11, and 3 Type 12 (Engineered Plan Sheets 11-23). These structures will be 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) promote gravel bar stabilization; 6) provide margin roughness; 7) break up riffles; 8) promote localized scour; 9) provide bank stabilization; 10) promote establishment of vegetation; and 11) provide mainstem and side channel maintenance and desired configuration. Habitat structures 6, 7, 8, 9, and 10 were designed specifically to provide zero to low velocity habitat with the complexity needed to support winter rearing of spring/summer Chinook salmon based on results from Favrot and Jonasson (2014)[1] and VanDyke et al. (2008)[2].

Approved tree species include juniper, cedar, spruce, pine, white fire, or red fir. The entire tree will be imported to the extent possible, including branches and tops of trees, which will be used as racking material. Tops and limbs of some trees will be used as slash.

[1] Favrot, Scott D. and Brian C. Jonasson. 2014. Identification and Characterization of Catherine Creek Juvenile Spring Chinook Salmon Overwinter Rearing Habitat in Upper Grande Ronde Valley. Final Report to U.S. Department of Energy, Bonneville Power Administration and Bureau of Reclamation.

[2] Van Dyke, Erick S., Dennis L. Scarnecchia, Brian C. Jonasson, and Richard. W. Carmichael. 2009. Relationship of winter concealment habitat quality on pool use by juvenile spring Chinook salmon (Oncorhynchus tshawytscha) in the Grande Ronde River Basin, Oregon USA. Hydrobiologia (2009) 625:27-42.

Wood and habitat structures will be comprised of the following trees and logs:

- 85 logs, 20 feet x 12 inch diameter at breast height (DBH) with 3 foot diameter rootwad;
- 4 logs, 10 feet x 10-12 inch DBH without rootwad;
- 173 logs, 30 feet x 16-18 inch DBH with 5 foot diameter rootwad;
- 36 spruce trees, 45 feet x 16-18 inch DBH with 5 foot diameter rootwad;
- 12 logs, 30 feet x 16-18 inch DBH without rootwad;
- 141 logs, 30 feet x 20-24 inch DBH with 5 foot diameter rootwad;
- 29 logs, 30 feet x 20-24 inch DBH without rootwad;
- 20 trees, 30 feet by 12-14 inch DBH with 5 foot diameter rootwad;
- 12 juniper trees, 20 feet by 10-14 inch DBH without rootwad;
- 177 logs for racking material, 10 feet by 6-10 inch DBH; and
- The tops and limbs of some trees will be used as slash.

Task 3a – Construction of 16 mainstem engineered wood and habitat structures

Seven different types of engineered wood and habitat structures (3A, 4, 5, 6, 7, 8, 12) will be installed on the mainstem Wallowa River, contributing 283 logs and trees as members and 66 logs as racking material. One Type 3A Habitat Structures will be located in the mainstem. The Type 3A Habitat Structure has five members with rootwads projected into flow. It is designed and located for bank protection and stabilization, creation of a pool approximately 20 feet long, and to provide cover. Three Type 4 Habitat Structures (3 members with rootwads) designed as apex jams are located in the mainstem to stabilize gravel bars and promote vegetation growth. They are also intended to collect wood and create log jams, maintaining the split flow in the mainstem. Two Type 5 Habitat Structures (3 members with rootwads) are located on the mainstem. These structures are designed to control flow into the existing side channel on the north side of the project, preventing the side channel from become the mainstem. They also provide margin roughness. Five Type 6 Habitat Structures (9 members with rootwads) are located in the mainstem to provide bank protection and stabilization and margin roughness, promote deep, large pool development (20-30 feet long) and sediment sorting, and to provide habitat complexity and cover for rearing salmonids. One Type 7 Habitat Structure (25 members, 24 with rootwads) is located on the mainstem as an inlet structure for Side Channel C. As designed, this structure will provide bank stabilization, pool development, habitat complexity, sediment sorting, and overhead cover. One Type 8 Habitat Structure (46 members, 39 with rootwads) will be installed as an inlet structure for Side Channels A and B. As designed, this structure will provide mainstem bank stabilization, pool development, margin roughness, backwater alcove habitat, and overhead cover. Lastly, 3 engineered Type 12 Structures will be constructed as bank stabilization structures; one on the ODOT property at the west end of the project and two at the east end of the project (one each on right and left bank). Each structure will contain 49 members, 28 with root wads. These structures have also been designed to promote pool development. Habitat Structures will increase habitat complexity and bank stabilization in the mainstem Wallowa River, and enhance adult holding and juvenile rearing habitat.

Task 3b – Construction of 21 engineered wood and habitat structures in Side Channel A

Six different types of habitat structures (3, 3A, 6, 9, 10, 11) will be constructed in Side Channel A comprised of 178 members and 97 racking members. These structures were designed and will be located to provide bank stabilization, pool development and maintenance, within pool habitat complexity, overhead cover, sediment sorting, and margin roughness. Additionally, habitat structure type 11 was designed to provide riffle complexity (break up large riffles) and localized scour in riffle complexes.

One Type 3 (4 members with rootwads) and one Type 3A (5 members with rootwads) Habitat Structure will be constructed in Side Channel A. The Type 3A Habitat Structure has five members with rootwads projected into flow. Each structure is designed and located for bank protection and stabilization, creation of a pool approximately 20-30 feet long, and to provide cover. Four Type 6 Habitat Structures (9 members with rootwads) will be constructed in Side Channel A to provide bank protection and stabilization and margin roughness, promote deep, large pool development (20-30 feet long) and sediment sorting, and to provide habitat complexity and cover for rearing salmonids. Four Type 9 Habitat Structures (17 members, 15 with rootwads) will be constructed. Each is approximately 60 feet long and designed to provide bank stability while providing interstitial space (open matrix in middle of structure) for rearing. Logs are spaced to allow scour under structure. Structure will promote pool development and sediment sorting, and provide habitat complexity and rearing. Two Type 10 Habitat Structures (19 members, 17 with rootwads) will be constructed. Function is similar to Type 9, while providing additional channel roughness and preventing Side Channel A from migrating into landowner's south pasture. Nine Type 11 Habitat Structures (3 members) will be constructed to provide margin roughness, complexity, and overhead cover to riffles in Side Channel A.

Task 3c – Construction of 2 engineered wood and habitat structures in Side Channel B

One Type 3 and one Type 3 A habitat structure will be constructed in Side Channel B. The structures will be placed for bank stabilization and to create and maintain two 6-foot deep pools and provide habitat complexity for juvenile salmonid rearing.

Task 3d – Construction of 4 engineered wood and habitat structures in Side Channel C

Two Type 3 and 2 Type 3A habitat structures will be constructed in Side Channel C. These structures have been designed and located to provide bank stabilization, develop and maintain four 5-foot deep pools, and provide habitat complexity and overhead cover for rearing salmonids.

Task 3e – Construction of 11 engineered wood and habitat structures in Side Channel D

Three different types of wood and habitat structures (1, 1A, 2) will be constructed in Side Channel D. These structures consist of 3 to 4 logs as member and racking material. They will be placed on multiple bends to promote pool development and provide bank stability. They will also provide needed cover for rearing salmonids. Additional single logs will be placed throughout Side Channel D to provide added complexity.

Task 4 – Easement fencing

Approximately 3,000 feet of fencing will be constructed for the easement boundary. Fifteen hundred feet will be post and rail at the request of the landowner and the remaining 1,500 feet will be barbed wire. Planting and seeding with native riparian species will occur within the easement fencing with plants protected from browsing. Livestock will be excluded from the easement area. ODFW has a signed Cooperative Agreement with the landowners. A 15-year riparian easement will be signed prior to construction.

Task 5 – Improve riparian vegetation

ODFW will implement the Planting Plan developed by Diebel Contractng, LLC (Draft Plan Attached). The objective of the planting plan is to create a forested riparian buffer to meet future condition of a fully functioning riparian area. Considerations in plan development included intense reed canary grass competition and intense herbivory.

Thirteen planting areas have been identified within the 30.2 acre easement for planting 550 vertical bundles, 1,599 whips, and 120 clumps of local willows and dogwoods and 60 poles of cottonwood and peachleaf willow. The majority of the planting will occur in the vicinity of newly constructed channels. Woody species will be concentrated on the banks edge, 0-10 feet. Plants will be maintained and protected from livestock use, herbivory, competing vegetation, and noxious weeds. A majority of the planted area will have hog panel caging protection to eliminate browsing pressure. A cage will be constructed on the inside of each new meander bend adjacent to riffles. Cages will also be installed in the side channel areas in areas of high planting density. Once protected vegetation reaches a height above browse capability, the cage will be removed or moved to another area requiring protection. Mechanical control of reed canary grass will occur including mowing in the spring to provide sunlight and a competitive advantage to planted vegetation.

Photo points will be established prior to construction to visually document existing conditions. For the first five years after implementation, yearly inspection of plants will occur. We will walk through and measure growth, survival, and cover. Transects will be established to measure shade in and around the stream channels. During inspections we will search for weeds, meet with landowners, and implement suitable control methods. Our goals include 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 five 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.

Task 6 – Installation of Fish Screen and Diversion
ODFW is designing and will install a new fish screen and diversion at the head of Side Channel D. This structure will divert flow to Side Channel D and prevent fish migration into and stranding in the spring creek/irrigation return channel. Side Channel D will also contribute flow to designed habitat improvements.

Task 7 – Reseed and Replant Disturbed Areas
All areas disturbed during construction will be re-seeded using native seed mixes and replanted using a combination of live stakes, plugs, and container plants.

Benefits
The proposed project addresses the limiting factors and attributes identified by the 2012 Expert Panel and within the GRSP. This project will improve aquatic/riparian habitat, improve channel condition, increase habitat complexity, reduce sediment delivery to the stream, and improve flow and water temperature regimes. The project's location and objectives are also consistent with the Grande Ronde Subbasin Plan's (GRSP) habitat goals (Section 5.2.1.1) to

- Protect high quality habitat, restore degraded habitats, and provide connectivity between functioning habitats, and
- Manage for healthy ecosystems to support aquatic resources and native species.

The GRSP Supplement includes a framework for screening and identifying the priority of proposed projects in the Grande Ronde Subbasin. The Wallowa-Baker project is consistent with the guidelines in the framework listed below, as a result of the following actions:

"Restore watershed processes impacting the aquatic system, water quality-limited streams, and wildlife habitat" **-** through restoring hydrology and reestablishing healthy riparian zones in the landscape.

"Sediment Reduction" **-** through reestablishing riparian vegetation by planting native trees, shrubs, and sedges; stabilizing active erosion sites using engineered wood and habitat structures and vegetation establishment; and increasing floodplain extent and connectivity.

"Channel Condition" **-** through reconstructing stream reach to near-historic form, constructing four side channels and increasing floodplain and floodplain connectivity, improving the density, condition and species composition of riparian vegetation through planting and seeding, and installing in channel structures to improve habitat complexity.

"Riparian Function" **-** through improving the density, condition and species composition of riparian vegetation by planting and seeding and reconnecting the Wallowa River with the floodplain, and implementing a noxious weed management program including survey, prevention practices, treatment and revegetation.

When implemented, this project will include several side channels to increase stream complexity, riparian restoration, large wood structures and other wood features to increase habitat complexity and stabilize streambanks, and will promote aquifer recharge with floodplain reconnection. Most importantly, project implementation will addresses the primary limiting factors for federal ESA listed spring/summer Chinook salmon and summer steelhead in this section of the Wallowa River. Implementation will also benefit native bull trout, Pacific lamprey, and resident fish populations.

Project 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 exclosure 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 maintenance will occur every 10-14 days. Maintenance of structures, fences, and vegetation, including implementation of a noxious weed management plan, will occur for the duration of the 15-year easement.

Permits

In cooperation and coordination with project partners and BPA, ODFW will complete all environmental compliance requirements. These requirements include obtaining the following permits:

Permit or License Name	**Entity Issuing Permit or License**
Section 106 Cultural Resources Clearance	Oregon SHPO
404 Permit	COE
HIP III	NMFS
HIP III	USFWS
Removal-Fill Permit	Oregon DSL
401 Water Quality Certification	Oregon WRD

Permit coordination with BPA, COE, NMFS, USFWS, ODSL, and OWRD has been initiated.

Monitoring Plan

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

GRMW staff will record aerial video using an unmanned aerial vehicle. 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 will be 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 the GRMW in 2014. Aerial videos will also be recorded 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. Surveys of the as built project will be conducted 1, 3, 5, 10, and 15 years post project completion to determine changes in mainstem and side channel stream profiles and morphology; and
8. A final report documenting project implementation and monitoring will be submitted.

Work Dates

Project design has been completed. Permitting consultation is on-going and targeted for completion by August 01, 2015. Construction is expected to begin in September 2015, starting with construction of the inset floodplain, side channels, and habitat structures in the side channels. All of this work will occur in the dry and continue through November 2015. Fall seeding, and potentially some planting, will occur in 2015. In March and April of 2016, planting will occur. From July 15-August 15, 2016, construction of habitat and wood structures in the mainstem Wallowa River and connection of the side channels to the Wallowa River will occur, coinciding with the inwater work window (July 15-August 15). Final seeding and planting will occur in October-November of 2016. Pre-project surveys were completed in 2014 and pre-project photo points will be established in spring of 2015. Post-project monitoring is anticipated to begin in 2016 and continue through 2031. Contract term is anticipated to be July 01, 2015 through June 30, 2016.

8. Project Budget

A detailed budget including materials, labor, unit cost, and cost share by funding source is provided. Requested BPA funds will be utilized for construction of inset floodplain and Side Channels A, B, and C. Estimate costs were developed using known costs from previous stream restoration projects, conversations with contractors, suppliers, and partners, and staff's experience with implementation of large stream restoration projects. Unless otherwise noted, the unit costs reflect the costs to purchase, transport, and deliver materials.

9. Attachments:

1. Budget
2. Project Location Map – Figure 1
3. Project Location Pictures – Figures 2-8
4. Planting Plan
5. Project Design – 90% Engineered Plans - Click here to download plans.
6. Aerial imagery from UAV flights – April 03, 2014

http://youtu.be/juTkrL8MTE4

http://youtu.be/0aDI3dcw4XI

http://youtu.be/cQBDokTaRCY

7.

Wallow River-Baker Project Budget 2015-2031

		Unit	Estimated Quantity	Unit Cost	ODFW In-Kind In-Kind	NPT & GRMW In-Kind	GRMW	OWEB*	Total Cost
Salaries Wages and Benefits									
Pre-Implementation									
	ODFW-GRFH Project Leader	HR	80	$45.00	$3,600.00				$3,600
	ODFW-GRFH Fish Habitat Biologist	HR	80	$40.00	$3,200.00				$3,200
	GRMW Project Manager	HR	20	$45.00	$900.00				$900
	GRMW Office Manager	HR	10	$45.00	$450.00				$450
	NPT-Fish Habitat Project Leader	HR	80	$45.00	$3,600.00				$3,600
Project Management/Implementation									
	ODFW-GRFH Project Leader	HR	480	$45.00	$21,600.00				$21,600
	ODFW-GRFH Fish Habitat Biologist	HR	640	$40.00	$25,600.00				$25,600
	ODFW-GRFH Technician	HR	320	$35.00	$11,200.00				$11,200
	ODFW-GRFH EBA	HR	160	$35.00	$5,600.00				$5,600
	GRMW Project Manager	HR	50	$45.00		$2,250.00			$2,250
	GRMW Office Manager	HR	10	$45.00		$450.00			$450
	NPT-Fish Habitat Project Leader	HR	160	$45.00		$7,200.00			$7,200
	NPT-Fish Habitat Assistant Project Leader	HR	160	$40.00		$6,400.00			$6,400
		Subtotal:			**$75,750.00**	**$16,300.00**	**$0.00**	**$0.00**	**$92,050**
Contracted Services									
Side channel construction and instream habitat improvement									
1	Mobilization (5% of estimated construction)	EA		$29,750.00			$29,750.00		$29,750
2	Environmental Controls (1200C Permit)	EA		$7,000.00			$7,000.00		$7,000
3	Work area isolation and water management	HR	120	$250.00				$30,000.00	$30,000
4	Clearing and grubbing	HR	35	$200.00			$7,000.00		$7,000
5	Floodplain excavation	CY	57000	$4.00			$228,000.00		$228,000
6	Side Channel 'A' Earthwork - 2,300' channel	CY	5600	$5.00			$28,000.00		$28,000
7	Side Channel 'B' Earthwork - 230' channel	CY	600	$5.00				$3,000.00	$3,000
8	Side Channel 'C' Earthwork - 924' channel	CY	850	$5.00				$4,250.00	$4,250
9	Side Channel 'D' Earthwork - 1,300' channel	CY	350	$5.00				$1,750.00	$1,750
10	Type 1 Habitat Structure (4 structures)	HR	16	$200.00				$3,200.00	$3,200
	Tree w/ rootwad	EA	8	$250.00				$2,000.00	$2,000
	Racking material	EA	4	$150.00				$600.00	$600
11	Type 1A Habitat Structure (3 structures)	HR	12	$200.00				$2,400.00	$2,400
	Tree w/ rootwad	EA	9	$250.00				$2,250.00	$2,250
	Racking material	EA	3	$150.00				$450.00	$450
12	Type 2 Habitat Structure (4 structures)	HR	16	$200.00				$3,200.00	$3,200
	Tree w/ rootwad	EA	8	$250.00				$2,000.00	$2,000
	Tree w/o rootwad	EA	4	$150.00				$600.00	$600
	Racking material	EA	4	$150.00				$600.00	$600
13	Type 3 Habitat Structure (4 structures)	HR	20	$200.00				$4,000.00	$4,000
	Tree w/ rootwad	EA	16	$250.00				$4,000.00	$4,000
	Racking material	EA	8	$150.00				$1,200.00	$1,200
14	Type 3A Habitat Structure (5 structures)	HR	25	$200.00				$5,000.00	$5,000
	Tree w/ rootwad	EA	20	$250.00				$5,000.00	$5,000
	Full Tree w/ rootwad	EA	5	$300.00				$1,500.00	$1,500
	Racking material	EA	10	$150.00				$1,500.00	$1,500
15	Type 4 Habitat Structure (3 structures)	HR	12	$200.00				$2,400.00	$2,400
	Tree w/ rootwad	EA	6	$250.00				$1,500.00	$1,500
	Full Tree w/ rootwad	EA	3	$300.00				$900.00	$900
	Racking material	EA	3	$150.00				$450.00	$450
16	Type 5 Habitat Structure (2 structures)	HR	8	$200.00				$1,600.00	$1,600
	Tree w/ rootwad	EA	2	$250.00				$500.00	$500
	Full Tree w/ rootwad	EA	4	$300.00				$1,200.00	$1,200
	Racking material	EA	4	$150.00				$600.00	$600
17	Type 6 Habitat Structure (9 structures)	HR	90	$200.00				$18,000.00	$18,000
	Tree w/ rootwad	EA	72	$250.00				$18,000.00	$18,000
	Full Tree w/ rootwad	EA	9	$300.00				$2,700.00	$2,700
	Racking material	EA	36	$150.00				$5,400.00	$5,400
18	Type 7 Habitat Structure (1 structure)	HR	20	$200.00				$4,000.00	$4,000
	Tree w/ rootwad	EA	24	$250.00				$6,000.00	$6,000
	Tree w/o rootwad	EA	1	$150.00				$150.00	$150
	Racking material	EA	10	$150.00				$1,500.00	$1,500
19	Type 8 Habitat Structure (1 structure)	HR	25	$200.00				$5,000.00	$5,000
	Tree w/ rootwad	EA	37	$250.00				$9,250.00	$9,250
	Tree w/o rootwad	EA	7	$150.00				$1,050.00	$1,050
	Full Tree w/ rootwad	EA	2	$300.00				$600.00	$600
	Racking material	EA	12	$150.00				$1,800.00	$1,800
20	Type 9 Habitat Structure (4 structures)	HR	60	$200.00				$12,000.00	$12,000
	Tree w/ rootwad	EA	52	$250.00				$13,000.00	$13,000
	Tree w/o rootwad	EA	8	$150.00				$1,200.00	$1,200
	Full Tree w/ rootwad	EA	8	$300.00				$2,400.00	$2,400
	Racking material	EA	32	$150.00				$4,800.00	$4,800

21	Type 10 Habitat Structure (2 structures)	HR	32	$200.00				$6,400.00	$6,400
	Tree w/ rootwad	EA	30	$250.00				$7,500.00	$7,500
	Tree w/o rootwad	EA	4	$150.00				$600.00	$600
	Full Tree w/ rootwad	EA	4	$300.00				$1,200.00	$1,200
	Racking material	EA	20	$150.00				$3,000.00	$3,000
22	Type 11 Habitat Structure (9 structures)	HR	45	$200.00				$9,000.00	$9,000
	Tree w/ rootwad	EA	27	$250.00				$6,750.00	$6,750
	Racking material	EA	9	$150.00				$1,350.00	$1,350
23	Type 12 Habitat Structure (3 structures)	HR	70	$200.00				$14,000.00	$14,000
	Tree w/ rootwad	EA	28	$250.00				$7,000.00	$7,000
	Tree w/o rootwad	EA	21	$150.00				$3,150.00	$3,150
	Full Tree w/ rootwad	EA	1	$300.00				$300.00	$300
	Racking material	EA	22	$150.00				$3,300.00	$3,300
24	Miscellaneous Wood (Side channels and floodplain)	HR	20	$200.00				$4,000.00	$4,000
	Tree w/ rootwad	EA	60	$250.00				$15,000.00	$15,000
	Full Tree w/ rootwad	EA	20	$300.00				$6,000.00	$6,000
25	Juniper carcass	EA	12	$100.00				$1,200.00	$1,200
26	Site Restoration (labor, material, seed, equipment)	EA	1	$10,000.00				$10,000.00	$10,000
			Subtotal:		**$0.00**	**$0.00**	**$299,750.00**	**$294,250.00**	**$594,000**
Construction Administration									
	Meetings and Site visits								
	Senior Engineer	HR	1	$140.00				$140.00	$140
	Project Engineer	HR	46	$115.00				$5,290.00	$5,290
	Staff Engineer	HR	9	$90.00				$810.00	$810
	Surveying								
	Project Engineer	HR	8	$115.00				$920.00	$920
	Drafting	HR	15	$90.00				$1,350.00	$1,350
	Suveyor Crew	HR	50	$170.00				$8,500.00	$8,500
	Design Support during construction								
	Senior Engineer	HR	2	$140.00				$280.00	$280
	Project Engineer	HR	50	$115.00				$5,750.00	$5,750
	Field observation during construction								
	Senior Engineer	HR	8	$140.00				$1,120.00	$1,120
	Project Engineer	HR	112	$115.00			$250.00	$12,630.00	$12,880
	Staff Engineer	HR	225	$90.00				$20,250.00	$20,250
	Drafting	HR	20	$90.00				$1,800.00	$1,800
			Subtotal:		**$0.00**	**$0.00**	**$250.00**	**$58,840.00**	**$59,090**
Planting									
	Vegetation Restoration: Seeding and Planting								
	vertical bundles	EA	550	$20.00				$11,000.00	$11,000
	whips	EA	1599	$5.00				$7,995.00	$7,995
	poles	EA	335	$5.00				$1,675.00	$1,675
	clumps	EA	120	$75.00				$9,000.00	$9,000
	protection(cages)	EA	66	$150.00				$9,900.00	$9,900
	seeding (20# per acre)	Lb.	300	$15.00				$4,500.00	$4,500
			Subtotal:		**$0.00**	**$0.00**	**$0.00**	**$44,070.00**	**$44,070**
Fencing									
	Materials and Installation	Ft	3000	$3.50				$10,500.00	$10,500
			Subtotal:		**$0.00**	**$0.00**	**$0.00**	**$10,500.00**	**$10,500**
Fish Screen/Headgate (lump sum estimates until final plans and engineering cost estimate received)									
	Fish Screen/headgate design	EA		$15,000.00	$15,000.00				$15,000
	Fish Screen/headgate manufacture	EA		$20,000.00	$20,000.00				$20,000
	Fish Screen/headgate installation	EA		$10,000.00	$10,000.00				$10,000
			Subtotal:		**$45,000.00**	**$0.00**	**$0.00**	**$0.00**	**$45,000**
ODFW travel to project site (100 days, 93 miles a day).		Miles	9300	$0.575	$5,347.50				$5,348
Contracted Engineering firm travel (100 days, 93 miles a day).		Miles	9300	$0.575				$5,347.50	$5,348
NPT travel to project site (20 days, 56 miles a day)		Miles	1120	$0.575		$644.00			$644
			Subtotal:		**$5,347.50**	**$644.00**	**$0.00**	**$5,347.50**	**$11,339**
Post completion monitoring (15yrs)									
	Photopoints (Pre, post,1,2,3,6,9,12,15yr)	HR	54	$35.00	$1,890.00				$1,890
	Aerial photopoints (Pre, post,1,2,3,6,9,12,15yr)	HR	54	$45.00		$2,430.00			$2,430
	Project topo survey (As built,1,3,5,10,15yr)	HR	480	$75.00	$36,000.00				$36,000
	Vegetation Monitoring and maintenance (annual)	HR	300	$40.00	$12,000.00				$12,000
	Salmonid presence/absence (annual spawning/rearing)	HR	90	$35.00	$3,150.00				$3,150
			Subtotal:		**$53,040.00**	**$2,430.00**	**$0.00**	**$0.00**	**$55,470**
			Total:		**$179,137.50**	**$19,374.00**	**$300,000.00**	**$413,007.50**	**$911,519.00**
GRMW Direct Cost Billing (10% of OWEB funding)		EA	0.1					$41,300.75	$41,301
			Subtotal:					**$41,300.75**	**$41,301**
			Grand Total		**$179,137.50**	**$19,374.00**	**$300,000.00**	**$454,308.25**	**$952,819.75**

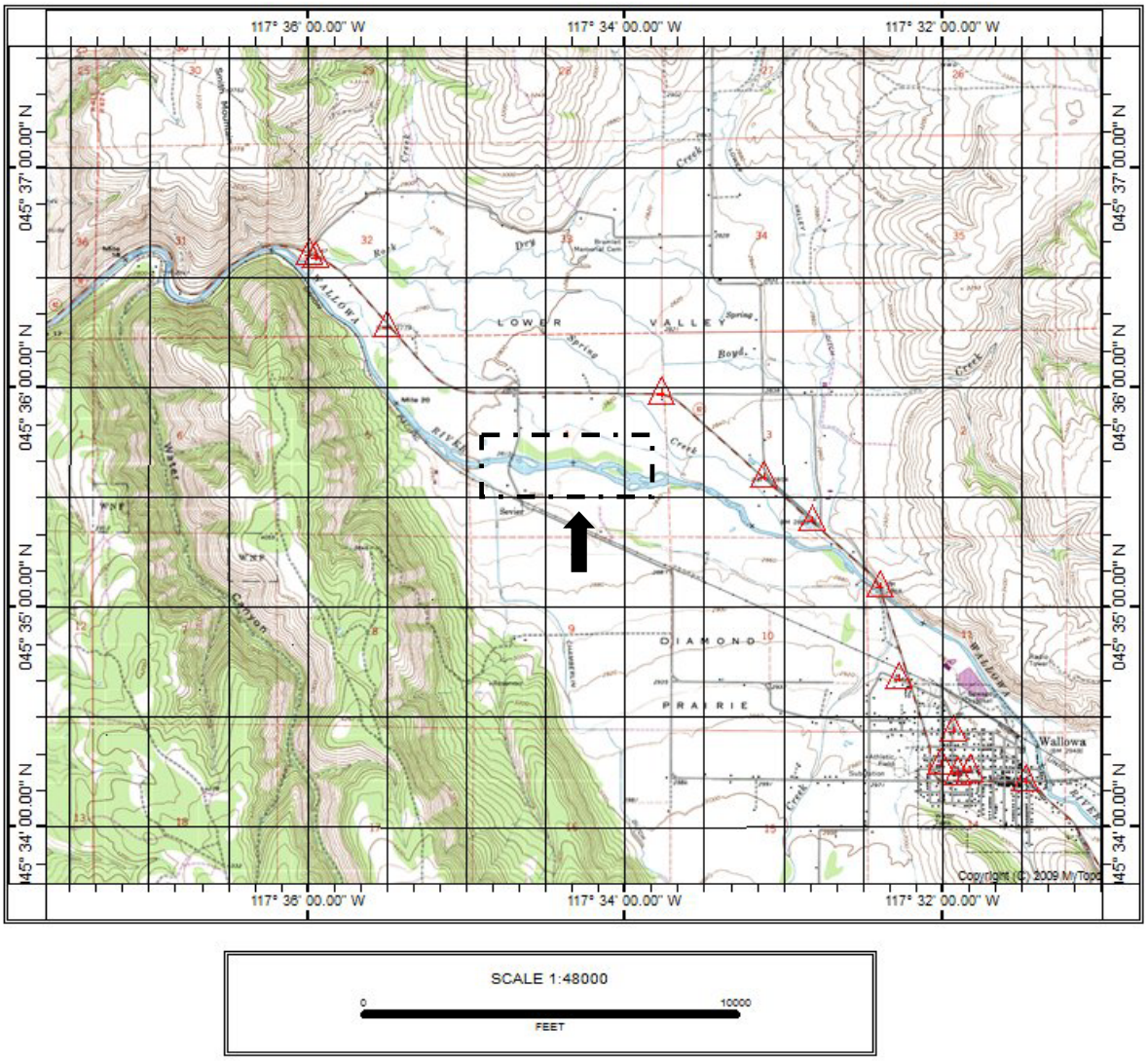


Figure 1. Location of the Wallowa River-Baker Project, as indicated by the dash lined box above the arrow. Project located Township 1 North, Range 42 East, Section 4, Willamette Meridian, Wallowa County, Latitude 4.594011 and Longitude -117.575855.

Figure 2. Looking downstream from the Baker property at the localized bank erosion (April 2007).

Figure 3. Looking downstream from the Baker property, in June 2, 2009, showing the Wallowa River laterally migrating through the narrow riparian buffer, carving what would become the main channel by the end of runoff.

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

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

Figure 6. 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 7. Aerial photo of Wallowa-Baker Project location looking downstream, 2010.

Figure 8. 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.

Figure 9. Aerial photo of Wallowa-Baker Project including spring creek/irrigation return ditch, 2012.

Wallowa River - Baker Restoration
Planting Plan

Riparian Forest Buffer Sheet

Landowner:
Address:
Phone:
County: Wallowa
Water Body: Wallowa River

Objectives:
Create forested riparian buffer to meet future condition of fully functioning riparian area.

Considerations:

- Intense canary grass competition
  - Plant and prepare site to reduce competition from canary grass
  - Conduct proper site preparation
    - Planting areas should be clean. All competing vegetation removed down to bare mineral soil
  - Plant at high density levels to shade out the grass

- Intense herbivory
  - Provide tree/shrub protection
    - Construct livestock panel cages (keeps deer and elk from browsing)
    - Wrap aluminum foil at the base of each cutting (discourages mice and voles from girdling trees)

Riparian Buffer Width:
Concentrate woody species planting on the banks edge, 0- 10 feet.

Ecological Site Description:

Cottonwood-willow- Riparian (RO1OXYO11OR)

Dominant vegetation:
Cottonwood
Short and tall willows

Sub-dominant vegetation:
Alder
Dogwood
Water birch
Currant species
Mock orange

Recommended Species List:
Species

Locally adapted willow
Red osier dogwood
Black cottonwood/
Peachleaf willow
Alder

Schedule of Work:

Collect cuttings	Fall after trees have gone dormant and lost leaves
Plant	Fall after trees have gone dormant and lost leaves
Maintenance	On-going until plants are established

PLANTING DIRECTIONS

1. Select individual planting spots on a site-specific basis. The best micro-site takes precedence over spacing.
2. Remove debris and competing vegetation from each planting spot. Clear down to bare mineral soil.
3. Handle cuttings carefully. Keep in cooler storage until ready to plant. Keep cool, moist, and covered during storage and transport. Do not allow to dry out. Ideally soak the cutting for 10-14 days prior to planting.
4. Plant in the fall as soon as the trees have gone dormant for the winter and lost their leaves. Plant prior to ground frost.
5. Do not plant when air temperatures are more than 65 degrees, or when humidity is less than 50%.
6. Insert cuttings into moist soil with two to three buds showing above ground. Ensure bottom of cutting will be below ground water level during active growing season. Cuttings should be 6- 10 feet long or long enough to reach mid-summer water table, and be at least 3/4 inch in diameter depending on species. Collect cuttings in the fall after bud break. Keep moist and cool until planting.
7. Poles should be at least% inch in diameter and at least 6-10 feet long. Poles should be planted using a stinger or auger or backhoe for the "cluster planting method." Be sure to "mud in" after planting to avoid air pockets in the planting hole.
8. Consider planting oversized container stock of hard- to- root species, such as alder, if specialized stock is available.
9. At least % of the pole should be below ground.

MAINTENANCE

Control competing vegetation, especially grass, around each plant for at least two growing seasons and then implement a prescribed grazing plan designed to benefit and protect woody vegetation.

2 growing seasons of non-use by domestic livestock: The restoration channel area will be precluded from domestic livestock following construction completion. This period of rest will allow planted vegetation, as described in this plan the opportunity to establish prior to reintroduction of domestic livestock. A majority of the planted area will have hog panel caging as protection.

- Hog panel cages, small exclosures, will eliminate all browse pressure from both deer and cattle. A cage will be constructed on the inside of each new meander bend adjacent to the riffle. These areas do not have wood structure and are a logical place to construct each cage. Cages will be installed in the side chatmel areas. At this time location is uncertain but they will be strategically placed in areas of high planting density that offer the best planting conditions. Once protected vegetation reaches a height above browse capability the cage will be dismantled and moved to an area on the project needing cage protection.

Mechanical maintenance during the non-use period: Mechanical control of Reed's Canary Grass (RCG) is required during the period of non-use. In planted areas along the restoration and side channels competing vegetation will be mowed. Mowing will occur in the spring, which mimics prescribed grazing tactics. This will provide sunlight to planted vegetation, contribute to depleting carbohydrate stores in RCG, and offer desirable plant species a competitive advantage. Mowing will occur adjacent to each hog panel cage. However, if desired species are showing robust growth mowing may be deferred so that mowing does not accidentally damage them. Additional mowing will occur if necessary.

PLANTING GUIDELINES-

Poles and Whips

Preferred Species:

- Coyote willow *(Salix exigua)*
    - Or locally adapted willow

Red osier dogwood *(Cornus sericea)*
- Black cottonwood *(Populus balsamifera)*

Plant Material Collection and Storage:
Preference is for local sources of cuttings along the river itself and on nearby tributaries and irrigation ditches.
- Cuttings should be collected while the plants are dormant and buds are set.
- Cuttings should be at least 6-10 feet long (long enough to reach mid-summer water table) and 3/4 inches or larger in diameter.
- Plant immediately if possible. If not, store in a cooler kept at 33-40 degrees F.
- Pre-soak stored cuttings 10-14 days before planting.
- Red osier dogwood cuttings should be wounded (with a knife, or scrapping,) through the bark in several locations to enhance rooting and establishment.

Planting Location:
- Near banks edge (0- 10 feet)
- 2-foot spacing between plants

Planting Method:
- Plant using a stinger or auger. The hole should be only slightly larger than the pole.
    - Consider using a "Waterjet stinger" if there are no gravel bars in the planting areas.
    - Consider "cluster planting technique" using a back hoe to dig down to the appropriate water table depth and plant several poles in the one hole.
- No matter what planting method is used, it is essential to have good contact between cutting and soil for roots to sprout. Air pockets around the cutting will kill the roots.

PLANTING GUIDELINES- (continued)

CLUMPS

Clump planting is a successful method of establishing woody vegetation in riparian restoration projects. They are particularly successful in areas that are droughty, for example the side channels that are being proposed for this project.
- Use a back hoe to dig up an existing clump. Attempt to keep at least 70% of the root system intact.
- Replant as quickly as possible. Do not let the root system dry out. Keep moist, cover with a tarp. Sprinkle with water if necessary.
- Ideally pre-dig the holes where the clumps are going to be planted. Ensure the holes are deep enough to reach mid-summer water table.
- "Mud in" planted clumps to eliminate any air pockets that can kill roots. Make sure 4-6 feet of stem is above ground.
- Lop off about a third to half the willow tops. This stimulates more rooting and reduces the leaf mass the root system must support.
- Clumps should be about 8-10 feet apart and as close to the ordinary high water mark as possible.

VERTICAL BUNDLE PLANTING

Preferred Species

- Coyote willow *(Salix exigua)*

- Red osier dogwood *(Cornus sericea)*

Plant material collection and storage

- Preference is for local sources of cuttings along the river itself and on nearby tributaries and irrigation ditches.
- Cuttings should be collected while the plants are dormant and buds are set.
- Cuttings should be at least 6-8 feet long and 3/4 inches or larger in diameter.
- Plant immediately if possible. If not, store in a cooler kept at 33-40 degrees F.
- Pre-soak stored cuttings 2-10 days before planting.

Planting location

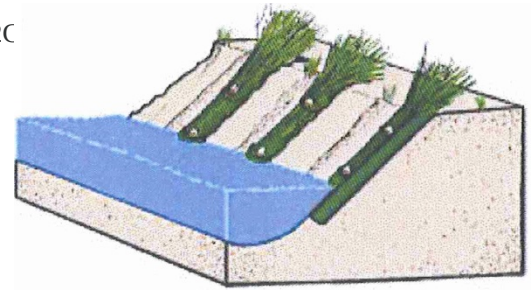
Along banks

Constructing bundle

- Bundles shall consist of 3-5 willow or dogwood cuttings so that the bundles are about 3-to - 6 inches in diameter.
  Tops should be with tops and butts with butts. Butts of each cutting in the bundle should be even on the ground.
- Tie bundles together with Sisal rope or cotton string or non-galvanized wire in at least two places- 1-2 feet from bottmn and at about 2/3 the length of the bundle.

Planting

- Dig a trench vertically on the streambank 12-to -16 inches longer than the bundle. Ensure the bottom of the trench is 6-8 inches into the bed below the low water tnark.
- **Trenches should be sloped to 2:1 or flatter.**
- The depth of the trench should be at least 4-to-9 inches.
- Place the bundle in the trench.
- Stake the bundle into place using at least two wedge shaped wooden stakes.
  - The stakes should be at least 3-foot long and cut from a kiln-dried 2 x 4.
- To form the wedge shape the 2 x 4 should be cut diagonally. (See the attached diagram)
- Place stakes between the ties or at 1/3 and 2/3 the length of the bundle.
- Pound the stakes into the ground until only 3 inches is above the bundle.
- Cover at least 2/3 of the bundle with soil.
- To ensure good soil-to-stem contact gently wash in the soil with a small amount of water.
- Trim the terminal buds of the cuttings.



MAINTENANCE

Control competing vegetation, especially grass.

Non-use by domestic livestock: Domestic livestock will not be allowed in the project area following construction. A majority of the planted area will have hog panel caging as protection from wildlife browsing.

- Hog panel cages, small exclosures, will eliminate all browse pressure from deer. Along the restoration channel, a cage will be constructed on the inside of each new meander bend adjacent to the riffle. At this time, location is uncertain but they will be strategically placed in areas of high planting density that offer the best planting conditions. Once protected vegetation reaches a height above browse capability the cage will be dismantled and moved to an area on the project needing cage protection.

Mechanical maintenance: Mechanical control of Reed's Canary Grass (RCG) is required during the period of non-use. In planted areas along the restoration and side channels, competing vegetation will be mowed with hand held weed eaters. Mowing will occur in the spring, which mimics the prescribed grazing tactic in the attached grazing management plan. This will provide sunlight to planted vegetation, contribute to draining carbohydrate stores in RCG, and offer desirable plant species a competitive advantage. Mowing will occur in and to each hog panel cage. However, if desired species are showing robust growth mowing may be deferred so mowing does not accidentally damage them. Additional mowing will occur if necessary through the year.

MONITORING

Measure survival, growth and cover of desired woody species through out the project area.

For the first 5 years after implementation, we plan on yearly inspections. We will establish photo points to visually document conditions. The project site is small enough that we can walk through and measure growth, survival, and cover without the need for transects. The one exception is that we will use transects to measure shade in and around the stream channels. During our inspection we will search for weeds and evaluate what means will be required to control them if found.

Success criteria include:

(1) Percent survival of planted cuttings and clumps,

- Achieve 40% survival of planted cuttings by year 2.
- Achieve 50% survival of transplanted clumps by year 2.

In our experience, we should achieve these survival targets if all step outlined in our planting plan are conducted properly. It is important to wait at least two years before deciding if the planting was a failure. It seems, especially with the clumps, the plants are devoting most of their energy into growing roots. In year 3 the clumps and cuttings begin to grow shoots and develop aboveground height and width.

(2) Percent cover along stream channels.

- Increase woody plant percent cover along stream channels by 10% each year after year 2.

If we are successful with our planting, we expect cover to be an important factor to measure. We expect woody vegetation to spread on its own either clonally or by establishment of volunteer propagules.

(3) Tree height, and

- Achieve tree heights of 8 feet or more over 10% of the new main channel length in five years. Our experience shows that after initially slow growth cuttings and clumps can grow 1 to 3 feet per year.

(4) Percent shade over the new channel.

- Achieve 15% shade across channel after 3 years (at noon during the low flow season)
- Achieve 25% shade across channel after 5 years.

We will establish transects that run through the channel. We will take densiometer readings on each bank and in the middle of the channel. We will follow OWEB monitoring protocols.

References:

Hoag, JC and D Ogle. 1994. *The Stinger, a tool to plant unroofed hardwood cuttings of willow and cottonwood species for riparian or shoreline erosion control or rehabilitation.* USDA Natural Resources Conservation Service, Idaho Plant Materials Technical Note No. 6, Boise, ID. 13 pp.

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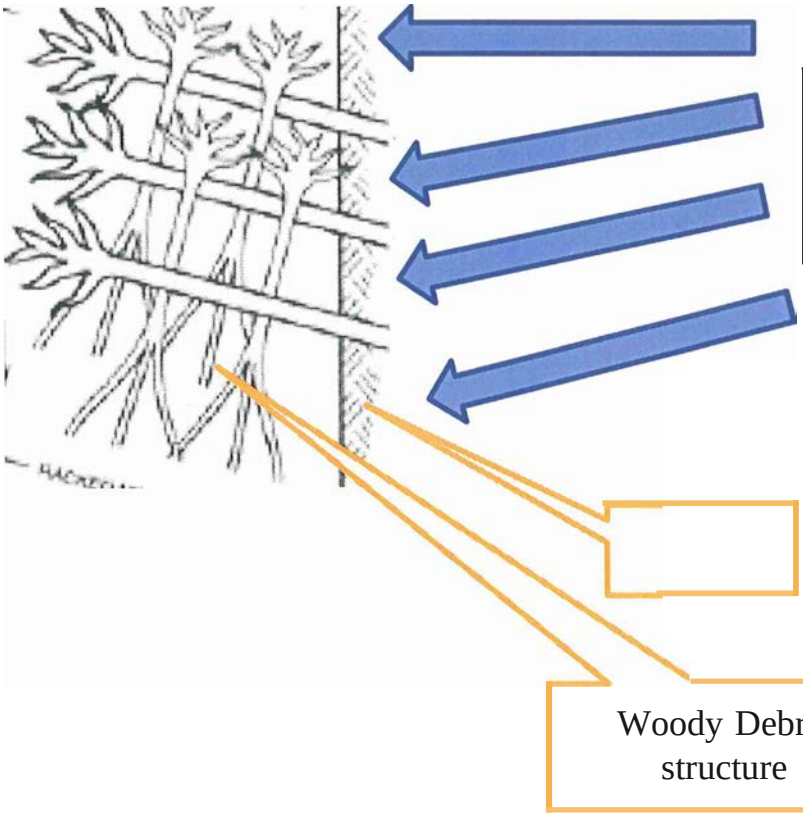
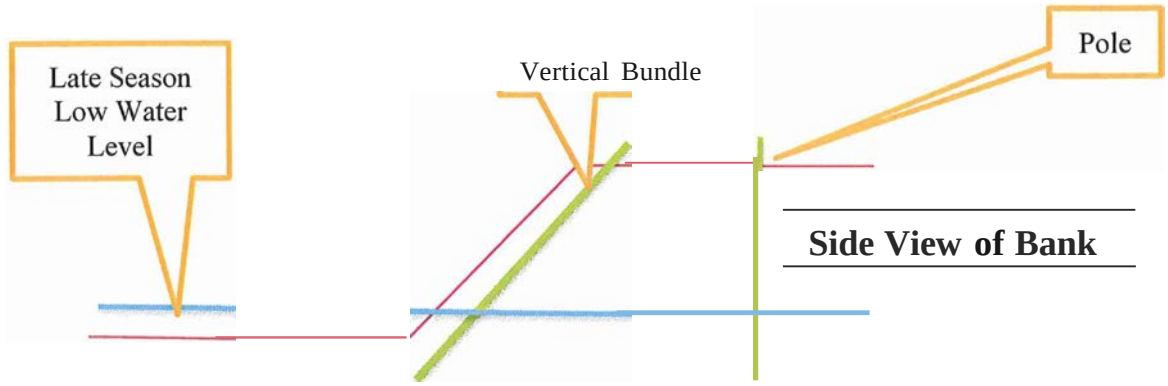
Hoag, JC. 2010. *Cluster Plantings: A way to plant live unroofed cuttings in coarse soils including sands, gravels and cobbles.* PMC, Aberdeen, ID. IS 26, riparian wetland project. 8p

Tilley, D., Ogle, D., St. John, L., Hoag, C., and J. Scianna. 2012. *Native Shrubs and Trees for Riparian Areas in the Intermountain West.* Idaho Plant Materials Program Technical Note 32, Boise, Idaho. 8/9/12. 63p

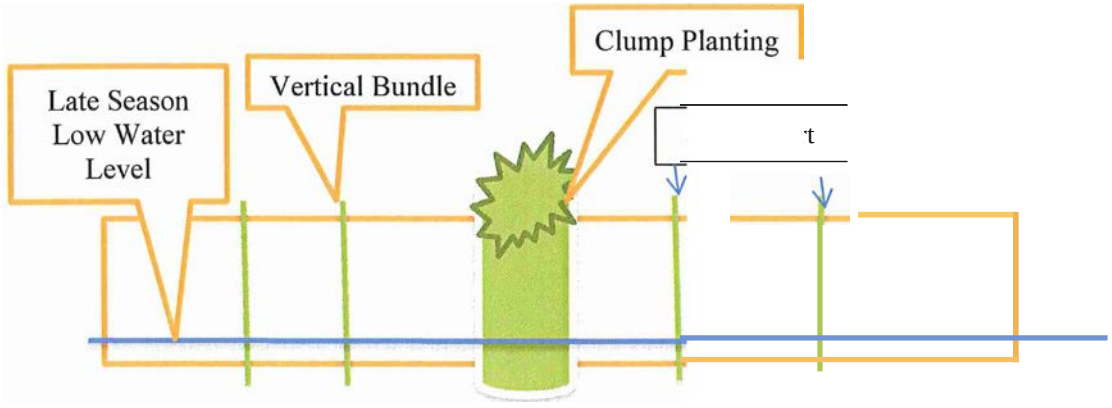


Plant vertical bundles, clumps, poles with waterjet stinger, or use cluster-planting planting technique

Woody Debris structure



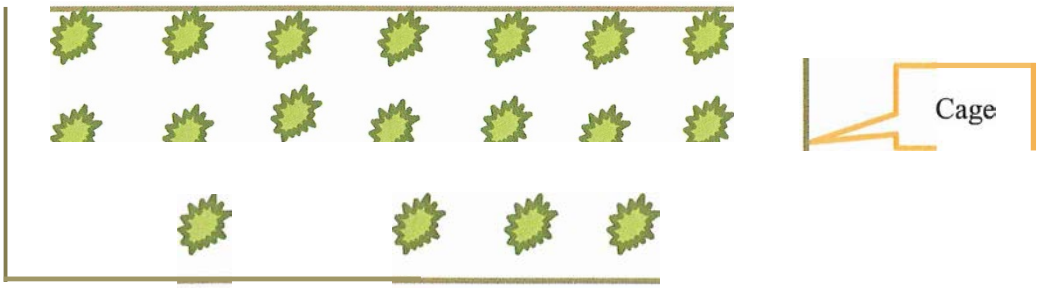
Side View of Bank



Front View of Bank

Riffle Planting-

High Density Of Whips -2-foot by 2-foot spacing
8-foot by 16-foot planting area



Planting Area	Vertical Bundles	Whips	Poles	Clumps	
1	75		20		
2		63		20	
3		330	20	10	
4	40	330	20	10	
5	40		20	10	
6	100	420	100		
7	75		20	10	
8	20		5		
9	75		20	10	
10	50	63	10	5	
11	75		20	10	
12		63	20	5	
13		330	60	30	
Total	550	1599	335	120	2604.00
Costs	$11,000.00	$7,995.00	$1,675.00	$9,000.00	$29,670.00
				Cages=	$10,000.00
				Total Cost	**$39,670.00**

Vertical bundles = local willows and dogwoods

Whips= Local willows and dogwoods

Poles= cottonwood and peachleaf willow-- if available oversized container nursery stock

Clumps= local willows and dogwoods

Wallowa Baker Project

Planting Area #1
Planting Area #13
Planting Area #11
Planting Area #5
Planting Area #12
Planting Area #2
Planting Area #7
Planting Area #3
Planting Area #9
Planting Area #4
Planting Area #8
Planting Area #6
Planting Area #10

N
W E
S

0 0.02 0.04 0.08 0.12 0.16 Miles