FY 2008-2018 F&W Program Project Solicitation

Section 10. Narrative

Project ID: 2008-301-00
Lead Agency: The Confederated Tribes of the Warm Springs Reservation of Oregon
Title: Deschutes River Restoration Program
Province: Columbia Plateau
Subbasin: Deschutes
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A. Abstract

The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO) will develop and execute the Deschutes River Restoration Program (DRRP). This program will focus on projects aimed at improving instream habitat along with holistic watershed restoration directed at factors limiting salmonid production. Projects will occur mostly on the Warm Springs Indian Reservation, but the Program may choose to partner on priority projects off the Reservation within the Deschutes basin.

Projects will target four limiting factors including habitat complexity and quantity, fine sediment, water temperature and altered hydrology. These projects will be tiered to the Deschutes River Subbasin Plan, and the Mid-Columbia Steelhead Recovery Plan. All of the projects will focus on the Tribes goal of sustaining harvestable levels of fish for many generations. The limiting factors were developed using guidance from the U.S. Fish and Wildlife Service and NOAA Fisheries matrix indicator methods for making Endangered Species Determinations and were linked with biological monitoring and production data collected by Tribal Fisheries staff on the Reservation.

Instream and watershed restoration projects are important in this portion of the Deschutes basin for several reasons. The 660,000 acre Warm Springs Indian Reservation provides critical habitat for wild populations of spring Chinook salmon, Mid-Columbia summer steelhead, bull trout, redband trout, Pacific lamprey, and a variety of other native non-salmonid species. Protection and maintenance of these populations is important to Tribal culture and future harvest opportunities. The new regulatory license agreement for the Pelton-Round Butte Hydroelectric Complex (~river mile 100) requires the co-owners to reintroduce salmon and steelhead into the upper Deschutes basin. The populations downstream of the hydro complex on the Reservation will provide the donor stock for rebuilding the populations upstream.

The DRRP will use funding from the recent Memorandum of Agreement between the Tribes and the Bonneville Power Administration matched with funding from the National Resources Conservation Service, the Pacific Coastal Salmon Recovery Fund, the Oregon Watershed Enhancement Board, the Pelton Round Butte Fund, and other competitive sources. Additionally, the program will have access to restoration funding received through the American Transport Inc. 1999 gasoline spill settlement fund. It is anticipated that over the next ten years (2008-2018) these funds will exceed $6 million dollars.

Projects will be planed by Tribal staff from the Fish Habitat Program, designed by the NRCS or other technical assistance providers, and implemented by both Tribal and non-tribal contractors. The projects currently identified are listed in Table 7 along with a description and limiting factor addressed. All projects will pass through the Tribe's Integrated Resource Management Planning process and complete the required Endangered Species Act consultation.

Error! Objects cannot be created from editing field codes.
Map 1. The Warm Springs Indian Reservation.

B. Technical and/or scientific background

The Warm Springs Indian Reservation (Map 1) is located on the east slope of the Cascade Mountains in Oregon, north of Mt Jefferson. The Reservation is approximately 660,000 acres in size and contains a large portion of the Deschutes basin downstream of the Pelton-Round Butte hydro-electric project. Due to their high Cascade origin many of the Reservation watersheds have excellent water quantity and quality resulting in a stronghold for Deschutes basin fish stocks. The Reservation provides habitat used for migration, spawning, and rearing by Mid-Columbia summer steelhead, wild spring Chinook, bull trout, redband trout, and a mainstem Deschutes population of fall Chinook (Map 2). Sockeye salmon used Suttle Lake (not on Map 2) in the upper Metolius watershed until construction of the hydro-electric facility in the 1960s. An improved juvenile passage facility is intended to create self sustaining populations upstream of the dam. This will allow for increased steelhead and Chinook production, along with the potential of restoring the sockeye run from a robust kokanee population in Lake Billy Chinook.

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Map 2. Distribution of anadromous salmonids on the Warm Springs Indian Reservation

The Problem

Resource use and development have combined to reduce and simplify habitat resulting in limited salmonid production in many watersheds on the Reservation. A limiting factors analysis was used identify the key factors limiting salmonid production. Four limiting factors were chosen including: habitat complexity and quantity, fine sediment, water temperature, and altered hydrology. The following section will discuss each of these in more detail. Projects developed through the DRRP will address one or all of these limiting factors. Table 7 presents a list of projects by watershed and limiting factor proposed for further development under this contract.

Habitat Complexity and Quantity

Salmonids in small streams are specialists and use habitats with specific characteristics. These habitats should meet the demands for spawning and incubation, summer rearing, adult holding, migration, and winter rearing. Two often overlooked habitats are thermal and velocity refugia. Creating and enhancing habitats that provide thermal refugia during

warm water periods and velocity refugia during high flows are critical to a successful restoration strategy.

McIntosh and others (2000) evaluated the historical changes in pool habitats across the Columbia basin and found that in streams located in watersheds influenced by timber harvest, livestock grazing, and other anthropogenic activities, frequencies of the largest and deepest pools have decreased by just over 50% since 1945. Pool frequency and size, percentage of undercut bank, pieces of large wood per kilometer, percentage of overhead cover, percentage of off channel habitat, substrate, channel length vs. valley length (sinuosity), and varied velocity distributions can all be considered when evaluating habitat complexity.

Homogenous habitat with reduced complexity exists in some stream reaches on the Reservation. Pools are infrequent and shallow riffle habitats predominate. Floodplain connectivity and off channel habitat are limited as well. Over head cover and large wood are infrequent in many stream reaches. It is important to evaluate the quantity of habitat along with the frequency of key habitat features. Pool frequencies, large wood counts, overhead cover, and off channel habitat have all been reduced below appropriate levels in many stream reaches. Project development will incorporate a biological reference (example Photos 1-3) within the watershed to help discern the pattern and dimension of habitat features for a specific channel type. This will aid the restoration design and help to address the frequency of key habitat types.

Photo 1: Overview of a biological reference site on Shitike Creek showing complex habitat including side channels, large wood, deep lateral scour pool, and a connected floodplain.

Fine Sediment

Elevated levels of fine sediment in salmonid habitats can limit the overall aquatic productivity and survival. Road building, timber harvest, and livestock use all contribute to increased sediment delivery to the stream channel. Reduced survival of embryos and emerging fry caused by increases in fine sediment is well documented (Chapman 1988). Incubating eggs of salmonids require spawning gravel that is relatively free of fine sediment (Bjornn and Reiser 1991). Studies of fine sediment in streams have repeatedly shown reduced salmonid survival, production and/or carrying capacity, with salmonid populations negatively correlated with the amount of fine sediment in stream substrate (Shepard et al. 1984; Hicks et al. 1991; Bjornn and Reiser 1991; Scully and Petrosky 1991; Rich et al. 1992; Weaver and Fraley 1993; Rich and Petrosky 1994; Meyer et al. 2005). A negative correlation in production has been attributed to reduced survival-to-emergence of salmonid fry from the redd (Scrivener and Brownlee 1989), primarily due to reduced dissolved oxygen concentrations to the incubating eggs (Maret et al. 1993) or entombment of the emerging alevins (newly hatched fish with yolk sac attached) within the redd.

Suttle and others (2004) presented the idea of fine sediment playing a keystone role in the population recovery of Columbia basin stocks. Survival can be further reduced due to a reduction in juvenile salmonid prey species availability caused by fine sediment accumulating in the stream bed. Decreases in juvenile steelhead growth and survival were observed with increasing levels of fine sediment and likely resulted from higher activity, aggression, and risk of injury (Suttle et al. 2004). It is easy to understand the influence of fine sediment and complex habitat on growth and survival of juvenile salmonids in fresh water streams.

Modest increases in survival rates across many watersheds will be a critical element in the recovery of salmonid species across the Columbia basin. Developing projects that reduce the delivery of fine sediment to stream channels and restore the fluvial processes that manage fine sediment in the aquatic environment are key elements needed to increase survival rates.

Bulk core sediment sampling in Beaver Creek on the Reservation have shown that fine sediment content of Chinook salmon and summer steelhead spawning habitat is high, with particle size less than 1.0 mm averaging 14% (range 7 – 24%) in some reaches. McHenry et al. (1994) found fine sediments (less than 0.85 mm) were nearly 100% lethal to steelhead eggs when concentration exceeded 13% within the redd.

Identifying projects that address erosion and unnatural delivery of fine sediment to stream channels will address aquatic productivity, and is an essential step to recovery. The DRRP will develop projects intended to reduce chronic sediment delivery within each watershed. Work elements to a successful project may include decommissioning hydrologically connected road segments, improving livestock management, and upland vegetation management and restoration.

Water Temperature

Extended exposure to elevated water temperatures and can cause thermal stress and reduce survival of juvenile salmonids (McCullough et al. 2001 and Ebersole et al. 2003) Due to their high Cascade origin many of the Reservation watersheds have excellent water quantity and quality. However, simplification of the stream channel, loss of a

connected floodplain and off channel wetlands, along with a reduction in riparian vegetation have resulted in increased temperatures in many stream reaches.

Figure 1 shows the mechanisms that affect stream temperature (Loheide and Gorelick 2006). Shade and solar exposure play an important role influencing stream temperatures. Interaction between surface and subsurface water sources also play an important role in regulating water temperatures. Studies have shown that during warm periods water temperatures can be directly influenced by surface and groundwater exchanges (Loheide and Gorelick 2006, Meisner et. al., Poole and Berman 2001, Ebersole et al 2003, Stanford and Ward 1993). Loheide and Gorelick (2006) show that this exchange process influences stream temperatures at base flow through reduced, or buffered, diurnal temperature shifts. Groundwater input and hyperheic exchange also create thermal refugia at the habitat and reach scales allowing both juvenile and adult salmonids opportunities to thermoregulate and survive in streams where water temperatures reach chronically high levels (>25°C).

Photo 2**:** Complex habitat in a side channel at a reference site with newly constructed beaver dam.

Photo 3**:** Typical habitat within a reference side channel.

Similarly, channel geometry influences heat transference and heat conduction. For example, a channel that is wide and shallow (high width:depth ratio) will be influenced more by solar radiation and ambient temperatures than a channel that is narrow and deep (low width:depth ratio), where water temperatures are more influenced by the conductive properties of the streambed and stream bank.

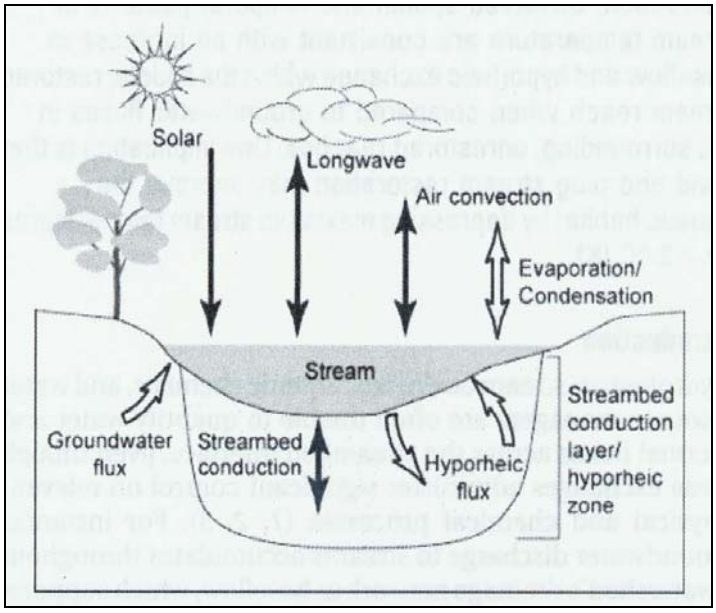

Figure 1. Mechanisms that influence stream temperatures from Loheide and Gorelick (2006)

Torgersen et al. 1999 concluded that spatial patterns of water temperature in the Middle Fork John Day River (MFJD) were more complex than in the North Fork John Day River (NFJD) and that the coldest reaches available to salmon in the MFJD were located in the low gradient, unconstrained where surface and subsurface flow interactions were occurring. This research highlights the importance of restoring the processes that support

the dynamic floodplains which create variability in water temperatures, especially within the unconfined valley reaches.

Thermal imagery (2001) of the Reservation shows the influence of spring and wetland features located in the prism of the floodplain on local and reach scale temperatures (Figures 2 and 3). Restoration objectives to influence stream temperatures will use techniques to create wetland and off channel habitat features that intercept and capture hyperheic and groundwater sources where appropriate. The thermal imagery will greatly assist identifying locations where this influence is substantial and will help direct restoration actions to achieve the fullest ecological potential.

Restoration and enhancement may not change the overall stream temperature from where it enters the project area downstream to where it leave the project, but the thermal characteristics may change within the restoration reach, providing additional thermal refugia. The following images show the cooling influence of well connected floodplains with wetland features and abundant vegetation.

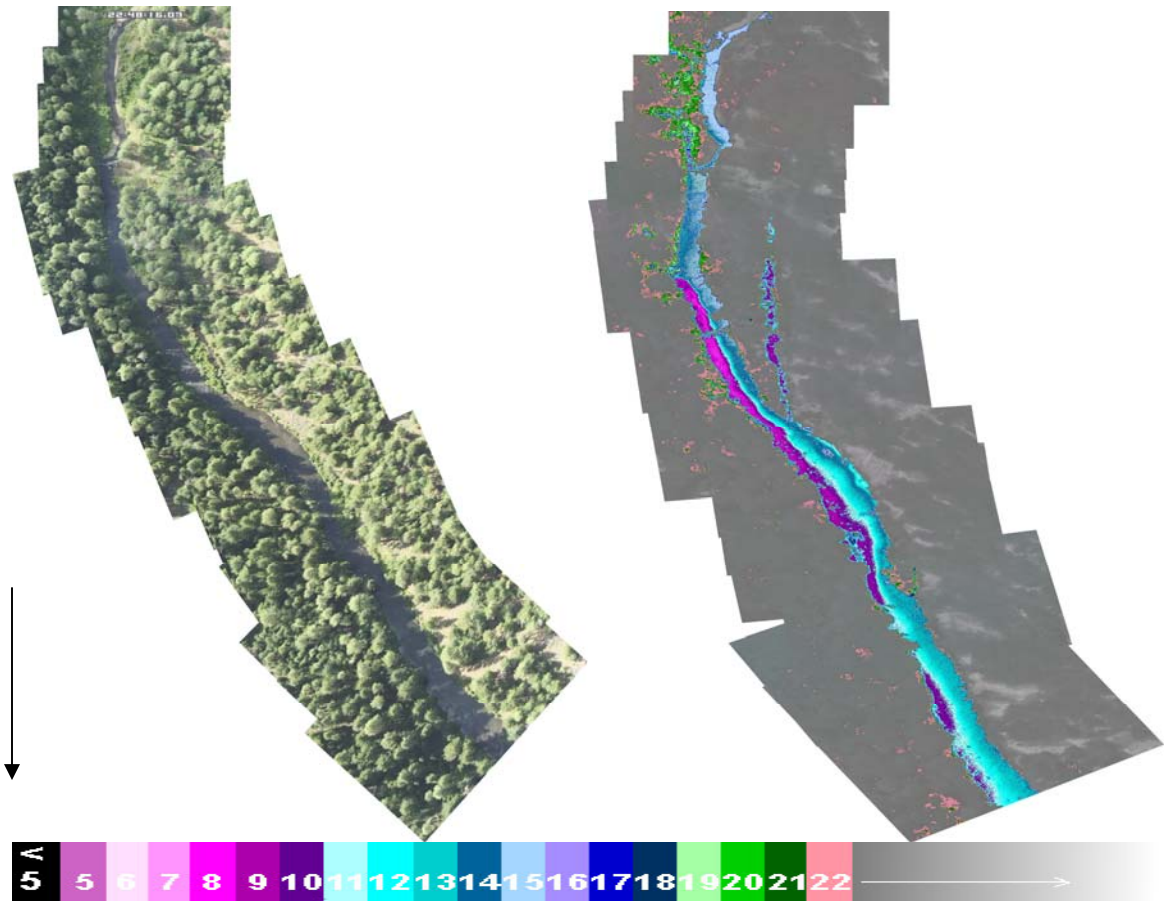

Figure 2. These mosaics show a series of four springs at river mile 12.9 that cause Beaver Creek's temperature to drop from 15.6^{o}C to 12.2^{o}C. The spring on the left bank is 10.6^{o}C and the three right bank springs are 10.1^{o}C, 10.8^{o}C and 9.0^{o}C respectively.

Theses figure (2-3) show the obvious need to protect the abundant high quality wetland sites. The DRRP contract will support ongoing riparian fence and off channel livestock watering site maintenance to continue protection of critical spawning and rearing habitats. Other benefits include increases in bank stability due to root growth, and

terrestrial food inputs due abundant overhead cover. Biological objectives to reduce stream temperatures will also result in projects that will focus on maximizing riparian and wetland vegetation potential.

The source of many watersheds on the Reservation lies in Cascade Mountains. Fire suppression, drought, and beetle infestations have created unhealthy forest conditions. Trees have encroached into meadow areas changing the water budget. Drought stressed, the over stocked stands began to die and the beetles moved in to attack the stressed trees. Currently vast acres, some which include significant high elevation meadow complexes, are littered with over stocked dead lodgepole pine and other coniferous species. Protecting and restoring headwater sources by creating an environment that is resilient to intense fire, and has more a more appropriate vegetation composition will benefit long-term water quality within the watershed.

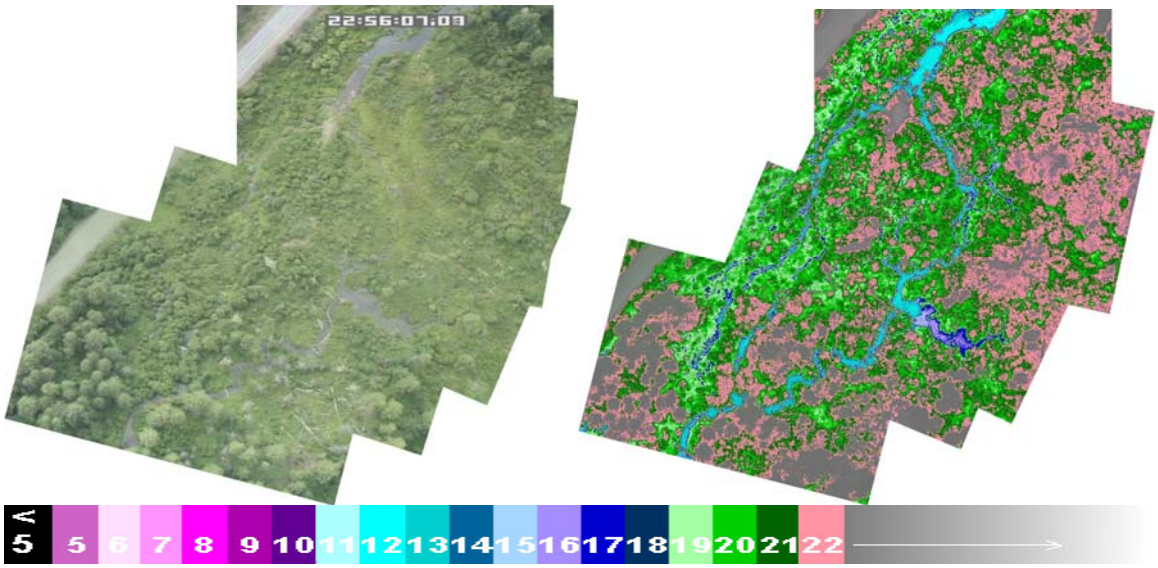

Figure 3. These mosaics show a marshy area of Beaver Creek (13.2^{o}C) at river mile 18.5. and the temperature signature of a distributed channel network through a connected wetland.

Altered Hydrology

Many watersheds on the Reservation have been impacted by timber harvest, road building, development, along with livestock and agricultural production. These actions generally increase the water budget due to changes in vegetation, compacted soils, and an extension of the drainage network from road construction. Cumulative effects from these practices result in changes in the magnitude and timing of run off events. Erosion will increase due to soil disturbance and increased overland flow. Map 3 shows the distribution of fifth field hydrologic units and their location on the Reservation.

The effects from altered hydrology on biological communities center on impacts to habitat complexity and quantity, water temperature and fine sediment. Altered hydrology can be directly linked to the health of many watersheds. Changes in the magnitude and

timing of run off change the pattern and dimension of the stream channels, reducing complexity. Erosion and sediment input increase, lowering aquatic productivity. Stream channels become over widened to accommodate the increased runoff and sediment. Low summer base stream flows caused by changes in the timing of run off create limited habitat and elevated water temperatures.

Projects developed to address the limiting effects of altered hydrology in the Reservation watershed will include work elements to reduce road densities and compacted surfaces, protect and enhance wetlands and floodplains, manage upland vegetation, and restore appropriate stream channel and floodplain forms when possible.

Photo 4: A stream channel that was 'captured' by a road creating severe erosion. A culvert will be installed to reroute the stream and the road surface will be leveled and rocked in October 2008.

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Map 3. Distribution of 5th field hydrologic units on the Reservation.

The Strategy

The DRRP will use the stable funding through this contract to manage and administer a program that will enhance and protect aquatic habitats across the Deschutes basin. This stable funding will be used to cost share with a variety of funding sources to complete priority projects (Table 7). Annual maintenance and operation of the existing riparian fence and water development projects (Map 3) will be supported through this contract, along with those fences and watering sites developed under new projects. Development of a sediment monitoring protocol to track both delivery of sediment to stream channels and composition of fine sediment in the bed material within critical habitats will receive annual support. Repeatable habitat surveys will be conducted to every five- ten years to evaluate trends. The funding will be used to support the Habitat Program Manager, Restoration Biologist, full time technician, and one seasonal field technician. One full size truck, supplies, equipment, funding for annual equipment maintenance, travel and training costs, a few capital items, and annual restoration contracts will be included in a typical scope of work budget proposal. These needs may grow with the program.

Restoration and biological monitoring will be coordinated with other Fisheries Programs and to track trends in production relative to our efforts. Ongoing supplementation projects will be coordinated into the restoration planning process. For example, several of the projects proposed to enhance habitat complexity will have and element to create off channel wetlands. These wetlands will not only address the limiting factors discussed in this proposal they may also provide supplementation opportunities as natural acclimation sites for fry releases. Murdoch et al 2007 used natural ponds as acclimation and release sites to reintroduce coho salmon into the Wenatchee basin in eastern Washington. Increased survival in fish reared at natural acclimation sites, and was attributed to the development of natural coloration, exposure to predation, and access to natural food sources.

Watershed restoration to address erosion and altered hydrology will include the restoration of several large meadow/seasonal wetland habitats. Included within the holistic watershed planning element will be a prioritization and implementation schedule for improvements in livestock management systems, road decommissioning, and vegetation management.

The addition and enhancement of habitat complexity will include projects that use engineered large wood placements, main and side channel construction, planting native riparian and upland species, and wetland and floodplain creation.

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Map 3. Location of current riparian fences maintained through this contract.

C. Rationale and significance to regional programs

The Warm Springs Indian Reservation lies in the Lower Westside Deschutes Assessment Unit section 3.2 in the Deschutes Subbasin Plan (Deschutes Subbasin Plan, Management Plan Page MP– 9-18).

This unit includes the lower 100 miles of the Deschutes River, the Warm Springs River system, Shitike Creek and the smaller tributaries that enter the lower Deschutes on its west bank. The Deschutes Subbasin Plan identified several overall biological and habitat objectives. The habitat objectives for the Lower Westside Deschutes Assessment Unit are presented in Table 2 (Deschutes Subbasin Plan, Management Plan Page MP– 11). The Lower Westside Deschutes Assessment Unit contains two distinct life history strategies within the Mid –Columbia steelhead populations using Reservation watersheds. Four intermittent streams (Nena Cr, Eagle Cr, Oak Cr and Skookum Cr.) in the northeast corner of the Reservation provide spawning and rearing habitat during wet periods and in isolated spring fed stream segments. Habitat actions will focus on these watersheds as well.

The following tables are taken directly from the Deschutes Subbasin Plan.

Habitat Objectives

- Protect or restore 1,471 acres of riparian habitat along 163 miles of stream in the Lower Westside Deschutes Assessment Unit.

• Protect and restore important wildlife habitats, including backwaters, oxbow sloughs, seeps and springs, and cottonwood groves, willows, and aspen groves.
• Provide efficient fish passage to all historic fish habitat in the assessment unit
• Increase minimum stream flows in lower Deschutes River tributaries and mainstem Deschutes.
• Restore and maintain upland vegetative conditions to improve overall watershed health.
• Restore and maintain grasslands and ponderosa pine forests (including white oak component) to benefit wildlife populations.

Table 2. Habitat objectives taken from the Deschutes Subbasin Plan, Management Plan Page MP– 11 for the lower Westside Deschutes Assessment Unit section 3.2.

The lower Deschutes unit was further divided into the Warm Springs and Shitike habitat complexes. The specific objectives developed for these focal areas are presented in Tables 3 and 4. These recommendations echo the main points from the action items presented in the proposal section.

One of the finer details mentioned in the objectives and strategies tables presented from the subbasin plan are the last points in Table 3 stating "Manage riparian ecosystems to encourage restoration of beaver populations through restoration of woody vegetation." Projects developed by the DRRP intend not only encourage beaver activity, but actually construct wetland features that simulate beaver dam and pond complexes to jumpstart keystone ecological processes. Pollock et al. 2007 explained in detail the how beaver dams promote sediment deposition and aggradation of stream beds. A key element to success using this strategy is a food source to support beavers. Several projects planned under this contract will use constructed wetland and beaver pond features to address both habitat and wetland restoration objectives. In some systems where natural production is low constructed beaver ponds and off channel oxbow ponds may be used as acclimation and release sites for supplementation actions.

Many stream channels on the Reservation are incised and experience high rates of erosion. Reducing sediment delivery and rebuilding floodplain storage mechanisms lost in many streams is crucial to building resiliency into the watershed to prepare for potential changes in the climate. The following tables from the Deschutes Subbasin Plan present objectives and strategies that support the holistic watershed approach proposed by the DRRP and address the limiting factors.

Warm Springs River Habitat Complex

Management Strategies Specific to Habitat Complex

In Channel Strategies

• Increase minimum stream flow.
• Reduce stream temperature to meet water quality criteria for salmonid rearing.
• Reduce channel width by 50%.
• Restore and maintain instream habitat complexity with a minimum of 20 pieces per 100 meters of stream channel.
• Reduce substrate fine sediment percentage to less than 10%.
• Increase primary pool.

Sub-Watershed Strategies

- Improve upland watershed health through effective management to increase water infiltration, retention and permeability rates and soil stability.
- Restore diverse riparian vegetative function by 50%.
- Proper construction and maintenance of range and forest roads can reduce sediment delivery to streams.
- Implement upland and riparian grazing systems to increase ground cover and slow runoff and erosion.
- Develop upland livestock water sources to help alleviate livestock concentrations in streams and riparian corridors.
- Restore and maintain healthy riparian and floodplain areas with good habitat complexity and species diversity.
- Restore water tables under former wet meadows and stream floodplains to provide natural sub-irrigation and stream flow and stream temperature moderation and reduce stream sedimentation.
- Manage riparian ecosystems to encourage restoration of beaver populations through restoration of woody vegetation.

Table 3. Management strategies for the Warm Springs River Habitat Complex taken from the Deschutes Subbasin Plan, Management Plan Page MP– 15.

Shitike Creek Habitat Complex

Management Strategies Specific to Habitat Complex

In Channel Strategies

- Maintain pristine condition of the stream above Peter's Pasture.
- Maintain or increase stream flow.
- Reduce stream temperature to comply with current water quality standards.
- Increase primary pool habitat by 20% in appropriate stream channel types.
- Restore diverse riparian vegetative corridors to provide 80% stream shading and increase stream bank stability to 80%.
- Reduce channel width-to-depth ratio to less than 10.
- Restore and maintain instream habitat complexity with a minimum of 20 pieces of large wood per 100 meters of stream channel or other comparable structure.
- Reduce substrate fine sediment percentage to less than 10%.

Sub-Watershed Strategies

- Improve upland watershed health through effective management to increase water infiltration, retention and permeability rates and soil stability.
- Proper construction and maintenance of roads can reduce sediment delivery to streams.
- Implement upland and riparian grazing systems to increase ground cover and reduce erosion.
- Develop upland livestock water sources to help alleviate livestock concentrations in the stream and riparian corridor.
- Restore and maintain healthy riparian and floodplain areas with good habitat complexity and species diversity.

• Restore water tables under former wet meadows and stream floodplains to provide natural sub-irrigation and stream flow and stream temperature moderation.
• Manage riparian ecosystems to encourage restoration of beaver populations through restoration of woody vegetation.

Table 4. Management strategies for the Shitike Creek Habitat Complex taken from the Deschutes Subbasin Plan, Management Plan Page MP– 17 Management Plan

Table 5 presents the summary of habitat factors limiting the Deschutes River Westside steelhead population taken from the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (DPS) (2007). This recovery document presented limiting factors and specific restoration actions by fifth field hydrologic unit. Table 7 presents the list of projects proposed through this contract in a similar format. Many of the proposed projects of the DRRP are identified in the 'sites affected' metric of the Recovery Plan presented in Table 5.

The Recovery Plan defined seven general types of tributary habitat factors that limit the viability of Oregon's ten steelhead populations in the Mid-C DPS and listed the key contemporary threats to each population at specific life stages, and is presented in the following list. These factors are echoed throughout the actions proposed through this document and directly support the recommendations highlighted in the Subbasin Plan.

Degraded floodplain connectivity and function: The loss, impairment or degradation of floodplain connectivity; access to previously available habitats (seasonal wetlands, off-channel habitat, side channels); and a connected and functional hyporheic zone. This factor includes reduced overwinter habitat and channel habitat. Life stages affected: egg-to-smolt survival, smolt migration, adult migration, pre-spawning.

Degraded channel structure and complexity: The loss, impairment or degradation of channels; a suitable distribution of riffles and functional pools; functional amounts and sizes of large woody debris or other channel structure. Includes reduced summer rearing habitat, degraded spawning habitat, reduced diversity and structure (wood, boulders, etc.), inadequate quantity or depth of pools, loss of side and braided channels. Life stages affected: egg-to-smolt survival, smolt migration, adult migration, pre-spawning.

Degraded riparian areas and LWD recruitment: The loss, degradation or impairment of riparian conditions important for production of food organisms and organic material, shading, bank stabilizing by roots, nutrient and chemical mediation, control of surface erosion, and production of large-sized woody material. Life stages affected: egg-to-smolt survival, smolt migration, adult migration, pre-spawning.

Altered hydrologic processes: Changes in the hydrograph that alter the natural pattern of flows over the seasons, causing inadequate flow, scouring flow, or other flow conditions that inhibit the development and survival of salmonids. Life stages affected: egg-to-smolt survival, smolt migration, adult migration, pre-spawning.

Degraded water quality: Degraded or impaired water quality due to abnormal temperature, or levels of suspended fine sediment, dissolved oxygen, nutrients from agricultural runoff,

heavy metals, pesticides, herbicides and other contaminants (toxics). Life stages affected: egg-to-smolt survival, smolt migration, adult migration, pre-spawning.

Altered sediment routing: Altered sediment routing leading to an overabundance of fine-grained sediments, excess of course-grained sediments, inadequate course-grained sediments and/or contaminated sediment. Includes excessive fine sediment that reduces spawning gravel or increases embeddedness. Life stages affected: egg-to-parr survival.

Impaired fish passage: The total or partial human-caused blockage to previously accessible habitat that eliminates or decreases migration ability or alters the range of conditions under which migration is possible. This may include seasonal or periodic total migration blockage. Includes dams, culverts, seasonal push up dams, unscreened diversions, and entrainment in irrigation diversions. Life stages affected: smolt migration, adult migration, juvenile upstream migration due to thermal blockage or water availability.

These habitat limiting factors are often interrelated. For example, degraded riparian condition often results in channel straightening, elimination of off-channel habitat, loss of large woody debris, reduced channel roughness, increased water temperatures, and increased sedimentation. Changes in the hydrograph — such as through loss of storage on connected riparian areas,

floodplains and uplands — often lead to higher peak flows and lower summer flows, which can impair water conditions and temperatures, or restrict fish movement between habitat reaches.

The primary tributary habitat limiting factors identified by the Recovery Planning Team for the Deschutes Westside steelhead population are degraded channel structure and complexity, altered sediment routing, high water temperature, low flows and lack of fish passage over Pelton-Round Butte Complex (Oregon Mid-C Steelhead Recovery Plan 2007).

Population MaSA and MiSA	Major Limiting Factors	Sites Affected*	VSP Characteristics Impacted	Potential Causes/Threats	Life Stages Affected
DESCHUTES WESTSIDE POPULATION					
Deschutes River Westside Population	Degraded riparian communities; degraded floodplain and channel structure (complexity, side-channel habitat, diversity); water quality (temp); altered hydrology (low flow); altered sediment routing; blocked and impaired fish passage	MaSAs and MiSAs	Abundance, productivity, spatial structure, diversity	Primarily livestock grazing, roads, residential development and agricultural practices that simplify habitat, irrigation withdrawals, forest practices, dams and other barriers	All life stages
Lower Warm Springs MaSA	Degraded floodplain and channel structure (complexity, loss of LWD); degraded riparian communities; degraded water quality (temp); altered hydrology; altered sediment routing	Beaver Creek [R, F, CS, T, S (mouth to Wilson Cr.)]; Warm Springs R. [(F, CS and R in Ka-Nee-Ta resort area), S, R (mouth to Schoolie Cr.)]; Quartz and Coyote creeks [F, CS, S]	Productivity, abundance, spatial structure and diversity	Confinement and runoff from Hwy. 26, livestock grazing, bank armoring and confinement in Ka-Nee-Ta area	All life stages are affected.
Middle Warms Springs MaSA			Degraded riparian communities; degraded floodplain and channel structure; altered sediment routing		
Upper Warm Springs MaSA		Degraded channel structure; water quality (temp)		Loss of LWD	
Mill Creek MaSA	Degraded floodplain and channel structure (channelization, complexity)		Mill Cr. [mouth to Old Mill Camp]	Channelization	
Shitike Creek MaSA	Degraded floodplain and channel structure; degraded riparian communities; altered hydrology; degraded water quality (temp, pollutants); altered sediment routing	Shitike Cr. [F, CS, R (mouth to upper road crossing, City of Warm Springs, near Hwy. 26); WQ (Warm Springs mill site and sewage lagoons)]	Productivity, abundance, spatial structure and diversity	Livestock grazing, riparian degradation and confinement through Warm Springs, Hwy. 26, Warm Springs mill site and sewage lagoons, channelization	All life stages are affected.

Table 5. Habitat limiting factors summary for the Deschutes River Westside steelhead population from the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment

Abbreviations for limiting factors: degraded floodplain connectivity and function (F), degraded channel structure and complexity (CS); degraded riparian communities (R); altered hydrology (H); degraded water quality (WQ), high water temperatures (T); altered sediment routing (S); man-made block to migration (BP); impaired fish passage (IP).

D. Relationships to other projects

The DRRP has a direct link and relationship with several other BPA funded projects in the Deschutes basin (Table 6) along with relationships and linkage to several other non-BPA funded efforts. Population monitoring projects supported through MOA projects on the Reservation and the Deschutes basin will provide the baseline status and trend monitoring required to evaluate the success of restoration and recovery efforts basinwide.

The recent relicensing of the Pelton-Round Butte Hydroelectric complex resulted in the first co-license (Tribes and PGE) issued through the Federal Energy Regulatory Commission. The other landmark decision that resulted from this process was the mandate that salmon and steelhead be reintroduced above the hydroelectric complex for the first time in fifty plus years. This reintroduction effort will use donor stock form the populations downstream of the hydroelectric complex to develop the populations upstream. To do this the populations below the dam must be both abundant and viable enough to provide this donor stock. One key element of this viability and abundance is excellent habitat and healthy watersheds. Thus robust populations and properly functioning habitat downstream of the dam is a critical element of the success of the reintroduction of salmon and steelhead upstream of the hydro-complex.

Funding Source	Project #	Project Title	Relationship
BPA	2007-157-00	Bull Trout Status and Abundance	Monitors bull trout trends within habitat program area.
BPA	2008-307-00	Deschutes River Sockeye Development	Develops recovery plan and monitors sockeye population trends within habitat program area.
BPA	2002-016-00	Lamprey Abundance	Determine status and limiting factors for lamprey in the Deschutes basin
BPA	2008-306-00	Escapement Goals-Deschutes River Fall Chinook	Monitor trends in Fall Chinook abundance on the Deschutes River
BPA	2008-305-00	Steelhead Production Monitoring	Monitor trends in steelhead abundance on the Warm Springs Reservation
BPA	2008-304-00	Spring Chinook Production Monitoring	Monitor trends in spring Chinook abundance on the Warm Springs Reservation
BPA and others	1998-028-00	Implement Trout Creek Watershed Restoration	Enhancement of fish habitat in Trout Creek watershed. Deschutes basin recovery.
BPA	1994-042-00	Trout Creek O and M	Continue monitoring and maintenance of habitat projects in Trout Creek. Deschutes basin recovery.
Various		Upper Deschutes Watershed Council Crooked River Watershed Council	Habitat and passage projects in the upper basin. Increases in production will support viable populations.
Various		Natural Resources Conservation Service Soil and Water Conservation Districts	On the farm water efficiency and quality improvement projects with in the basin.
Various		Pelton Round Butte Reintroduction Projects	Habitat enhancement and production monitoring projects involved with the upper Deschutes basin reintroduction effort.

Table 6. List of projects that either have a direct or indirect link to the Deschutes River Restoration Program #2008-301-00.

E. Project history

No History available. This is a new project.

F. Proposed biological objectives, work elements, and methods.

Biological objectives will focus on the limiting factors at the watershed scale. Table 7 presents a list of projects that will be developed over the next ten years to improve habitat and watershed health. This list is not comprehensive and does not preclude the DRRP from working elsewhere in the Deschutes basin. All of the projects developed through the DRRP will address one or all of the limiting factors and follow the guidance and recommendations of regional and Columbia basin level planning decisions.

Ten objectives were developed to discuss the vision and direction of the Program. Ecological recovery and function may require decades at the minimum, especially concerning biological objectives 1-4. The DRRP will establish a repeatable, robust monitoring element intended to track trends in fine sediment, habitat, water temperature, and hydrology within the emphasis area. Objectives to manage the program and conduct outreach with the Tribal public are included. Work elements will center on the planning and design of constructed habitat or watershed restoration features, as well as the planning and monitoring to track effectiveness.

A summary of the biological objectives includes:

1. Restoration of habitat complexity
2. Reduction in fine sediment—delivery and bed composition
3. Restoration of hydrologic function
4. Protect water temperature, increase thermal refugia.
5 Increased floodplain and wetland habitat areas
6. Protection of critical habitat areas
7. Improve upland and riparian vegetation composition
8. Fill data gaps and evaluate status and trends
9. Conduct Outreach to Tribal public
10. Manage the Deschutes River Restoration Program

Objective 1: Restore habitat complexity.

Methods: Implement instream habitat enhancements that increase pool size and frequency, overhead cover, off channel habitat, and increase spawning habitat.

- Add large wood features
- Construct new main and side channel segments
- Construct new channel patterns, profiles and bed forms.
- Restore/Enhance riparian and wetland vegetation.

Applicable Work Elements:

WE #	WE Name
29	Increase In-stream Habitat Complexity
30	Realign, Connect, and/or Create Channel
31	Relocate Road

180	Enhance Floodplain
181	Create, Restore, and/or Enhance Wetland
184	Install Fish Passage Structure
186	Operate and Maintain Habitat / Passage
40	Install Fence
22	Maintain Vegetation
47	Plant Vegetation
53	Remove Vegetation
99	Outreach and Education
22	Maintain Vegetation
34	Develop Alternate Water Source
175	Produce Design and/or Specifications
122	Provide Technical Review
165	Produce Environmental Compliance Documentation

Objective 2: Reduce the delivery of fine sediment to stream channels from the uplands and reduce the composition of fine sediment in stream beds.

Methods: 1. Develop and implement projects that address limiting factors at the watershed scale.

- reduce road densities
- rehab compacted surfaces
- improve livestock management
- restore appropriate upland vegetation types
- restore wetland storage and energy release features

2. Restore fluvial processes that transport and sort sediment loads.

Applicable Work Elements:

WE #	**WE Name**
33	Decommission Road
38	Improve / Relocate Road
55	Upland Erosion and Sedimentation Control
175	Produce Design and/or Specifications
122	Provide Technical Review
165	Produce Environmental Compliance Documentation
188	Provide access and Public Information
22	Maintain Vegetation
47	Plant vegetation

Objective 3: Restore hydrologic function with in priority watersheds.

Methods: 1. Reduce road densities and other hydrologically connected features.

2. Restore compacted surfaces, and manage both upland and riparian vegetation.

3. Restore floodplain and wetland features where appropriate.

Applicable Work Elements:

WE #	WE Name
33	Decommission Road
38	Improve / Relocate Road
55	Upland Erosion and Sedimentation Control
175	Produce Design and/or Specifications
122	Provide Technical Review
165	Produce Environmental Compliance Documentation
22	Maintain Vegetation
47	Plant vegetation

Objective 4: Maintain or improve stream temperatures

Methods: Protect functioning floodplains, wetlands and springs.

Applicable Work Elements:

WE #	WE Name
30	Realign, Connect, and/or Create Channel
40	Install Fence
180	Enhance Floodplain
181	Create, Restore, and/or Enhance Wetland
22	Maintain Vegetation
26	Investigate Trespass
47	Plant Vegetation

Objective 5: Increase and enhance wetland areas

Methods: Conducting planning and analysis prioritize wetland restoration sites.

- Restore incised channel and wetland features
- Incorporate appropriate surface water pond features where appropriate (mimic beavers)
- Restore vegetation
- Improve livestock management

Applicable Work Elements:

WE #	WE Name
29	Increase In-stream Habitat Complexity
30	Realign, Connect, and/or Create Channel
180	Enhance Floodplain
181	Create, Restore, and/or Enhance Wetland
184	Install Fish Passage Structure
186	Operate and Maintain Habitat / Passage
40	Install Fence
47	Plant Vegetation
53	Remove Vegetation
99	Outreach and Education
22	Maintain Vegetation
34	Develop Alternate Water Source
175	Produce Design and/or Specifications
122	Provide Technical Review
165	Produce Environmental Compliance Documentation

Objective 6: Protect critical habitat areas

Methods: Maintain the existing riparian fence network. Work with range users in the development of new projects to include an improved livestock management. Include the long term maintenance into every project.

Applicable Work Elements:

40	Install Fence
47	Plant Vegetation
53	Remove Vegetation
99	Outreach and Education
22	Maintain Vegetation
34	Develop Alternate Water Source

Objective 7: Improve riparian and upland vegetation composition.

Methods: Plant and manage vegetation to restore riparian and upland processes important fish habitat and watershed health.

Applicable Work Elements:

40	Install Fence
47	Plant Vegetation
53	Remove Vegetation

99	Outreach and Education
22	Maintain Vegetation
34	Develop Alternate Water Source

Objective 8: Fill data gaps and conduct status and trend monitoring of limiting factors

Methods: Collect stream flow, temperature, sediment, and habitat data. Develop methods and analysis to track trends over time.

Applicable Work Elements:

WE #	WE Name
148	Install Flow Measuring Device
157	Collect / Generate / Validate Field and Lab Data
162	Analyze / Interpret Data
115	Produce Inventory or Assessment
160	Create / Manage / Maintain Database
99	Outreach and Education
183	Produce / Submit Scientific Findings Report

Objective 9: Conduct outreach with the Tribal public.

Methods: Create open line of communication with the Tribal public to improve relationship and build better understanding of proposed projects and objectives. Promote Tribal participation in project development.

Applicable Work Elements:

WE #	WE Name
99	Outreach and Education
119	Manage and Administer Projects
191	Watershed Coordination

Objective 10: Manage and administer the Deschutes River Restoration Program.

Methods: Manage and administer DRRP and non-BPA funding sources. Develop priorities, projects, and funding proposals. Produce annual and quarterly reports to satisfy contractual obligations.

Applicable Work Elements:

WE #	WE Name
114	Identify and Select Projects
118	Coordination
119	Manage and Administer Projects
132	Produce Annual Report

185	Produce Pisces Status Report
115	Produce Inventory or Assessment
122	Provide Technical Review
174	Produce Plan
191	Watershed Coordination

5th field huc	Project	Partner	Description	Limiting Factors Addressed	Species
Badger Creek	Culvert removal	NRCS, NOAA	Fish passage for all life stages	Habitat quantity	STH, CK, RB, PL
Badger Creek	Road removal	OWEB, NRCS, PRB Fund	Remove road from floodplain. Create fish habitat and wetlands	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL
Beaver Creek	Riparian restoration	OWEB, NRCS Spill Settlement	Riparian planting to improve streambank stability, reduce erosion, provide shade and overhead cover	Habitat complexity, water temperature, and fine sediment	STH, CK, RB, PL
Beaver Creek	Road obliteration	NRCS	Remove legacy roads that have contributed to altered hydrology and erosion.	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL
Beaver Creek	Road fill and berm removal	OWEB, NRCS Spill Settlement	Removal of legacy road fill in stream channel and floodplain. Create side channel habitat	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL
Beaver Creek	Large wood additions	OWEB, NRCS Spill Settlement	Addition of large wood using engineered logjams to improve habitat complexity	Habitat complexity	STH, CK, RB, PL
Coyote Creek	Road obliteration	PRB Fund, NRCS	Road decommissioning, ripping and rocking to reduce sediment delivery and improve hydrology	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL
Coyote Creek	Riparian and wetland exclosure	OWEB, NRCS Spill Settlement	Livestock management to protect meadow function, water storage and reduce sediment inputs to spawning habitat downstream.	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL
Coyote Creek	Instream and wetland restoration	Spill Settlement, NRCS, PRB Fund	Restoration work to create improved wetland and floodplain function to store water and reduce erosion.	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL
Coyote Creek	Bank stabilization, gabion removal	OWEB, NRCS Spill Settlement	Removal of rock gabion structures and replacement with bioengineered bank stability treatment (soil lift Figure 4.).	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL
Lower Deschutes	Tule reed restoration	NRCS	Streambank stabilization and habitat restoration	Habitat complexity, water temperature, and fine sediment	STH, CK, RB, PL, BT

Meitolus	Mariel Creek culvert replacement	OWEB, NRCS, Pelton Round Butte Fund	Fish passage for all life stages	Habitat quantity	STH, CK, RB, PL, BT
Mill Creek	Mill pond and channel restoration	OWEB, NRCS, PRB Fund	Stream restoration to improve habitat complexity in Mill Creek	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL, BT
Quartz Creek	Gabion removal and bank stabilization	OWEB, NRCS Spill Settlement	Removal of rock gabion structures and replacement with bioengineered bank stability treatment (soil lift Figure 4.)).	Fine sediment, water temperature, and altered hydrology	STH, CK, RB, PL, BT
Shitike Creek	Shitike Creek head works removal	OWEB, NRCS, PRB Fund	Removal of legacy irrigation diversion structure	Habitat quantity	STH, CK, RB, PL, BT
Shitike Creek	Shitike Creek channel restoration at city park	OWEB, NRCS, PRB Fund	Stream restoration to improve habitat complexity in lower Shitike Creek	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL, BT
Shitike Creek	Berm removal and habitat and flood plain development	OWEB, NRCS, PRB Fund	Stream restoration to improve habitat complexity in lower Shitike Creek	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL, BT
Shitike Creek	Channel restoration near sewage treatment plant		Stream restoration to improve habitat complexity. Ongoing before MOA, implemented in 2008-2009.	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL, BT
Skookum Creek	Culvert removal	OWEB, NRCS	Fish passage	Habitat quantity	STH, CK, RB, PL, BT
Skookum Creek	Skookum Creek road obliterations	OWEB, NRCS	Road decommissioning, ripping and rocking to reduce sediment delivery and improve hydrology	sediment reduction and improved hydrology	STH, CK, RB, PL, BT
Warm Springs River	Lemiti Meadow restoration	OWEB, NRCS, PRB Fund	Vegetation treatments to improve altered hydrology	Water temperature, and altered hydrology	STH, CK, RB, PL, BT
Warm Springs River	Road obliteration	OWEB, NRCS	Road decommissioning, ripping and rocking to reduce sediment delivery and improve hydrology	sediment reduction and improved hydrology	STH, CK, RB, PL, BT
Warm Springs River	Large wood additions	OWEB, NRCS, PRB Fund	Addition of large wood using engineered logjams to improve habitat complexity	Habitat quantity and complexity, water temperature, fine sediment	
Warm Springs River	Cedar Meadow restoration	OWEB, NRCS	Vegetation treatments to improve altered hydrology	Altered hydrology	STH, CK, RB, PL, BT
Clackamas	Big and Clackamas Meadows encroachment treatments	OWEB, NRCS	Vegetation treatments to improve altered hydrology	Altered hydrology	STH, CK, RB, PL, BT

Ongoing and Reservation wide projects				
Reservation wide	LIDAR mapping	Mapping to assist restoration design	Habitat quantity and complexity, water temperature, fine sediment	STH, CK, RB, PL, BT
Reservation wide	Watershed maintenance	Annual maintenance of riparian fence network and off channel livestock watering sites	Habitat quantity and complexity, water temperature, fine sediment, altered hydrology	STH, CK, RB, PL, BT
Reservation wide	Watershed planning	Planning and support for projects to assist with environmental compliance, permitting, public scoping and data collection	Habitat quantity and complexity, water temperature, fine sediment, altered hydrology	STH, CK, RB, PL, BT

Table 7. Summary of projects proposed through the Deschutes River Restoration Program.

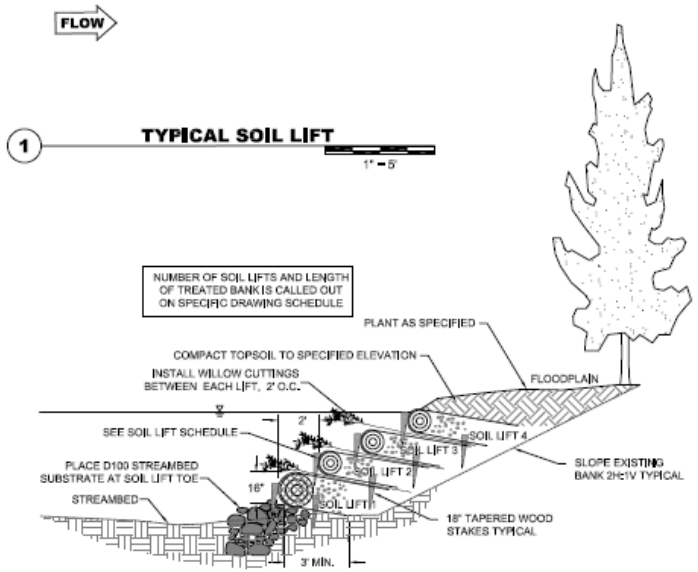

Figure 4. Diagram of a typical soil lift bank treatment. These treatments will withstand increased shear along the bank and allow vegetation to become established.

G. Facilities and equipment

This project will be managed from the Natural Resources building in Warm Springs, Oregon located on the Warm Springs Indian Reservation. Office space and utilities are currently provided through addition grant and contract dollars. The Habitat Program on the Reservation is small with three full time staff, two vehicles, one six wheeler ATV, two computers, some fence supplies, and tools stored a small storage shed. As the program grows funding through this contract will support the growing needs of a full service restoration and land management operation.

It is anticipated that through the life of this contract equipment will be purchased to develop and monitor projects. Capital items to be purchased will likely include a GPS and survey equipment to design and lay out restoration projects, an additional ATV to assist with weed and vegetation management, computers and software to manage and administer the program. A shop building for storage and work space will be required to support the needs of the program and will be incorporated into the contract. Hand tools, monitoring equipment, office supplies, and vehicle accessories will be purchased through this contract as well.

A list of this equipment and its condition will be maintained and supplied to the contracting officer annually.

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I. Key Personnel

Scott Turo

B.S. Fisheries and Aquatic Ecology from the University of Montana '97

- November 2004-present

Fish Habitat Program Manager and Off Reservation Habitat Biologist
The Confederated Tribes of the Warm Springs Reservation of Oregon
Warm Springs, OR

Duties include Habitat Program development, and project management. Endangered Species Act consultation for Reservation projects. Represent Tribal interests within the ceded lands across eastern Oregon.

- November 2001- November 2004

Fish Biologist—Water Rights and Protection Division
Yurok Tribal Fisheries Program
Weitchpec, CA

Managed a division of the Tribal Fisheries Program focused on monitoring the impacts of regulated flow on the Klamath and Trinity Rivers. Conducted life history investigations of green sturgeon using radio and sonic telemetry techniques, and studied adult and juvenile use of thermal refugia on the Klamath and Trinity Rivers.

- 1996-2001

Held various technician and crew leader positions working on projects from Alaska to Wyoming. Through this I gained experience and exposure with all five species of Pacific salmon, and many resident interior salmonid species and their habitats.

Scott Struhs

B.S. Fishery Resource Management from the University of Idaho **'98**
M.S. Hydrology from University of Idaho **2006**

- August 2005-July 2007

Water Quality Planner
Nez Perce Tribe
Lapwai, ID

Managed the Clean Water Act (CWA) 106 Program. Represented the Nez Perce Tribe Water Resources Division in natural resource management within the Tribe's reservation and ceded lands.

- July 2001-August 2005

Fish Biologist
Nez Perce Tribe
Orofino, ID

Worked on the Nez Perce Tribe Spring Chinook Monitoring and Evaluation Project monitoring juvenile and adult spring Chinook in three northern Idaho streams. Tasks included juvenile survival estimates, fish density estimates, juvenile fish marking, adult marking and spawning surveys.

Johnny Holiday Sr.

- May 2008-present

Fish and Wildlife Technician II
Fish Habitat Program
The Confederated Tribes of the Warm Springs Reservation of Oregon
Warm Springs, OR

Conducted fence and water develop maintenance. Managed projects and contractors for road decommissioning projects. Participated in fisheries monitoring data collection.

13+ years of experience as a wildland fire suppression crew boss prior to becoming a Fish and Wildlife Technician II.