THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

Fisheries Department
Branch of Natural Resources
P.0. Box C, Warm Springs, Oregon 97761
Phone (541) 553-3557
Fax (541) 553-7827

Date: October 26, 2011

To: Rich Alldredge, Independent Scientific Review Panel Chairman

From: Jen Graham, Fisheries RM&E Supervisor
Scott Turo, Habitat Program Supervisor

RE: CTWSRO Accord Project No. 2008-301-00 Narrative Rewrite

We would like to thank ISRP for their multiple reviews and guidance in the development of a more comprehensive narrative for BPA, Columbia River Basin Fish Accord, funded project 2008-301-00. Prior to revising the attached narrative all previous ISRP reviews were revisited as well as narrative format to ensure all concerns were addressed. Substantial changes were made to the narrative that included additional details, rational for identified habitat based improvements, and their associated linkage between limiting factors and biological responses. Notable changes include:

- Changing of the narrative name from "*Deschutes River Restoration Program*" to "*Habitat Restoration Planning, Design and Implementation within the boundaries of the Confederated Tribes of the Warm Springs Reservation of Oregon, lower Deschutes River, Oregon*". The previous title implied a much larger geographic scope then intended. The new title clarifies how funds will be used as well as the area of focus being waters within the boundaries of the CTWSRO boundary;
- In previous versions of the narrative it was unclear that we were not proposing individual projects for review. This version clarifies that a programmatic approach has been taken which describes a strategy for identifying projects to be implemented and descriptions of projects, which have been identified through regional planning documents and addresses limiting factors within those documents. This clarification is important because majority of the BPA funds will be used for administration (*i.e.,* planning, design) of the CTWSRO Fisheries Habitat Program;
- Additional clarity has been added through restructuring of the document; improving the flow. This was done by development of a coherent restoration

philosophy (protecting, managing, and restoring aquatic productivity) linking "the problem" (lack of habitat complexity, sedimentation, increased water temperatures, and altered hydrology) with anticipated biological benefits to focal species (*Oncorhynchus mykiss and O. tshawytscha*) which are supported by regional and Tribal planning documents; and

- Review and revision of restoration evaluation and prioritization criteria consistent with recent approaches modified from Beechie *et al.* (2008) and Beechie *et al.* (2010) and are consistent with the CTWSRO Integrated Resources Management plans.

Description of changes by narrative section

- Abstract (p. 1): Re-written to summarize the contents of the rewritten narrative with clarification that this is a programmatic and not individual projects for review.
- Technical and/or scientific background (p. 2 - 9): Significant re-writes were completed in this section to make it more concise and incorporate fish species information.

  This section includes:

  - Description of the programmatic geographical scope;
  - Background information on the CTWSRO management authority and species within the boundaries of the Reservation;
  - Clear development of the programmatic goal as defined by the CTWSRO Habitat Restoration Program (CTWSHRP);
  - Definition of "the problem" within the programmatic area including identification of limiting factors and their impact to focal species summer steelhead (*Oncorhynchus mykiss*) and spring Chinook (*O. tshawytscha*) and associated literature supporting the CTWSHRP goal;
- Rationale and significance to regional programs (p.10 - 14): The information within this section was not changed from previous versions (includes Deschutes River Subbasin Plan and Mid-Columbia Steelhead Recovery Plan) other than to add how the programmatic is related to the goals of the Columbia River Basin Fish Accords and CTWSRO Integrated Resource Management Plans.
- Relationship to other projects (p. 15): This list was updated to include new and/or previously unlisted projects.
- Project History (p. 16): No change.
- Proposed biological objectives, work elements, and methods (p. 16 - 50): This section has been completely re-written for clarity. While the existing and identified projects for implementation has remained unchanged, the format in which it is presented and detail has been changed significantly. Information within this section includes:

- Use of accord funds
- Tribal background information
  - Treaty of Middle Oregon and land ownership
  - CTWSRO Fisheries Department directives
  - Communication with the CTWSRO government and membership
- Section I – CTWSHRP Project Evaluation: In addition to the previously explained interdisciplinary approach employed by CTWSRO to guide natural resource management, specific criteria for restoration project evaluation are being developed. Projects proposed in this programmatic are in accordance with recommendations from tribal, state and federal planning documents and benefits are readily identifiable (*e.g.*, removing berms in floodplain, removal of roads in riparian and culverts in streams, addition of in-stream logs and woody debris for cover in a reach devoid of logs due to past riparian logging) and stem from legacy impacts (*e.g.,* logging, road building, and grazing) for which causes no longer exist due to change in management priorities and practices. The CTWSRO endeavors to develop a more comprehensive process for prioritizing and evaluating restoration projects under development. This evaluation process will incorporate the most current ecological philosophy that is in agreement with CTWSRO cultural and social values, adaptive decision and problem-solving strategies and tools developed for restoration planning, such as a system for weighting and scoring criteria and the River Restoration Analysis Tool, available on-line. With the development of the CTWSHRP, the process for prioritizing and evaluating restoration projects will be needed for proper planning and justification for funders.
- Section II – Maintenance of existing habitat protection projects: This information has not been changed; however it is presented in a different format. This portion of the narrative is based on the maintenance of riparian and wetland fences and off-site water developments along with restoration projects after completion.
- Section III – Planning and design of habitat projects: Again this section has changed significantly and is presented in a new format for clarity. Additional information as requested by ISRP has been added (see Summary of ISRP concerns and how they were addressed for more specific information). This section includes the description of three multi-phase projects to be planned, designed, and implemented in Warm Springs River, Beaver Creek Watershed, and Mill Creek.
- Section IV – Habitat project monitoring and reporting: Details for monitoring projects proposed in this programmatic are described in this iteration of the narrative. In addition, general monitoring metrics, frequency, and protocol by project type used by CTWSRO are listed in the appendix. Specific monitoring goals linked to project objectives are stated. Monitoring approaches to accomplish data collection and how

measured parameters are to be compared are provided. The CTWSRO will further develop restoration monitoring plans during final planning, which may include choosing appropriate control sites, determining sample size in order to confidently measure effect size, and plan for review, feedback and adaptation in the design.

- Facilities and equipment (p. 50): No change to content.
- References (p. 51 - 55): Updated to include new literature cited.
- Key Personnel (p. 55 - 58): Updated to include new staff and expertise.

Summary of ISRP concerns and how they were addressed

From the February 2011 ISRP review (ISRP 2011-4), further information was requested for the project to adequately meet scientific review criteria. Specifically:

> *"In order to properly justify habitat restoration projects, the project sponsors need to provide sufficient essential details that enable the ISRP to assess the value of the project on scientific merit.*
>
> *This basic information includes:*
> 1. *an adequate description of what will be done, including the details of anticipated habitat benefits;*
> 2. *identification of focal species and some quantitative expression of how the project would contribute to the species' recovery;*
> 3. *an ecological justification of the project, often achieved by citing its importance to successful implementation of the appropriate subbasin plan and by showing linkages with ongoing recovery programs in the area;*
> 4. *evidence of landowner cooperation, usually documented by reference to conservation easements and other long-term agreements; and*
> 5. *a thorough description of the post-implementation monitoring plan, including the procedures used to verify the project's habitat benefits and biological effectiveness."*

1. "…*adequate description of what will be done…"*

It is important to note that the intent of the programmatic has not changed; however, information is presented in a different format and with additional detail to meet scientific review criteria. While complete project descriptions are not available for individually identified projects within the programmatic, we feel the information added clarifies the merit of each project (Section F-III, p. 16 - 46).

Activities described include but are not limited berm removal within floodplain habitat, decommissioning of roads, and large wood placement. The exact location details and project designs are not included. This level of detail will be developed through the

CTWSHRP, Accord funding, with majority of the implementation funding through other secured and unsecured sources (*e.g.,* OWEB, NRCS, Tribal funds). Project descriptions include: watershed descriptions; use of Accord funds; timelines; habitat improvement activities; anticipated benefits to the fisheries resource; linkage to planning documents; and regulatory processes to be completed.

The revised narrative discusses three, multiphase, projects that will be designed, planned, and implemented during the life of the Columbia River Basin Fish Accords. All of these projects are priorities in both the Deschutes Subbasin Plan (NWPCC 2003; MP p. 15 - 17) and the Mid Columbia Steelhead Recovery Plan (Carmichael et al. 2008; Section 9.3). Physical and biological benefits to aquatic habitat and production are anticipated to be both immediate and geomorphically appropriate resulting in sustained increases in habitat complexity and quantity, improving survival during all life stages.

Following are brief descriptions of each project and anticipated benefit:
Potters Pond to Boulder Creek Restoration, Mill Creek (pg. 22 – 28)
This project will restore the aquatic habitat and fluvial process in a priority watershed where past land use has resulted in degraded spawning and rearing habitat for Spring Chinook salmon and Mid-Columbia Summer Steelhead. Stream restoration design (approximately 3,000 linear feet) will include the addition of large woody debris, increased pool, glide, and riffle habitats taking into account sinuosity and valley gradient. Complex, connected, floodplain wetland features will provide additional habitat diversity, thermal variability, and refuge for all fish species. Anticipated biological benefits include increased habitat availability and complexity for all life stage requirements. Improved floodplain connection, and enhanced riparian vegetation will improve water quality and water temperatures for target species.

Large woody debris additions/placements into the Warm Springs River (pg. 28 – 35)
The upper Warm Springs River (upstream of Hwy 26) is the last stronghold for wild spring Chinook salmon in the Deschutes River Basin. The Habitat Program will develop and execute a habitat enhancement project in the upper 10 miles of the Warm Springs River to create additional rearing habitat by adding large wood debris to the stream channel. Recruitment of large woody debris to the active channel has been reduced in the upper Warm Springs River by past timber harvest and the associated road building needed to access the timber. Past habitat surveys show that the quantity of large woody debris in the project reach is well below regional standards that support a proper functioning habitat condition. Past habitat surveys show that this reach is low in natural wood accumulations that provide essential habitat for rearing salmonids. Anticipated biological benefits include increased survival of fry to smolt due to the increased quantity of complex habitat available.

Beaver Creek Enhancement Projects (p. 35 – 46)
Fine sediment delivery from the Coyote and Quartz Creek watersheds into lower Beaver Creek is a major factor limiting the production and recovery of spring Chinook, and summer steelhead. Up to 35% of the spring Chinook spawning in Beaver Creek occurs downstream on the confluence with Coyote and Quartz Creeks. Surveys of the streambed

composition in Beaver Creek show that fine sediment levels are approaching 40%. Anticipated biological benefits include an increase in primary productivity of the aquatic system that will result in increased growth and survival of target salmonid species. Increases in the egg to fry survival life stage will be expected due to reduced fine sediment composition in spawning gravels and entombment of incubating eggs in redds.

2. "*…identification of focal species and some quantitative expression…"*
Focal species for this programmatic are summer steelhead and spring Chinook. (identified in abstract; p. 1). These species were identified based on their importance in regional and Tribal planning documents and cultural significance. While focal species have been identified, we have also recognized that habitat restoration and enhancement action benefits a larger suite of native flora and fauna (*e.g.,* bull trout, redband trout, Pacific lamprey). Quantification of how the project would contribute to species' recovery is very speculative and beyond the scope of this programmatic.

3. *"…ecological justification of the project…"*
The ecological justification for this project has been described at a variety of levels: basin, subbasin, watershed, and site specific.

In Section C (Rationale and significance to regional programs) excerpts from the Deschutes River Subbasin Plan, Management Plan, are included which specifically identify habitat improvements to benefit survival of all life history stages. The Mid-Columbia River Steelhead Recover Plan is also included with a table extracted directly from the plan. Within the table, major limiting factors, threats, and their associated impact on species and life stage are identified. More detail is given within Section C about the programmatic's linkage to the goals of the Columbia River Basin Fish Accords (pg. 10) , NWPPC Fish and Wildlife Program (p. 10 – 13), and Tribal Integrated Resource Management Plans (p. 13).

In the introduction (Section B; p. 4 - 10), we have conducted a literature review that links limiting factors altered hydrology, habitat complexity, fine sediment, and water temperature to species habitat requirements. Also within the introduction (p. 4 - 10) the literature review has been linked to "the problem" within the boundaries of the Reservation and their relationship to regional and Tribal planning documents.

Within Section F-III (p. 16 - 46), site-specific ecological justification is given. Within these descriptions is a definition of the problem, a general overview of habitat work to be completed and the associated benefit to fishes. For example, restoring hydrologic connectivity in the floodplain of Mill Creek near Potter's Pond will provide off-channel habitat for fishes and reduce erosion, turbidity and sedimentation. Enhancement of large in-stream wood in a 6.2 rkm reach of Warm Springs River to more normative levels, will provide cover for all life-stages of salmonids. Reducing road densities and removal of roads in floodplains, developing grazing rotations, fencing and planting riparian zones in the Beaver Creek drainage will reduce sediments, which may increase egg survival and hatch success for salmonids.

4. "*…evidence of landowner cooperation…"*

All of the projects to be designed and implemented within the programmatic lie solely on the Reservation and do not require individual land owner consent or conservation easements. We have provided an explanation of CTWSRO management authority as reserved in the Treaty of 1855 (p. 16). Additionally we describe communication with the Tribal government and constituency in Section F (p. 16 – 17). Following is a brief summary of the information.

The Treaty of Middle Oregon (1855), memorializes and acknowledges the rights the tribes possessed prior to June 25, 1855. While the United States hold legal title to trust property, the Tribes or individual members possess the beneficial title. The remaining one percent of Reservation land is held in title by the United States. These parcels are subject to the complete civil jurisdiction of CTWSRO.

Land management and activities, such as habitat improvement activities, are covered under the IRMP, which includes a process for the review of all projects that may impact the physical, biological, social, cultural or economic resources of the Tribe. The process is described on page 13 in the narrative.

5. "*…thorough description of the post-implementation monitoring plan…"*

Based on project objectives, monitoring plans for each proposed restoration site is described to the extent of what monitoring will be done and what objective it addresses and whether effectiveness monitoring is related to habitat or is used to measure biological effects. The monitoring plans are not developed to the extent that would be expected in a methods section. That is, protocols to be used are referenced but the spatial and temporal sampling regime has not been determined nor has a power analysis been done yet to determine sampling effort required to measure the anticipated biological effect. Monitoring physical elements of habitat characteristics pre- and post-restoration are straightforward and should withstand technical review at this point. During final planning, the CTWSHRP will engage CTWSRO staff specialized in developing restoration monitoring plans, which include choosing appropriate control sites, determining sample size in order to confidently measure effect size, and plan for review, feedback and adaptation in the design.

We have streamlined some of our data collection and population status and trends and restoration monitoring activities among Accords projects. We are also improving our data management and retrieval operations to facilitate data exchange among biologists within our Fisheries Department, the CTWSRO Branch of Natural Resources, as well as with outside natural resource professionals.

The ISRP response requested that an improved logic path supporting project prioritization and process based restoration in reference to Beechie et al. (2008) and Beechie et al. (2010) be developed. Each proposed restoration project should:

1. Address the root cause of the degradation.
2. Must be consistent with biological potential of the site.
3. Be implemented at a scale commensurate with environmental problem.

4. Have a clearly articulated expected outcome for ecosystem dynamics.

The CTWSHRP will continue to refine our restoration evaluation and decision support system to identify projects with high biological potential and work towards a restoration program that focuses on projects that restores ecosystem resilience by reestablishing normative rates and magnitudes of physical, chemical, and biological processes (*sensu* Beechie et al. 2010). There has been very little habitat restoration work done on the Reservation, however, the CTWSHRP has implemented numerous restoration projects on ceded lands. Therefore, there are sites that show a legacy of past resource use and extraction activity that have not been addressed. Since 1992, the CTWSRO has implemented the IRMP to provide a more interdisciplinary approach to resource management. The IRMP allows for continued resource extraction with protection and mitigation measures. Proposed restoration actions in this narrative represent the most flexible option is a simple decision support system, by project type (*e.g.,* restore watershed processes and instream habitat enhancement, Beechie et al. 2008). As the CTWSHRP program continues to develop, makes contacts with other restoration practitioners, internalizes and incorporates the latest concepts and approaches in restoration ecology and uses newly available tools for restoration planning (*e.g.,* River Restoration Analysis Tool, http://www.restorationreview.com). These will allow the CTWSHRP to promote ecologically sound restoration projects on the CTWSRO and ceded lands.

All of the proposed projects address the root cause of habitat degradation by eliminating further decline in habitat condition at each site. Land use compatible with the restored or protected site will be established to ensure long term potential is achieved. The overall restoration strategy and expected ecological outcome is increased rearing habitat availability and improved quality in all watersheds. From this we expect to increase rearing capacity and survival to increase natural origin out migrant production. We intend to implement the highest priority largest scale projects in each Subbasin of the Warm Springs River and Shitike Creek to improve habitat availability and quality at the greatest extend, while ensuring its protection and maintenance indefinitely. As part of the Tribal government's Natural Resource Branch the CTWSHRP works alongside the other Departments (Forestry, Fire, Wildlife, Range and Agriculture, Roads, etc) to address all the problems impacting the focus watershed. It is important that the reviewers understand the CTWSHRP focus on the watershed improvements with in the floodplain, wetted channel and wetland sites, while other departments focus on the rest of the focus watershed in a coordinated resource assessment driven process guided by the planning aspects of the Tribal Integrated Resource Management Plan (IRMP). This process addresses ISRP concerns that a simple project proposing the addition of LWD to a particular stream channel or a stream channel rehabilitation project does not address the root cause of degradation.

The biological outcome expected from this work centers on increased aquatic productivity and in turn an increase in salmonid production. Recruits per spawner data from the Warm Springs River shows a declining trend in recruits as spawner numbers increase. We feel this supports our strategy to develop projects that significantly increase

habitat availability and reduce sediment inputs that limit production in all wild spawning populations of the Warm Springs River. Mill Creek, Beaver Creek and the Warm Springs River are the principle spawning tributaries for spring Chinook salmon Warm Springs River. Shitike Creek has strong populations of all species and provides is an excellent strong hold to support recovery. All of the projects will be located within spawning and rearing reaches where habitat surveys support poor habitat condition in comparison to reference condition and regional matrices for ESA consultation determinations.

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:	Habitat Restoration Planning, Design and Implementation within the boundaries of the Confederated Tribes of the Warm Springs Reservation of Oregon, lower Deschutes River, Oregon. (*formerly titled: Deschutes River Restoration Program*)
Province:	Columbia Plateau
Subbasin:	Deschutes
Lead Contact:	Scott Turo 541-553-2025 or sturo@wstribes.org Jen Graham 541-553-3585 or jgraham@wstribes.org

A. Abstract

The Confederated Tribes of the Warm Springs Reservation of Oregon (CTWSRO), Branch of Natural Resources, Fisheries Department Mission is "*To provide fish populations at harvestable levels, allowing harvest opportunities for tribal members using information gained through the research, management, production, and habitat programs while excising our co-management authority*". A key piece to meeting the department's mission is the identification of habitat based bottlenecks which limit the production of culturally significant fishes. As such, under the Columbia River Accords (Accords), the Fisheries Habitat Program (a division of the Fisheries Department) will manage and execute the Confederated Tribes of Warm Springs Reservation of Oregon Habitat Restoration Program (CTWSHRP; formerly referred to as Deschutes River Restoration Program [DRRP]). The goal of the CTWSHRP is to protect, manage, and restore aquatic habitat through planning, design, and implementation of projects directed at factors limiting salmonid and other native fishes production within CTWSRO streams (Warm Springs River and Shitike Creek watersheds). Individual projects will focus on habitat improvement for Mid-Columbia River summer steelhead (*Oncorhynchus mykiss*) and spring Chinook (*O. tshawytscha*). However these activities are anticipated to have positive benefits for other native fish species including but are not limited to: fall run Chinook salmon (*O. tshawytscha*), bull trout (*Salvelinus confluentus)*, redband trout (*O. mykiss gairdneri)* and Pacific lamprey (*Lampetra tridentata*). Limiting factors to be addressed by CTWSHRP projects are altered hydrology, habitat complexity, fine sediment, and water temperature. This programmatic approach is consistent with needs identified in multiple regional planning documents including the Columbia River Accords, Deschutes River Subbasin Plan (NWPPC 2003), the Northwest Power Planning and Conservation Council Programmatic (NWPPC 2009), and CTWSRO Integrated Resource Management Plans (IRMP; CTWSRO 1992*a*; CTWSRO 1992*b*). Funding through the Accords will support program administration, restoration design, planning, maintenance of current habitat protection projects, matching funds for implementation of new projects, and permitting. Due to cost and scope of projects, a programmatic approach has been taken in the writing of this narrative. To complete projects described in the programmatic, match and/or in-kind funds from multiple funding sources will need to be secured.

B. Technical and/or scientific background

Programmatic Area Description

The Confederated Tribes of Warm Springs Reservation of Oregon (CTWSRO; referred as also as "Reservation") is located on the east slope of the Cascade Mountains (Figure 1). The Reservation covers approximately 240,000 hectare (ha) including majority of the Deschutes River Subbasin downstream of the Pelton-Round Butte hydro-electric complex of three dams (rkm 161). Reservation boundaries are the crest of the Cascades Mountain Range to the north and west, Deschutes River to the east, and Metolius River to the south. Warm Springs River is the largest watershed within the Reservation, flowing 85 rkm and draining 54,394 ha into the lower Deschutes River at rkm 136 (Figure 2). Major tributaries to the Warm Springs River are Beaver, Badger, and Mill creeks. Shitike Creek enters the Deschutes River at rkm 157 and is the third largest tributary to the lower Deschutes River, flowing for 48 rkm and draining 36,000 ha.

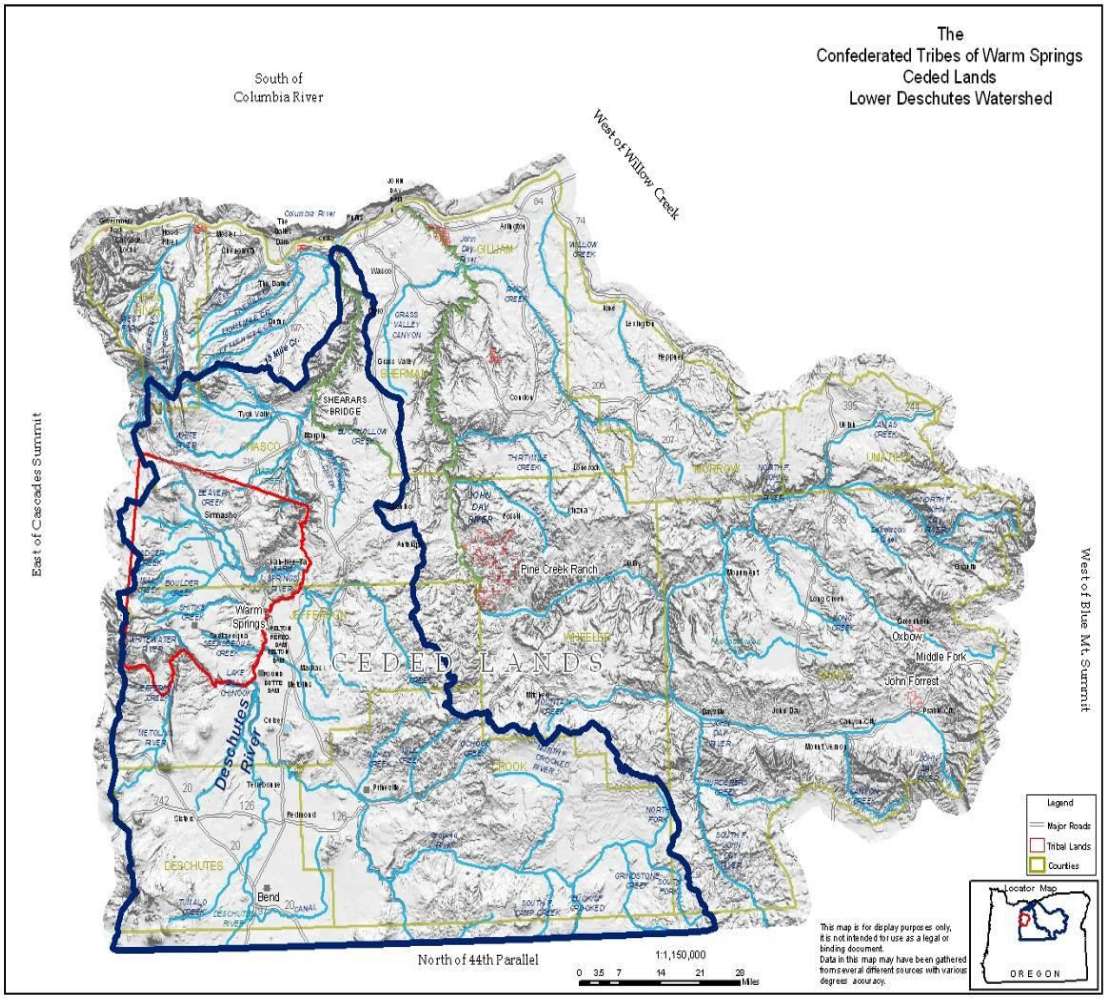

Figure 1. Map of the Confederated Tribes of Warm Springs Reservation of Oregon ceded lands with the lower and middle Deschutes River subbasins outlined in blue.

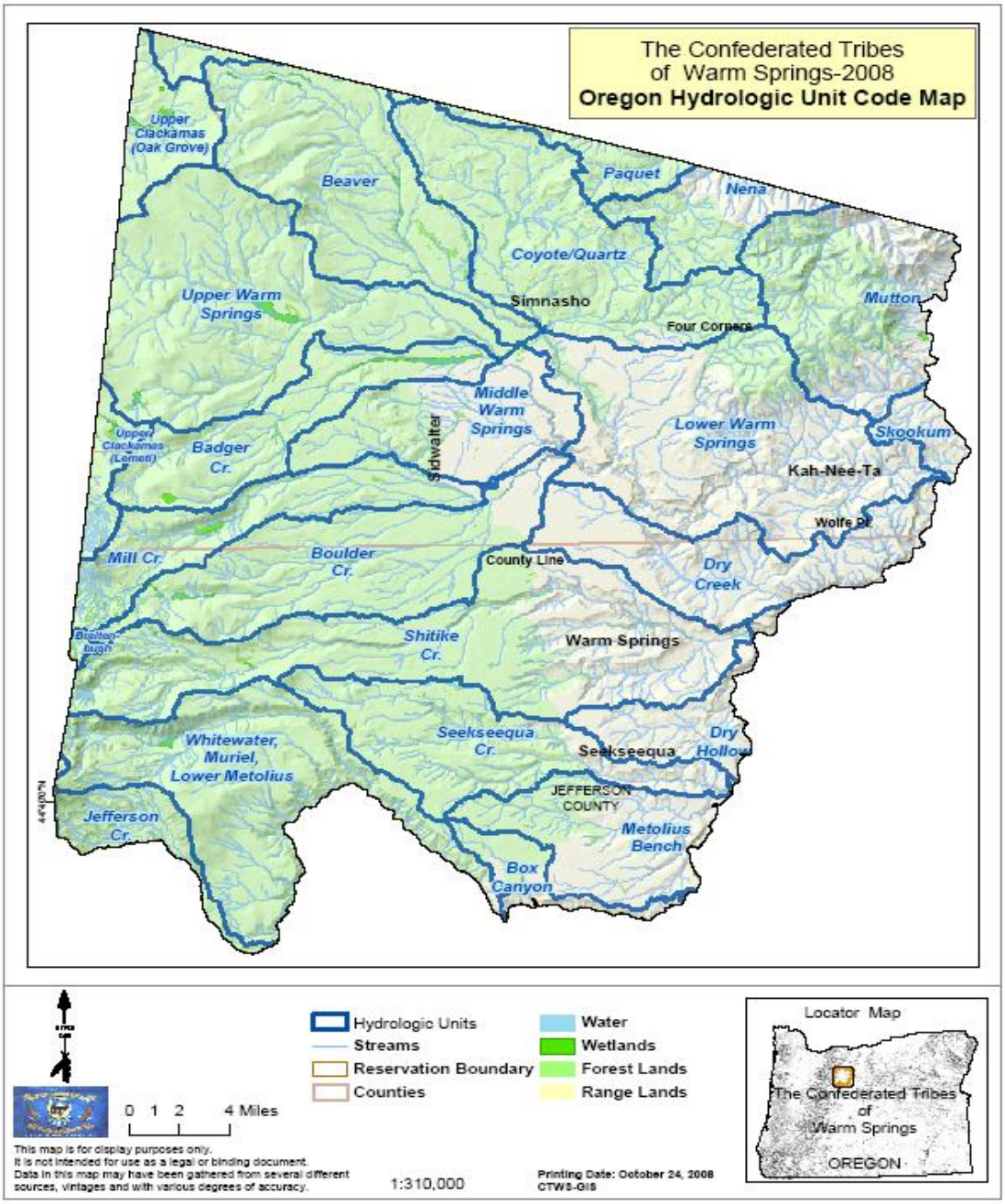

Figure 2. Map of The Confederated Tribes of the Warm Springs Reservation of Oregon displaying 5th field hydrologic units, lower Deschutes River Subbasin.

The CTWSRO has sole management authority of their natural resources within the boundaries of the Reservation and adjacent waters. The Reservation provides important migration, foraging, spawning, and rearing habitat for native anadromous and resident fishes. The Warm Springs River and Shitike Creek watersheds sustain populations of mid-Columbia summer steelhead (*Oncorhynchus mykiss)*, spring and fall run Chinook salmon (*O. tshawytscha*), bull trout (*Salvelinus confluentus)*, redband trout (*O. mykiss gairdneri),* Pacific lamprey (*Lampetra tridentata*) and an assemblage of non-game resident fishes. Mid-Columbia summer steelhead

(64 FR 14517) and bull trout (63 FR 31647) are listed as threatened under the Endangered Species Act (ESA) of 1973.

Fish production within Reservation streams was entirely natural until the late 1970s. In 1978, Warm Springs National Fish Hatchery (WSNFH; rkm 17) began producing spring Chinook for use by Tribal membership as additional angling opportunities for subsistence. Prior to construction of the WSNFH, U.S. Fish and Wildlife Service (USFWS) assisted CTWSRO in developing a wild fish management plan for the Warm Springs River. To minimize the escapement of hatchery spring Chinook and straying of hatchery steelhead upstream of the WSNFH, a weir is operated during upstream migration periods. The Warm Springs River Watershed sustains the only wild population of spring Chinook in the Deschutes River Subbasin. The Warm Springs River watershed and Shitike Creek also have the only populations of bull trout and Pacific lamprey in the lower Deschutes River Subbasin. Fall Chinook have been observed spawning in the lower reaches of the Warm Springs River and Shitike Creek.

Introduction

The Goal

The goal of the CTWSRO, Habitat Restoration Program (CTWSHRP) is to protect, manage, and restore aquatic habitats in Reservation watersheds. The CTWSHRP defines protect, manage and restore as:

- *Protect* existing high-quality habitats that have functioning ecological processes;
- *Manage* future land use through an integrated planning process to promote ecological integrity and sustainability; and
- *Restore* watersheds and habitats using a prioritized approach based on limiting factors analysis;

A strategic approach will be used to ensure projects have immediate physical qualitative and quantitative benefit with a long-term positive quantifiable biological response. Habitat improvements will acknowledge the diversity and dynamic nature of each stream at a variety of spatial (*e.g.,* watershed, reach) and temporal (*e.g.,* annual, seasonal) scales. The potential habitat capacity of each stream will be evaluated, and persistent anthropogenic activities within watersheds will be identified, as well as potential solutions to alleviate and/or reduce these factors, followed by monitoring physical and biological responses (Ebersole *et al*. 1997). This strategy is supported by the Deschutes River Subbasin Plan (NWPCC 2003), Mid Columbia Steelhead Recovery Plan (MCSRP; Carmichael *et al.* 2008) and CTWSRO Integrated Resource Management Plans (IRMP; CTWSRO 1992*a*; CTWSRO 1992*b*). Projects will be evaluated for merit by coupling ideas from Ebersole *et al.* (1997) and Beechie *et al.* (2008) into a modified decision framework that relates to regional planning, tribal, and recovery documents. The CTWSHRP is in the process of developing evaluation and prioritization criteria for restoration projects.

The Problem

Habitat capacity (*sensu* Ebersole *et al.* 1997) has been altered in most Reservation streams. These changes have decreased physical and biological diversity and adversely affected historic self-sustaining productivity. Changes in magnitude and timing of surface-water runoff have

decreased habitat complexity by altering stream pattern, profile and dimension. Increases in erosion and sediment input have reduced aquatic productivity. To accommodate increased run off and artificially amplified sediment delivery, stream channels over-widen and stream beds flatten, expanding high velocity habitats. This creates increased bed and bank scour which remove physical elements (*e.g.,* large wood, boulders) essential to the development and maintenance of habitat complexity. In other streams, changes to natural flow regimes have caused bed incision resulting in the loss of alluvial ground water storage capacity. At low summer base flows, the lack of ground water storage limit habitat quality and elevate water temperatures. As such, altered hydrology has been identified as a limiting factor for restoring biological diversity and abundance. Associated with hydrologic change are decreases in habitat complexity, increased fine sediment input, and increased water temperature.

Anthropogenic and natural landscape disturbances (*e.g*., road building, timber harvest, fire, floods) have altered riparian and fluvial systems and resulted in declining abundance or extirpation of fishes (Kauffman 1997; Li *et al.* 1994; Roper 1997; Wissmar 2004). Some of the consequences associated with landscape scale disturbances are: loss of habitat complexity as well as altered thermal, flow, and sediment regimes. Application of restoration ecology occurs along a continuum, but common goals center on returning a degraded system to a productive, resilient, functioning state (Hobbs and Norton 1996).

Salmonids have specific habitat requirements through their various life stages and are relatively intolerant to human-caused changes in the environment (*e.g.,* increased temperature and turbidity or sedimentation of streambed substrates; Bjornn and Reiser 1991; Kondolf 2000; Sedell and Luchessa 1982). Land use on the Reservation is dominated by timber harvest and livestock production with some municipal and residential development near the community of Warm Springs on Shitike Creek. The IRMP (CTWSRO 1992*a*; CTWSRO 1992*b*) includes mitigation provisions and best management practices for these activities through protection and restoration. Similarly, active and passive restoration is guided by IRMP and other regional planning documents to address legacy impacts CTWSRO 1992*a*; CTWSRO 1992*b)*. Historic harvest of large trees and road building to access timber within stream corridors have significantly reduced the amount of large wood in Reservation streams and consequently altered thermal, flow, and sediment regimes.

For most salmonids that inhabit Reservation streams, such as anadromous and resident *O. mykiss* and Chinook, preferred water temperatures range from 10°C to 14°C (Bjornn and Reiser 1991; McCullough 1999). However, bull trout (*Salvelinus confluentus*) have lower temperature preferendum, 4°C to 10°C (Buchanan and Gregory 1997). For many streams on Reservation, headwater temperature regimes are consistent with salmonid thermal preferences. However, human disturbance has impacted various upper and lower stream segments causing water temperatures to exceeding 20°C during summer low flow. These temperatures may result in thermal stress and reduced survival to fishes. Restoration approaches such as re-vegetation of the riparian zone and increasing hydrologic connectivity with floodplains have been shown to reestablish thermal regimes (Opperman and Merenlender 2004; Stanford 1993; Wissmar 2004).

Increased sediment inputs from human disturbance can reduce salmonid survival, production and/or carrying capacity. Salmonid productivity is 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). The 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 availability to incubating eggs (Maret et al. 1993) or entombment of the emerging alevins (newly hatched fish with yolk sac attached) within the redd. 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). Adding large wood to a system altered by timber harvest practices, resulting in loss of wood recruitment and increased sediment, can reduce sediment loading by decreasing stream velocity, scouring pools, and allowing fine material to settle in low velocity areas and rebuild stream banks. This ultimately bringing stream channel width:depth ratios in balance and comparable with reference conditions (Fausch and Northcote 1992; Angermeier and Karr 1984; Smock *et al*. 1989; Beechie and Sibely 1997).

Salmonids require habitat complexity to provide velocity refuge for resting and cover to avoid predation (McMahon and Hartman 1989; Pearsons et al. 1992). Large woody debris promotes a more complex environment that produces increased fish biomass (Fausch and Northcote 1992) and greatly increases the resilience and resistance of fish species to flood and drought (Pearsons 1992). Presence of large wood in streams has been found to enhance fish and invertebrate biomass and production (Dudley and Anderson 1982; Bilby and Ward 1989; Fausch and Northcote 1992) and provide important cover for juvenile salmonids (Houslet 2004). It also significantly affects channel morphology and hydraulics necessary to form pools and increase pool volume (Abbe and Montgomery 1996). Bisson et al. (1988) found pools associated with large wood produced higher densities of juvenile salmonids.

Habitat Standards and Current Habitat Condition

The CTWSHRP strives to restore ecologic processes and function that are sustainable over the long-term. The CTWSHRP identifies and evaluates potential habitat restoration projects using a series of criteria and processes taking into account project type, multispecies benefits, and cost effectiveness. Once the decision to restore has been made, the planning phase involves defining site-specific restoration goals and developing the habitat restoration strategy. Depending on site-specific restoration goals, ecosystem processes may be restored through active manipulation as an interim step towards long-term sustainability.

From 1996 to 2000, Reservation streams were surveyed by Oregon Department of Fish and Wildlife (ODFW) using the ODFW stream survey protocol (ODFW 2006) for inventorying habitat characteristics (*e.g.,* habitat type, dimension, wood, *etc*., CTWSRO unpublished data). The CTWSRO is currently updating these habitat baseline surveys (to be completed 2014; funded by Bureau of Indian Affairs). Available information (either through 1996-2000 ODFW surveys or updated baseline information) will be used to evaluate if habitat characteristics are within the range of reference conditions for eastside and upper Columbia River drainages (U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management 2000). Reference condition assessment includes river bed morphology, habitat complexity, substrate quality, riparian vegetation, hydrological regime, floodplain connectivity, and past and present human alterations (*e.g.,* logging, grazing, roads). The intent of using reference conditions is not to evaluate habitat

at a local scale, but a as coarse-scale assessment to identify areas of concern for further consideration.

Habitat performance standards developed from relatively unaltered watersheds with comparable underlying geomorphology, elevation, plant community, and climactic conditions as proposed restoration sites provide an ecologically relevant basis of measuring habitat recovery (Bilby et al. 2003). The Interior Columbia Basin Ecosystem Management Project (ICBEMP; http://www.icbemp.gov/) Supplemental Draft Environmental Impact Statement, Appendix 9 (U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management 2000) is based on a range of natural conditions pertinent for comparison to sites on the east side of the Cascade Range. The ICBEMP performance standards incorporate habitat parameters over large regional and spatial scales, which account for a variety of conditions generated by natural disturbance and recovery. The CTWSHRP recognizes an understanding of natural variability is important for defining biological objectives for stream restoration. Specific restoration goals within the context of salmonid life history requirements and factors limiting productivity will be defined during the planning phase of restoration. Comparing habitat parameters on Reservation streams to ICBEMP habitat performance standards (width:depth ratios, large wood/mile, and pools >3' deep/mile) indicate ecological function is impaired in Beaver Creek, Shitike Creek and Warm Springs River (Table 1). Data within Table 1 is from ODFW stream surveys conducted on Reservation from 1996 to 2000.

Table 1. Summary of habitat parameters by watershed and reach (* indicate function criteria scale) for Warm Springs River, Beaver and Shitike creeks, lower Deschutes River Subbasin, 1996-2000. Functioning criteria are outlined in the Matrix of Pathways and Indicators, Appendix 9: Additional Aquatics Guidance and USFWS and NMFS Matrices: *Functioning Appropriately, **Functioning at Risk, ***Functioning at Unacceptable Risk.

Reach	Reach Length (miles[1])	Width:Depth Ratio[2]	Large Wood/ Reach	Large Wood/mile[2]	Pools/Reach	Pools >3' in Depth/mile[2]
			Warm Springs River			
1		-		-	-	-
2	1.3	54.1***	1	0.8***	0	0.0***
3	3.8	37.3***	4	1.1***	15	1.1***
4	5.2	55.7***	6	1.2***	19	0.6***
5	3.7	28.1***	21	5.7***	114	0.9***
6	1.8	26.8***	17	9.4***	18	1.4***
7	3.9	15.8***	142	36.0*	92	0.4***
			Beaver Creek			
1	0.7	20.5***	0	0.0***	19	1.9***
2	1	21.6***	0	0.0***	21	2.6***
3	3.1	20.6***	0	0.0***	68	2.3***
4	2.1	32.9***	0	0.0***	27	2.0***
5	5.8	35.4***	0	0.0***	62	0.1***
6	5.8	23.8***	2	0.0***	245	4.0***
7	0.6	41.3***	1	0.0***	66	0.8***
8	1.4	26.2***	0	0.0***	35	0.7***
9	0.9	29.0***	0	0.0***	52	0.0***
10	1	26.6***	3	0.0***	73	0.3***
11	3	20.0***	1	0.0***	120	0.2***

[1]reported in miles rather than km for comparison with ICBEMP performance standards
[2]see bottom of p. 9 for ICBEMP standards

Table 1 (cont'd). Summary of habitat parameters by watershed and reach (* indicate function criteria scale) for Warm Springs River, Beaver and Shitike creeks, lower Deschutes River Subbasin, 1996-2000. Functioning criteria are outlined in the Matrix of Pathways and Indicators, Appendix 9: Additional Aquatics Guidance and USFWS and NMFS Matrices: *Functioning Appropriately, **Functioning at Risk, ***Functioning at Unacceptable Risk.

Reach	Reach Length (miles[1])	Width:Depth Ratio[2]	Large Wood/ Reach	Large Wood/mile[2]	Pools/Reach	Pools >3' in Depth/mile[2]
			Shitike Creek			
1	0.8	17.9***	8	10.0**	5	0.8***
2	4.3	25.9***	10	2.3***	52	3.5***
3	1.3	35.8***	2	1.5***	8	2.2***
4	4.5	32.4***	35	7.8***	39	2.7***
5	9.1	18.5***	125	13.7**	58	2.4***
6	5.8	23.1***	494	85.2*	76	4.0***
7	2	18.6***	38	19.0*	10	1.9***
8	0.5	10.3**	0	0.0***	3	1.9***

[1]reported in miles rather than km for comparison with ICBEMP performance standards
[2]see bottom of p. 9 for ICBEMP standards

Riparian Management Objectives in ICBEMP Supplemental Draft EIS, Volume 2, Appendix 9, p. 9-3 (U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management 2000)**.**

Habitat Feature	**Values**									
Pool frequency	Wetted width (feet)	10	20	25	50	75	100	125	150	200
Varies by channel width	Pools per mile	96	56	47	26	23	18	14	12	9
LWD (forested systems)	> 20 pieces per mile; > 12 inch diameter; > 35 foot length									
Width/Depth Ratio	<10, mean wetted width divided by mean depth									

C. Rationale and significance to regional programs

Columbia River Basin Fish Accords

This programmatic is covered under the Fish Accord funding supplied to CTWSRO. Projects to be designed and/or implemented under this program foster a collaborative approach between the Tribe and BPA to administer the CTWSHRP. The projects described herein were established to meet the CTWSHRP goals of protecting, managing, and restoring habitat for native fishes within the Reservation watersheds. Efforts will focus on improvements to spawning, rearing, and migratory corridor habitats for ESA listed steelhead and spring Chinook. Increased production for target species is expected. Habitat improvements will benefit all anadromous and resident fishes.

Deschutes River Subbasin Plan

The Deschutes River Subbasin Plan used existing watershed data to identify management strategies and habitat improvement actions to improve biological diversity and production for the Deschutes Westside Assessment Unit (NWPCC 2003). This unit includes the lower 161 rkms of the Deschutes River and its tributaries entering from the west side, including Warm Springs River and Shitike Creek. The proposed strategies and restoration actions from the Deschutes River Subbasin Plan are presented in Table 2.

NWPCC Fish and Wildlife Program

This programmatic aims to rebuild robust populations of self-sustaining wild fishes (and indirectly wildlife) by protecting, mitigating, and restoring habitats and biological systems. This rationale is in agreement with the 2009 Amendments to the Northwest Power and Conservation Council's (NWPCC), Columbia Basin Fish and Wildlife Program (NWPCC 2009). An adaptive management approach will be used and be based on the latest science associated with ecological restoration.

The process based restoration approach described within this programmatic meets with NWPCC's Scientific Foundation and Principles, specifically Principle 4 which states *"**Habitats develop, and are maintained, by physical and biological processes"*** (NWPCC 2009)**.**

Additionally the principle states:

> *"Habitats are created, altered, and maintained by processes that operate over a range of scales. Locally observed conditions often reflect more expansive or non-local processes and influences, including human actions. The presence of essential habitat features created by these processes determines the abundance, productivity, and diversity of species and communities. Habitat restoration actions are most effective when undertaken with an understanding and appreciation of the underlying habitat-forming processes."*(NWPCC 2009).

Table 2. Management strategies for Warm Springs River and Shitike Creek Habitat Complexes, Deschutes River Subbasin Plan (NWPCC 2003; MP pp. 15-17)

Habitat Complex Management Strategies and Actions	Warm Springs River	Shitike Creek
Develop upland livestock water sources to help alleviate livestock concentrations in streams and riparian corridors	X	X
Implement upland and riparian grazing systems to increase ground cover and slow runoff and erosion	X	X
Improve upland watershed health through effective management to increase water infiltration, retention and permeability rates and soil stability	X	X
Increase minimum stream flow	X	
Increase primary pool habitat	X	X
Maintain or increase stream flow		X
Maintain pristine condition of the stream above Peter's Pasture		X
Manage riparian ecosystems to encourage restoration of beaver populations through restoration of woody vegetation	X	X
Proper construction and maintenance of range and forest roads can reduce sediment delivery to streams	X	
Proper construction and maintenance of roads can reduce sediment delivery to streams.		X

Table 2 (cont'd). Management strategies for Warm Springs River and Shitike Creek Habitat Complexes, Deschutes River Subbasin Plan (NWPCC 2003; MP pp. 15-17)

Habitat Complex Management Strategies and Actions	Warm Springs River	Shitike Creek
Reduce channel width by 50%.	X	
Reduce channel width-to-depth ratio to less than 10		X
Reduce stream temperature to meet water quality criteria for salmonid rearing	X	X
Reduce substrate fine sediment percentage to less than 10%.	X	X
Restore and maintain healthy riparian and floodplain areas with good habitat complexity and species diversity	X	X
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	X	X
Restore diverse riparian vegetative corridors to provide 80% stream shading and increase stream bank stability to 80%		X
Restore diverse riparian vegetative function by 50%.	X	
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	X	X

Mid Columbia Steelhead Recovery Plan (MCSRP)

The Mid-Columbia Expert Panel identified land management as the greatest threat to Mid Columbia steelhead. For most fish populations, land management has negatively impacted tributary spawning, rearing, and migration habitats Table 3 (Carmichael et al. 2008). The MCSRP identifies the following factors as adversely affecting Deschutes River Westside steelhead:

- Modified and reduced stream flows;
- Impaired water quality due to elevated water temperatures and chemical inputs;
- Degraded channel structure and complexity (including riffles, pools and large woody debris);
- Loss of riparian vegetation;
- Reduced floodplain connectivity; and/or
- Excessive levels of fine sediment caused by altered sediment routing (Carmichael et al 2008).

Tributary habitat strategies and actions, located in Section 9.3 of MCSRP, call for protection of highest quality habitats, maintenance of existing unimpaired habitats and ecosystem function, and restoration through passive and active measures. Restoration strategies are linked directly to the limiting factors and aim to improve tributary spawning, rearing and migration conditions by restoring instream, riparian and upland habitat conditions, providing passage, floodplain connectivity, and addressing water quality and quantity.

CTWSRO Integrated Resource Management Plans

During 1992, the CTWSRO and the Bureau of Indian Affairs (BIA) completed two IRMP for forested and non-forested reservation lands (CTWSRO 1992*a*; CTWSRO 1992*b)*. These plans established goals and objectives for sustaining or improving fish and aquatic resources within the boundaries of the Reservation and adjacent waters within tribal ceded lands. The goal of IRMP is to effectively manage and protect the natural resources on Tribal lands. To attain this goal, CTWSRO is working to: (1) identify priority watersheds; (2) maintain or enhance the complexity and natural stability of all stream channels; (3) maintain riparian areas, floodplains and wetlands; (4) identify fish passage barriers and implement corrective measures; and (5) annually monitor and report population trends. The Tribes and BIA are currently completing a five-year update and revision of these documents.

Table 3. Major limiting factors, sites affected and potential threats and causes for the Mid-Columbia Deschutes River Westside steelhead population from Carmichael *et al.* (2008; MaSA = Major spawning aggregate; MiSA = Minor spawning aggregate).

Population MaSA and MiSA	Major Limiting Factors	Sites Affected*	VSP Characteristics Impacted	Potential Causes/Threats	Life Stages Affected
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.

D. Relationships to other projects

List of projects related to the Confederated Tribes of Warm Springs Habitat Restoration Program.

Funding Source	Project No.	Project Title	Relationship
BPA	2007-157-00	Bull Trout Status and Abundance	Monitor trends and abundance of bull trout; supply water temperature monitoring data
BPA	2002-016-00	Lamprey Abundance	Monitor trends, abundance and limiting factors for Pacific lamprey; supply water temperature monitoring
BPA	2008-306-00	Deschutes River Fall Chinook RM&E	Monitor trends and abundance of fall Chinook
BPA	2008-311-00	Natural Production Monitoring	Monitor trends and abundance of spring Chinook and steelhead
BIA	N/A	Tribal Watershed Restoration	Branch of Natural Resources funded habitat restoration projects
CTWSRO	N/A	Project Interdisciplinary Team	Coordinate and cooperation to ensure protection and mitigation for aquatic resources and watershed processes
CTWSRO /NOAA[1]	N/A	Beaver Creek Spill Settlement	Mitigation for loss of fish and aquatic productivity after a gas spill in 1999

[1]National Oceanic and Atmospheric Administration

E. Project history
New Project

F. Proposed biological objectives, work elements, and methods.
Use of Accord Funds
Accord funding will be used to support infrastructure (*e.g*., vehicles, equipment, and supplies) and administrative needs (*e.g.*, personnel, designs, and permits) necessary to manage the CTWSHRP. Remaining BPA funding will be used for programmatic development, design and matching funds for implementation of projects. Additionally, these funds will be used to maintain prior implemented habitat protection projects (*e.g*., fence lines, off-site water developments). Timelines for implementation are included within each project description; however, timelines may differ depending on the ability to secure implementation funding, necessary permits, coordination with a variety of stakeholders, and Tribal community involvement and review.

Tribal Background Information
Treaty of Middle Oregon and land ownership
The Treaty of Middle Oregon, dated June 25, 1855, memorializes and acknowledges the rights and privileges, which CTWSRO reserved. In other words, rights the tribes possessed prior to June 25, 1855, were retained. The Treaty described the Reservation boundary (Figures 1 and 2) while also memorializing the rights of the tribe to continue the harvest of fish, game, and other foods within the exterior boundaries of the Ceded Lands (Figure 1), in other areas, and at all usual and accustomed stations. The United States, through the Secretary of the Interior, holds legal title to trust property, while the Tribes or individual members possess the beneficial title. The remaining one percent of Reservation land is held in title by the United States. These parcels are subject to the complete civil jurisdiction of CTWSRO and are not within the watersheds this programmatic covers. The provisions of the General Allotment Act of 1887 (popularly known as the Dawes Act) were not implemented on the Warm Springs Reservation; meaning land was not offered for sale to non-Indians. Hence, there is not an issue of checkerboard civil jurisdiction and the lands on which the projects proposed in this programmatic are managed under the tribes Branch of Natural Resources (BNR).

Fisheries Department
The Fisheries Department's, and subsequently the Fish Habitat Program, directive from Tribal Council is to protect, restore, and enhance fish populations to ensure sustainable, harvestable levels of culturally significant fish species for the tribal membership in perpetuity. The CTWSHRP project prioritization and selection process supports this goal. All fish species are considered culturally significant, and would benefit from the protection, enhancement, or restoration of aquatic habitat on Reservation are described in Tribal Ordinance No. 68 and Warm Springs Tribal Code 490 including but not limited to focal species for this programmatic.

Communication with the Tribal government and membership
In many ways the IRMP corresponds with environmental protection afforded by the ESA and National Environmental Policy Act of 1969 (NEPA). Like ESA and NEPA, IRMP includes a process for the review of all projects which may impact the physical, biological, social, cultural

or economic resources of the Tribe (CTWSRO 1992*a*; CTWSRO 1992*b)*. The IRMP is tribal law as defined by Tribal Council Resolution 9987 and Ordinance 74.

Projects developed under the CTWSHRP will be coordinated and reviewed through an interdisciplinary team to ensure compliance with IRMP (CTWSRO 1992*a*; CTWSRO 1992*b)*. This process guarantees that all natural resource considerations (*e.g.*, water quality, range, wildlife) are taken into account and addressed. The IRMP process has a public comment period open to the tribal membership through public scoping and written comments. After the comment period, the project will be finalized and submitted for approval by the Resource Managers Interdisciplinary Team. The final step in the process is approval to implement the project through Tribal Council Resolution. Implemented projects will adhere to mitigation or additional requirements generated through the review processes.

In addition to soliciting input from the tribal public, BNR regularly works with and creates dialog on proposed projects with the committees to Tribal Council and Reservation Grazing Districts. This process ensures all interests and concerns are met while developing projects that meet the multiple use intent of IRMP. Transparent communications with the tribal public to develop relationships and explain the benefits of stream restoration activities are imperative. This also will foster and promote participation in the project development and implementation phases.

Federal funding used to develop and implement projects through this programmatic requires compliance with the conditions and responsibilities of the ESA. For projects implemented within the lower Deschutes River Subbasin, consultation would be required with National Oceanic and Atmospheric Administration for mid-Columbia River steelhead and USFWS for bull trout to guarantee projects do not further jeopardize the existence of these ESA species.

Completion of multiple layers of review (*e.g.,* ESA, IRMP) ensure projects implemented through the CTWSRHP, are sound ecological investments supporting the recovery and maintenance of the target species.

SECTION I: CTWSHRP PROJECT EVALUATION

The goal of the evaluation process is to guide project selection and ensure funders and Tribal constituency that strategic investments are made at the watershed scale. Projects proposed for development and implementation in this narrative will occur within a larger restoration and land management context currently being executed by CTWSRO BNR on-reservation.

Causes of habitat degradation, loss of habitat complexity and subsequent decline of aquatic productivity was likely a result of indirect impacts associated with land use. Past forestry practices, open range grazing, and municipal development have been impediments to the biological and physical recovery of watersheds within CTWSRO. Timber harvest and livestock grazing persists on the Reservation (as they do across the Columbia River Basin); however, implementing conservation-based management and planning has reduced aquatic habitat loss.

A collaborative approach from the departments within the CTWSRO BNR is used to address legacy impacts to on-reservation watersheds. For example, roads, skid trails, and landings from past timber harvest are being re-contoured and re-vegetated through projects implemented by the Forestry Department. The Range and Agriculture Department is addressing fine sediment sources by reseeding and initiating grazing rotations, which will restore perennial grasses in upland areas. The Fisheries Department has developed and maintains many kilometers of riparian fencing and off-site water developments to improve conditions within riparian zones. This coordinated approach addresses root causes of degradation at a watershed scale. In time, these actions, in concert with improvements directly to aquatic systems, will lead to increased survival and production of target fish species.

Project evaluation criteria, such as the example in Figure 3, will be developed to screen projects under consideration that are intended to protect, manage, and restore aquatic resources and are in accordance with regional planning documents. Evaluation criteria in Figure 3 are loosely based on steps for identifying and prioritizing stream restoration actions described in Beechie et al. (2008) that link restoration processes with planning steps but have been modified to suit Tribal goals. Additionally, some elements used to characterize a watershed restoration problem in the context of adaptive decision and problem-solving strategies have been incorporated into Figure 3 (Anderson et al. 2003). A system for weighting and scoring criteria may be added (see Beechie et al. 2008, Figure 2 for example). Questions in Figure 3 are meant to be used as a tool for the team of CTWSHRP restoration biologists to give consideration to the various outcomes of a restoration action and give substance and detail to the restoration plan as it is developed. Another tool recently suggested by National Oceanic and Atmospheric Administration (NOAA) is River Restoration Analysis Tool (River RAT, http://www.restorationreview.com). River RAT is a river restoration project development and evaluation tool that is used to guide the user through a critical evaluation of proposed stream projects. Development and use of project evaluation criteria will help guide the decision process, provide framework to define restoration priorities, and stimulate a rigorous internal review of proposed projects. This process will ensure that projects be implemented in locations where increases in fish survival and production will be measureable over time and prioritized for sites with the highest potential for success. Creating tribal employment through restoration is a high priority for the current Tribal Council. Establishing the foundation of a “restoration economy” and retooling the workforce are important selling points during public scoping and comment periods and will be integrated into this restoration effort.

CTWSHRP RESTORATION EVALUATION FORM
Decision to Restore
Does the project lie within the focal watersheds of the Warm Springs River or Shitike Creek? Is the project located in a stream reach where target life history patterns (spawning and rearing) occur? Does the project provide a significant opportunity to increase survival of the egg to fry and fry to smolt life stages? Does the current habitat and production data support these potential benefits? Does the project or restoration action relate to the Deschutes Subbasin Plan or Mid-Columbia Steelhead Recovery Plan? Does it address any or all of the limiting factors selected and detailed in these recovery documents? If so which ones? Does the project address one or more focal species? How long will it take for the system to respond to proposed management actions?
Social
Does the project have local landowner and Tribal public support? Will tribal jobs be created by this project? Does the project have educational value?
Technical/Implementation
Is the proposed project using best available restoration techniques based on the current understanding of primary processes driving habitat conditions and ecosystem dynamics?
Financial
Is the project cost effective (*i.e.*, will there be a positive, measurable change in habitat condition?) Will both the BPA and Tribal funded portions of the projects be matched with outside funds?
Monitoring and Evaluation
Will the project be monitored for a long-term biological response? How? Will the project be monitored for a long-term physical response? How? How can a satisfactory decision be recognized or progress towards a solution be measured? How can monitoring results be incorporated into future BNR management decisions? (timber harvest, road building, grazing, fisheries)

Figure 3. Preliminary questionnaire developed to evaluate proposed restoration projects.

SECTION II: MAINTENANCE OF EXISTING HABITAT PROTECTION PROJECTS

Currently, the CTWSHRP maintains 44 km of riparian and wetland fences (Figure 4). In addition to the fences, the CTWSHRP has developed and maintains 12 off-site water developments. Fencing and off-site water developments protect critical aquatic habitats and improve the distribution of livestock on the landscape.

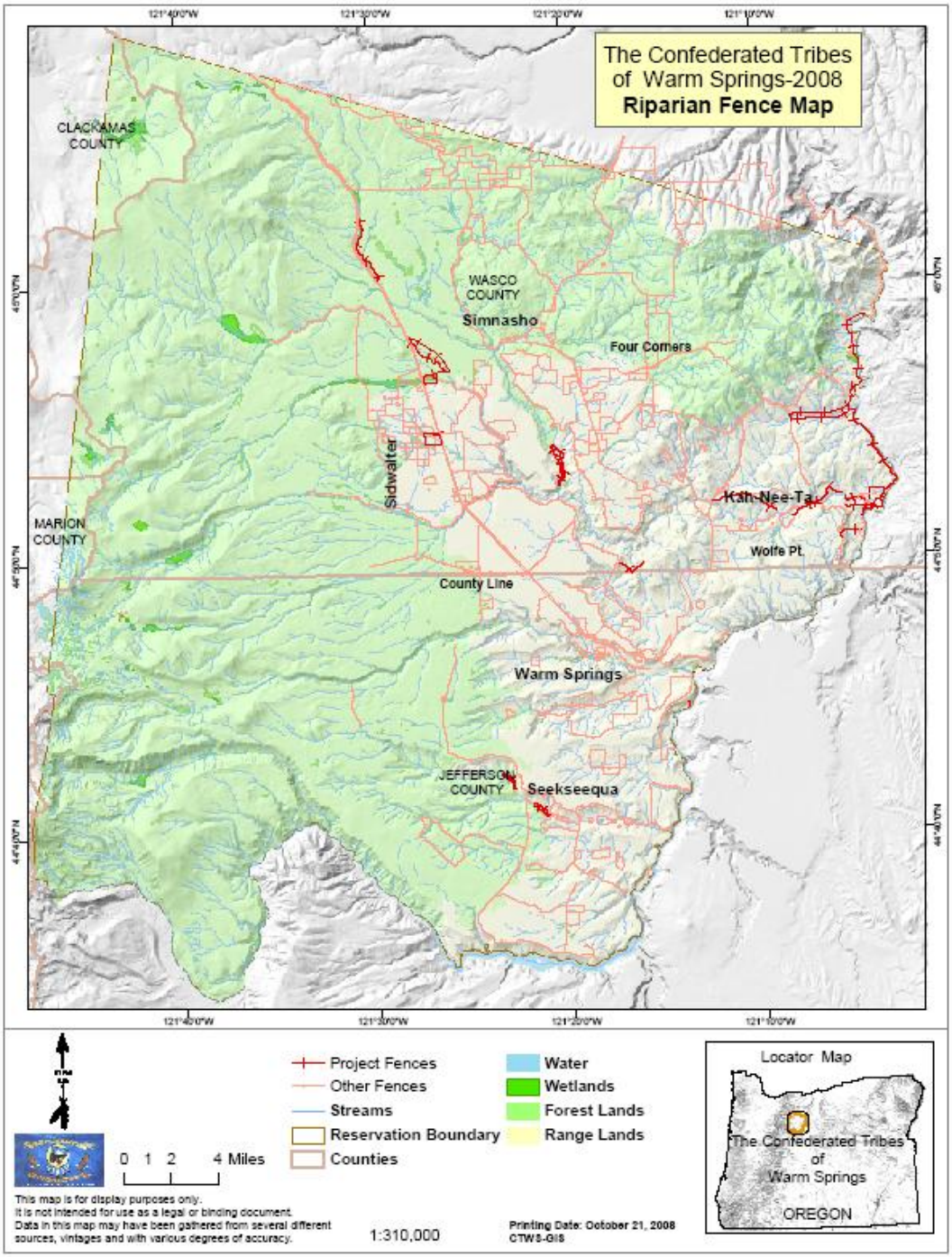

Figure 4. Location of current riparian fences (marked in dark red) maintained through this programmatic, CTWSRO, lower Deschutes River Subbasin, Oregon.

As habitat enhancement projects are developed, additional fencing and upland water developments will completed to increase protection of critical habitats. Improvements to the grazing systems will be included with these projects to ensure livestock management is compatible with the protection fences.

Fencing and off-site water developments have proven successful in protecting important habitats for anadromous and resident fishes. As projects are developed, further fence lines and off-site water developments will be added to protect essential habitat. In the early 1980s, a riparian fence along Beaver Creek was installed and continues to be maintained. This fence protects high quality spawning and rearing habitat used by steelhead, Chinook, and Pacific lamprey. Additionally, it protects an extensive wetland complex that provides significant water quality and cooling benefits to Beaver Creek.

SECTION III: PLANNING AND DESIGN OF HABITAT PROJECTS

Restoration will occur at a stream reach scale and focus on re-establishing physical, chemical and biological processes. Restoring these processes will allow the system to come into dynamic equilibrium and respond to the multiple limiting factors (*e.g*., altered hydrology, habitat complexity, fine sediment, and water temperature) that have been identified. This section provides a description of habitat projects proposed for planning and design. Project descriptions will include: watershed description; use of Accord funds; timelines; habitat improvement activities; anticipated benefits to the fisheries resource; linkage to planning documents; and regulatory processes to be completed.

Restoration approaches will be categorized and prioritized by project type (*e.g.,* protect intact habitat, remove barriers to intact habitat, restore processes, instream enhancement) and location where the action is expected to have a definite biological effect (*e.g.,* restoration of a floodplain where the anthropogenic disturbance has been removed). In cases where in-stream habitat enhancement is deemed necessary, and is part of a larger effort to restore watershed processes, hydraulic modeling will be used to increase the probability that the proposed enhancement is designed to perform within the recorded and predicted hydrologic range of variability. A qualified geomorphologist will be consulted during the design process to ensure the proposed habitat restoration actions are consistent with the litho-topographic template (*sensu* Beechie 2010 et. al.) of the watershed.

Following are descriptions of three projects to be planned and designed under this programmatic:

1. Potters Pond to Boulder Creek Restoration, Mill Creek
2. Large woody debris additions/placements into the Warm Springs River
3. Beaver Creek Enhancement Projects:
    - 3.1. Upper Beaver Creek enhancement project
    - 3.2. Coyote Creek watershed restoration
    - 3.3. Quartz Creek watershed restoration

Project 1. Potters Pond to Boulder Creek Restoration, Mill Creek

Watershed Description:

Mill Creek is a significant perennial tributary of the Warm Springs River and is located entirely on the Reservation (Figure 2). The watershed area is 27,453 hectares (ha) originating in the Cascade Mountains near Ollalie Butte, north of Mount Jefferson. Mill Creek flows for 37.9 rkms, with anadromous habitat in the lower 34.3 rkms. It enters the Warm Springs River at rkm 34.5.

Stream flow consists of seasonal snowmelt and groundwater springs that emerge through porous volcanic geology. The upper watershed is dominated by a coniferous forest community consisting of Douglas (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*) with some noble fir (*A. procera*) and western red cedar (*Thuja plicata*). The remainder of the watershed is primarily a shrub steppe ecotone with the lowest reaches flowing through a steep basalt canyon. The riparian community is predominantly hard wood species including white alder (*Alnus rhombifolia*), Pacific ninebark (*Physocarpus capitatus*), cottonwood (*Populus trichocarpa*), red osier dogwood (*Cornus sericea*), and willow (*Salix sp*.).

Resident and anadromous *O. mykiss* and spring Chinook are present in Mill Creek and monitored through yearly redd counts. There is also an assemblage of native fishes (*e.g., Cottidae, Catostomidae*). Bull trout may be present; however, presence information is limited to anecdotal accounts. Pacific lamprey are not present in Mill Creek, but habitat enhancement may allow for potential reintroduction.

Use of BPA funds:

Funds received from BPA will be used to fund staff to develop and manage the project through design, permitting, fund raising, implementation, and monitoring. Pacific Salmon Coastal Recovery Funds will be used as a match for restoration project design. Upon design completion, permitting and consultation will be completed and funding will be sought to implement the project. Majority of the implementation funding will be from outside, competitive sources with BPA and tribal funds used as leverage and match, if needed. Post project monitoring and maintenance will be completed using BPA funds.

Timeline:

	Year				
Objective	2011	2012	2013	2014	2015
Develop Request for Proposals	X				
Contract Design	X				
Permitting and Compliance	X	X	X		
Conduct Public Scoping	X	X			
Acquire Implementation Funds		X	X		
Implement Project			X	X	
Reporting upon Project Completion				X	
Begin Monitoring					X

Project Description

Past land use and restoration at the project site

An old mill pond (referred to as Potter's Pond) is located on the edge of the commercial forest in Mill Creek (rkm 9.7 – 12.1; Figure 5) and was historically used as log storage for the Warm Springs Forest Products Enterprise. In the 1940s, the pond was constructed using native floodplain material. Lateral berms were created bisecting the active floodplain to block stream flow, and storage ponds were created behind the lateral berms which were tied into the edges of the active floodplain at the edge of the high terraces (Figure 6). Water levels were manipulated to maintain enough water for suitable log storage. Remaining stream flow was routed around the ponds, in a ditch, and reconnected downstream to the channel. Fish passage was prematurely terminated by the construction and use Potter's Pond. In December 1980, high flows caused the earthen dams to fail resulting in erosion and excessive stream channel scour, essentially removing the pond (*i.e.,* anthropogenic disturbance) but the nature of the disturbance was that of press disturbance (*sensu* Bender et al. 1984), in which the system failed to recover and return to the nominal state (Yount 1990).

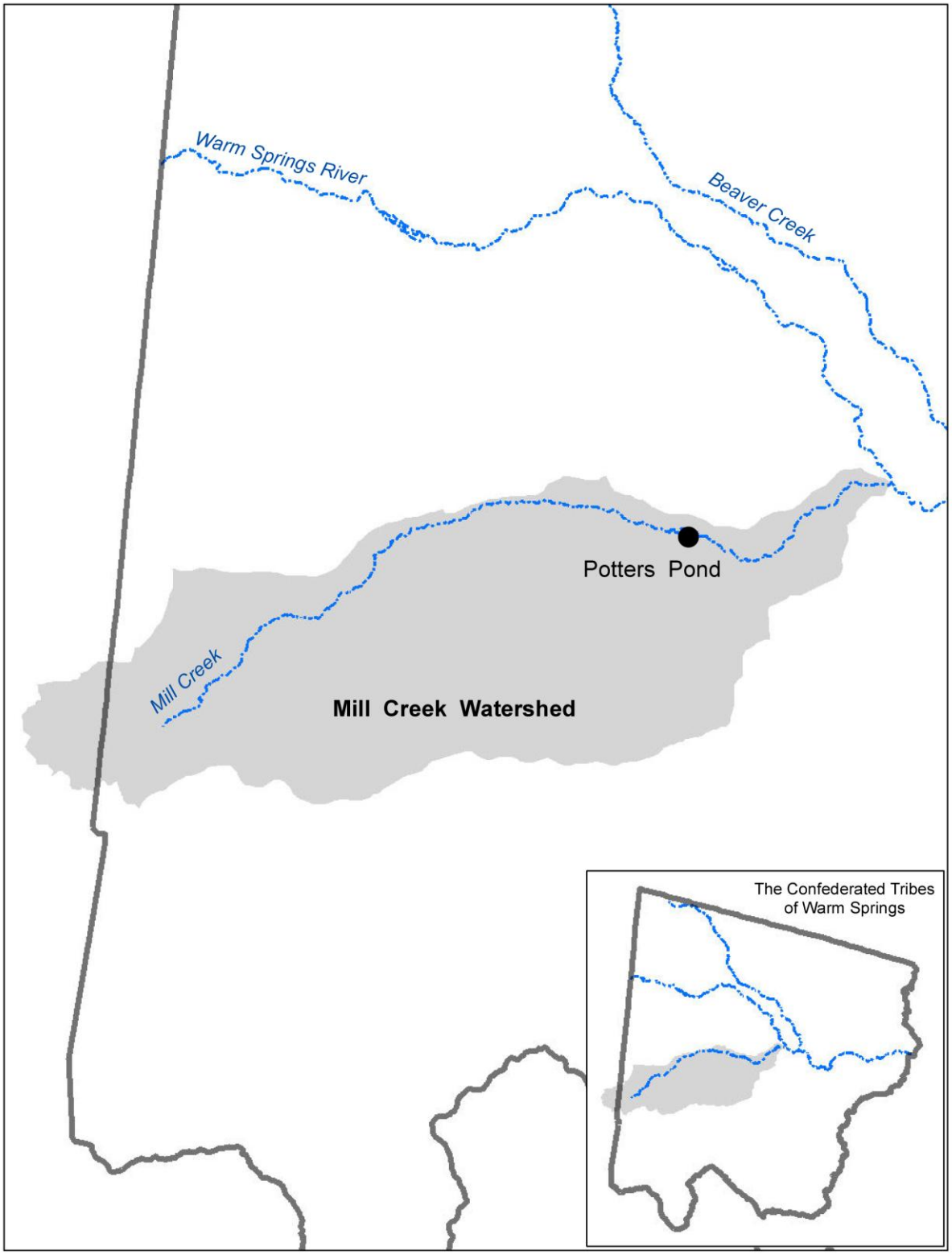

Figure 5. Map displaying the location of Potter's Pond restoration site, Mill Creek, lower Deschutes River Subbasin.

Figure 6. Historic photo of Potter's Pond, Mill Creek, lower Deschutes River Subbasin, July 20, 1966.

In the late 1980s, using BPA funds (Project Number 81-108-00), CTWSRO completed a project to increase habitat complexity. The project objectives were to:

- Increase salmonid habitat diversity;
- Increase stream depth;
- Create pools; and
- Reduce erosion, turbidity, and sedimentation.

In 1987, efforts included installation of 155 boulder structures, sloping of the lateral floodplain berms, and reseeding. A riparian fence was installed in 1989, to promote growth of existing riparian vegetation and protect the restoration activities. Efforts to stabilize the bank using rock gabions and riparian plantings were ultimately unsuccessful to create pools, increase stream depth and increase habitat diversity.

Restoration Activities and Limiting Factors

Natural recovery of the Potter's Pond site has continued since the berms were breached in 1980; however, additional restoration actions are needed to address factors that continue to limit fish production. Past projects used the best available knowledge and practices at the time. In addition to advancements in understanding processes driving habitat conditions and development of restoration concepts (Beechie *et. al.* 2010), technological advances have improved restoration science and employ more thorough hydrologic and geomorphic analysis and hydraulic modeling. Additionally, prior restoration activities were not designed to withstand the 100-year (or greater) flood event that occurred in 1996.

The proposed project will reconnect the floodplain, increase sinuosity, remove the lateral floodplain berms, and enhance off channel habitat through the development of side channels. Proposed project designs will incorporate large wood debris (LWD) as a key element in the creation of habitat features. Currently, Potter's Pond is devoid of LWD largely due to:

- Wood removed from the floodplain and channel migration by land use to construct log storage ponds.
- During large flow and recruitment events, LWD was transported from heavily forested reaches immediately upstream and deposited in the channel and on the floodplain due to valley and channel slope, floodplain width, and connection.
- Historically the project side was within a well developed ponderosa pine forest; however land use removed this component to the riparian and flood accessible areas.

This proposal follows the logical path of Beechie *et. al.* (2008) and Beechie *et. al.* (2010) as the last of the anthropogenic disturbance (lateral berms) will be removed so that watershed processes (detailed below) can resume. A component of the project will include habitat enhancement to support recovery of ecological processes.

Habitat complexity:

Increase pool habitat- Large pools (greater than 1 m in depth) are absent in the restoration site. Large wood structures (using trees with rootwads) will be used to create and maintain pools with overhead cover.

Increase channel complexity and roughness- LWD and boulder placements will be designed and constructed to provide habitat in the form of cover and velocity refugia in place of the continuous riffle habitat currently present.

Increase sinuosity- Channel segments have been straightened and floodplain connection eliminated through berming. New channel segments will be designed and constructed with stream and floodplain connection to improve habitat complexity.

Reduce channel width:depth ratio- A wide and shallow channel cross sectional area (high width to depth ratio) is currently present throughout the project site. This condition provides minimal habitat for all salmonid life stages. Restoration actions will use a mix of constructed features and vegetation enhancements to reduce width:depth and provide additional habitat complexity.

Enhance spawning habitat- High width:depth and reduced channel roughness has resulted in a high velocity environment that has removed much of the available spawning substrate and habitat. Based on information gathered from CTWSRO streams, habitat suitability criteria will be developed for the creation of spawning habitat.

Increase floodplain connectivity – Reconnection of the floodplain to the stream will be achieved through removal of lateral berms, grading of the floodplain, and construction of connected wetland and side channel habitats. This will create high flow off channel, velocity refugia, increased connection/interaction between surface, subsurface water flow, and additional flood storage.

Increase off channel habitat- Side channel and connected wetlands are important habitat features for juvenile rearing and provide thermal refuge due to influence from

groundwater and hyporheic inputs. These features will be included in the restoration design where appropriate given the valley width and slope.

Increase riparian vegetation- Riparian vegetation creates velocity refugia during high flows, nutrient and forage inputs, and encourages habitat development in the form of undercut banks and woody debris recruitment through time.

Fine sediment:

Decrease fine sediment- Increased levels of fine sediment are entering the stream channel due to erosion of the lateral berms constructed to form the historic mill ponds. These berms will be removed; the floodplain will be graded and re-vegetated with local species to reduce erosion.

Water temperature:

Increase vegetation- Riparian vegetation will be planted across the floodplain to increase main and side channel shade.

Increase floodplain connectivity- Connected floodplain will allow increased interaction between surface and subsurface water flow enhancing thermal refugia in main and side channel habitats along with off channel connected wetlands.

Altered hydrology:

Increase floodplain- Removal of lateral berms will increase floodplain area and floodplain storage.

Increase side channel and off channel wetland features- Addition of the appropriate geomorphic features will convey additional floodplain storage and energy dissipation.

Benefit of project to focal species:
Habitat restoration actions to be designed and implemented in the project will benefit all life stages of focal salmonid species as well as other fishes. Addition of deep pools with cover will provide habitat for migrating and holding adults in summer while providing habitat and cover for rearing juveniles. A full suite of low-velocity, high-cover stream-margin habitats required by juvenile fishes will be available until they become large enough to forage in pool and riffle habitats. Increased floodplain connection through grading and reshaping, along with the construction of off and side channel habitat will provide refugia from high flow events, and thermal refugia in cool micro habitats created by groundwater flow dynamics that are restored across the entire floodplain surface. Enhanced riparian vegetation will benefit stream temperatures which directly affects survival and growth. Riparian vegetation also provides additional food inputs through terrestrial insects falling into the stream and food for some aquatic insect species. All of these direct benefits are expected to increase overall freshwater survival and growth. Indirectly, restoration actions will restore fluvial process at this site (*e.g.,* floodplain connection, LWD, dense riparian vegetation) that create and maintain complex habitat used by fishes.

Relevance to and linkage to direction given in regional planning:
This project meets the goals and direction of the Tribal, subbasin and regional level planning documents.

The IRMP goals state aquatic resources should be managed to maintain or enhance populations of anadromous and resident fishes that meet the cultural, subsistence and recreational needs of tribal members (CTWSRO 1992*a*; CTWSRO 1992*b)*. In addition, watershed processes should be managed to maintain or improve functional aquatic habitats for fish and other water dependent resources.

Deschutes Subbasin Plan lists the "Management Strategies Specific to the Warm Springs River Habitat Complex" covers the Warm Springs River and tributaries including Mill Creek (Table 2). In-channel strategies from the subbasin plan specific to this project include:

- Reduce channel width by 50%
- Reduce stream temperature to meet water quality criteria for salmonid rearing
- Restore and maintain instream habitat complexity with a minimum of 20 pieces of large wood per 100 meters of stream channel (*LWD will be added as needed this standard will be used as a general guide*).
- Increase primary pool habitat

The MCSRP specifically lists Mill Creek as a major spawning aggregate with degraded floodplain and channel structure (channelization and complexity) as factors limiting natural production (Table 3). This proposed restoration project is within the area of interest for restoration in Mill Creek (the mouth to Old Mill Camp) listed in the Plan.

Project 2. Large woody debris placements into the Warm Springs River

Watershed Description:

The Warm Springs River is a 5th order stream. The watershed drains 54,394 ha and enters the Deschutes River at river kilometer (rkm) 136 (Figure 2). It originates on the eastern slopes of the Cascade Mountains and flows southeasterly 91 rkm through forest, canyon, and range landscapes. Its source is groundwater located off the Reservation, but has significant spring-fed sources on Reservation, particularly in the Warm Springs Meadow area (rkm 63). Average annual flow is 446 cubic feet per second (cfs) with a minimum flow of 149 cfs and maximum of 22,600 cfs. Land management in the watershed includes timber harvest, grazing, some dry land farming, and recreational developments on the lower river (Kah-Nee-Ta Resort and golf course). The river supports populations of spring and fall Chinook, summer steelhead, bull trout, redband trout, Pacific lamprey, non-native brook trout, and an assemblage of non-game resident fishes.

Use of BPA funds:

BPA funds will be used for staff time to develop and manage the project through design, permitting, fund raising, implementation, and monitoring. Once a restoration design is complete and permitting and consultations are underway, fundraising to implement the design will begin. It is anticipated a majority of the funding to implement this restoration project will be from outside grants. However, BPA funds may be used as matching. Once the project is completed BPA funds will be used to conduct post project monitoring and maintenance.

Timeline:

Objective	2012	2013	2014	2015	2016
Design	X				
Permitting and Compliance	X	X			
Conduct Public Scoping	X				
Acquire Implementation Funds		X			
Implement Project			X	X	
Reporting upon Project Completion				X	
Begin Monitoring					X

Restoration Activities and Limiting Factors:

The upper Warm Springs River flows through a mixed conifer forest which likely contributed a significant input of LWD necessary for the formation of key habitat components. Due to stable hydrology, larger trees have the tendency to fall directly across the channel and remain in place providing significant influence on habitat complexity and fluvial process. Past land-use practices (timber harvest and road development) have reduced recruitment of large wood into the active stream channel. Typical channel segments of the upper Warm Springs River lack instream woody debris, especially large key pieces essential for development of habitat complexity (Figure 7). Figure 8 illustrates how woody debris provides cover for spawning adults and newly hatched juveniles. Past timber harvest within the riparian zone removed trees that would have been recruited to the stream channel through natural vectors. Large stumps remaining after timber harvest are evidence of this lost recruitment. These trees, likely ponderosa pine, would have persisted in channel for long periods and acted as key structural elements influencing the fluvial process in the system (Figure 9). Recruitment of smaller more mobile trees would have collected on these larger trees creating log jams or LWD aggregates. Land use practices that were the root cause of the aforementioned alterations are no longer utilized as a matter of policy (CTWSRO and BIA 1992). Current practices require stream buffers, forest harvest and road building plans are reviewed by a fisheries biologist, and many roads have been decommissioned.

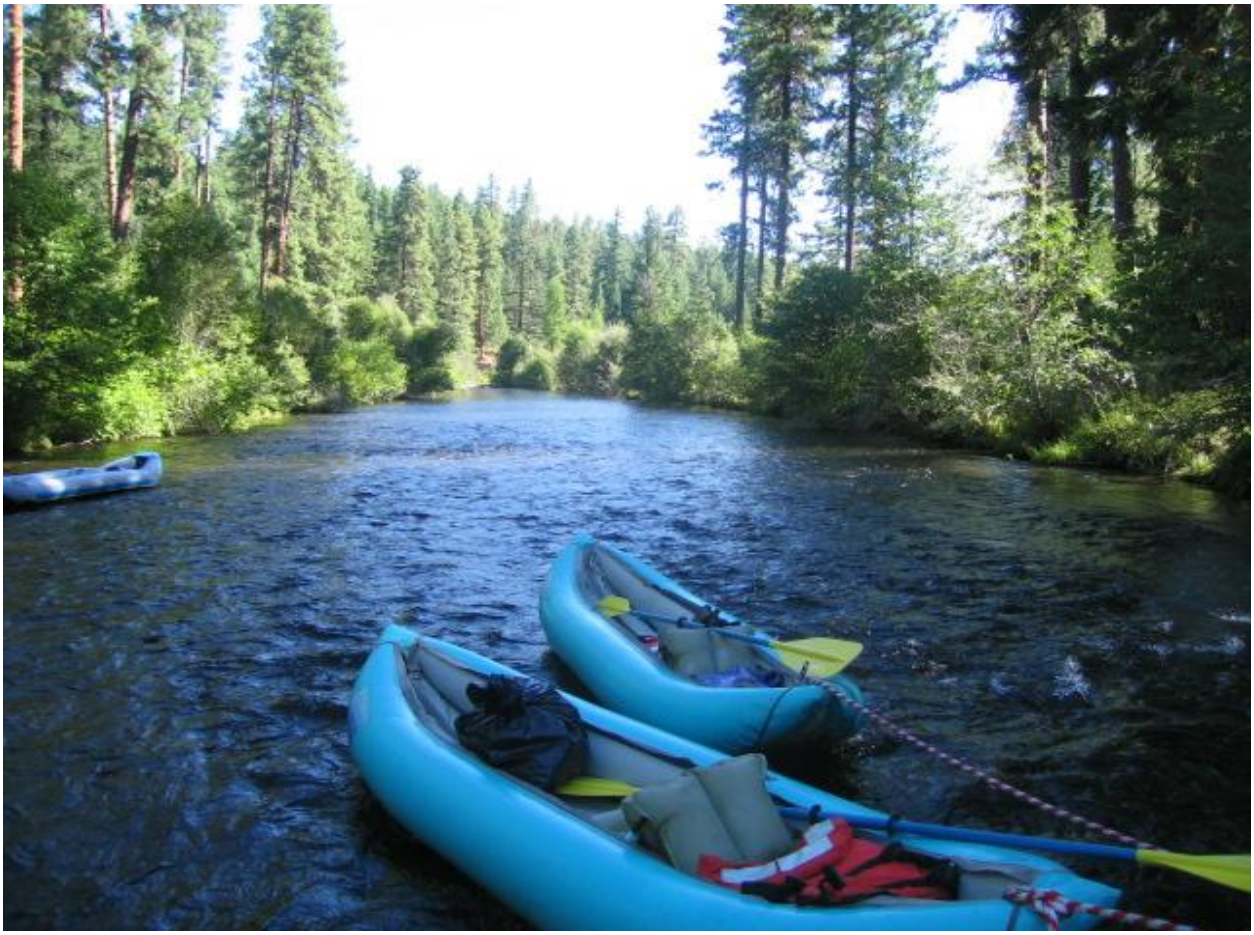

Figure 7. Typical stream reach in the upper Warm Springs River devoid of large wood, lower Deschutes River Subbasin.

Figure 8. Spring Chinook redd in the upper Warm Springs River with small debris jam downstream, lower Deschutes River Subbasin.

Figure 9. Ponderosa Pine stump showing evidence of historic timber harvest within the potential recruitment zone of the Warm Springs River, lower Deschutes River Subbasin.

This project is largely instream habitat enhancement for riparian zone recovery so the system will function closer to its physical and biological potential until natural wood recruitment is re-established. Large wood will be added (whole trees with root wads attached) to the stream channel to enhance habitat complexity. The project will be located from the U.S. Highway 26 Bridge (rkm 49.2) upstream approximately 6.2 km (rkm 55.4, Figure 10). Specific locations will be selected based on lack of LWD from both visual observation and habitat survey data. Instream wood placement will occur using both tracked excavators and helicopter, dependent on access. Placements will occur as single trees or as aggregates (log jams).

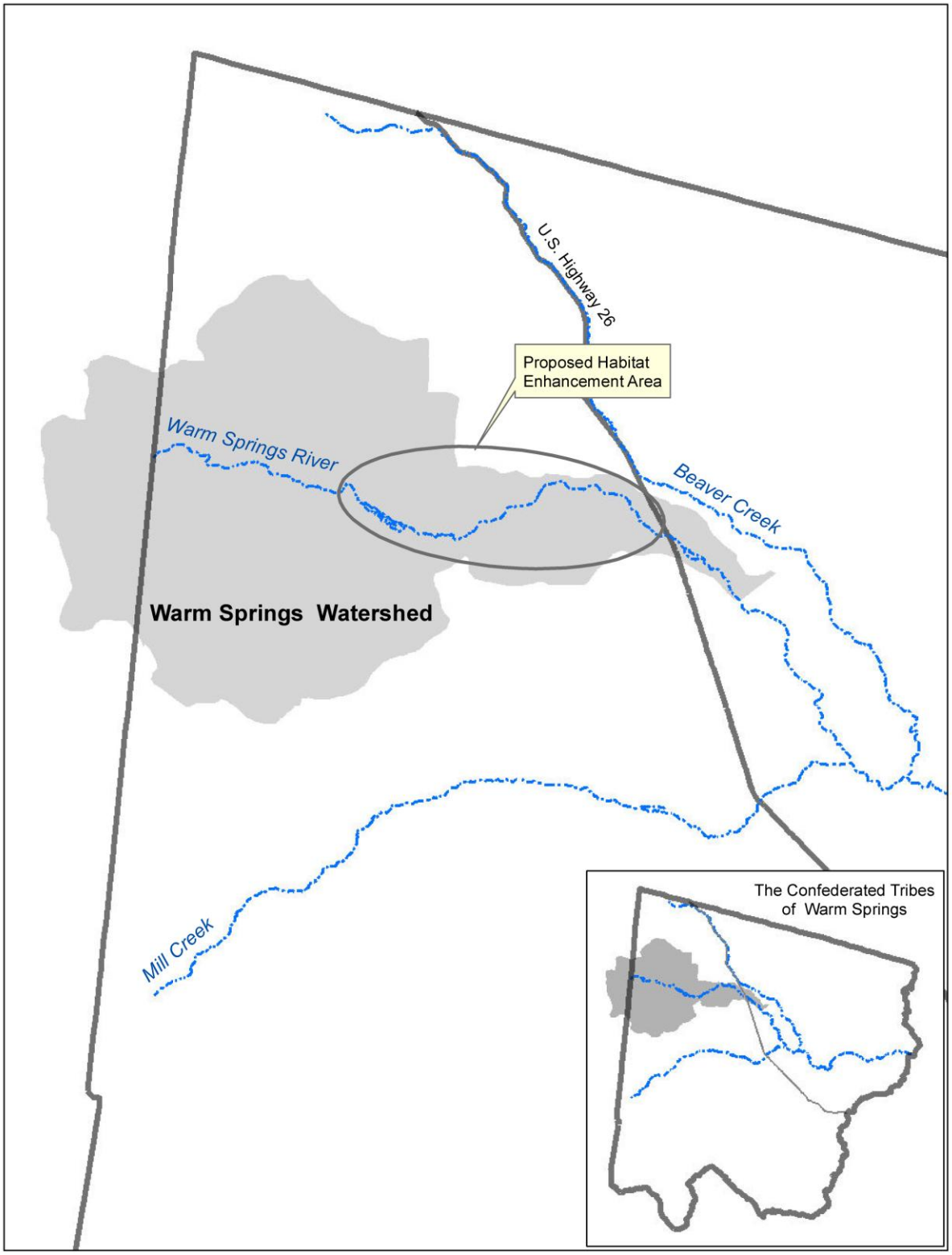

Figure 10. Map identifying large wood enhancement project reach in the upper Warm Springs River, lower Deschutes River Subbasin.

Habitat complexity:

Increase pool habitat- Large pools (greater than 1m in depth) are lacking within the defined restoration area. Large wood structures (using trees with rootwads) will provide a scour mechanism to create and maintain pools with overhead cover. Passive (long-term seasonal hydrology) and active (excavation around placed wood) pool development will be used dependant on the appropriate method for the location.

Increase channel complexity and roughness- Large woody debris placement will be designed and constructed to provide habitat in the form of cover and velocity refugia eliminating the long stretches of riffle habitat that currently exist.

Benefit of project to focal species:
This project will benefit all of salmonid species present by providing increased hiding cover for all life stages. Most importantly, wild spring Chinook will benefit from the increased cover as fry emerge and rear throughout the summer. Recruits per spawner data from the Warm Springs River show a declining trend in recruits as spawner numbers increase suggesting quality complex rearing habitat is limiting. Long sections of the upper Warm Spring River are dominated by riffle habitats with little complexity. Large wood placements will add complexity and provide hiding cover in long riffles sections. Sediment that accumulates behind LWD provides Pacific lamprey ammocoete rearing habitat. Currently, these sections only provide quality rearing habitat in limited areas along the stream margins. Improvements will promote increased production and survival by increasing foraging potential and hiding cover. In addition to benefits for juvenile rearing, LWD placements will provide cover for migrating, holding, and spawning salmon; potentially reducing predation.

Relevance to and linkage to direction given in regional planning:
This project meets the goals and direction of the Tribal, subbasin and regional level planning documents.

The IRMP goals state that aquatic resources should be managed to maintain or enhance populations of anadromous and resident fishes that meet cultural, subsistence and recreational needs of tribal members (CTWSRO 1992*a*; CTWSRO 1992*b)*. In addition, watershed processes should be managed to maintain or improve functional aquatic habitats for fish and other water dependent resources.

Deschutes Subbasin Plan lists the "Management Strategies Specific to the Warm Springs River Habitat Complex" covers the Warm Springs River and tributaries (Table 2). In channel strategies from the subbasin plan specific to this project include:

- Reduce channel width by 50%
- Reduce stream temperature to meet water quality criteria for salmonid rearing
- Restore and maintain instream habitat complexity with a minimum of 20 pieces of large wood per 100 meters of stream channel (*LWD will be added as needed this standard will be used as a general guide*).
- Increase primary pool habitat

The MCSRP specifically lists the Warm Springs River as a major spawning aggregate with degraded channel structure (cause by loss of LWD) as the factor limiting natural production (Table 3). Sites affected included the upper Warm Springs River, which encompasses this project.

Project 3. Beaver Creek Enhancement Projects:

Beaver Creek enhancement projects are made up of three projects. Following is a general overview of Beaver Creek enhancement projects with further description of each project under sections 3.1, 3.2, and 3.3.

Watershed Description:

Beaver Creek, a 5th order stream and is the second largest tributary to the Warm Springs River (Figure 2). Draining 29,784 hectares, Beaver Creek originates in the northwestern part of the Reservation and flows in a southeasterly direction for approximately 40 rkm, entering the Warm Springs River at river kilometer 30.4. Its principal water sources are snowmelt and springs. Several springs, located between rkm 12.8 and rkm16, contribute approximately 23 cfs to the flow. Beaver Creek has a number of tributaries which include: Wilson Creek (entering at rkm 32.6), Beaver Butte Creek (rkm 30.7), Indian Creek (rkm 26.9), Butte Creek (rkm 20.5), Coyote Creek (rkm 12.2), and Quartz Creek (rkm 11.9). Beaver Creek supports populations of spring Chinook, summer steelhead, redband trout, Pacific lamprey, non-native brook trout, and an assemblage of non-game resident fishes.

Use of BPA funds:

The Habitat Program will use BPA funds to manage, design, and secure the necessary permits for project implementation. These projects will benefit improve habitat and natural production of spring Chinook salmon, summer steelhead trout, and Pacific lamprey. The BPA funds may be used as a match to secure funding to further implement projects to improve habitat for anadromous fish resources.

The CTWSRO has secure implementation funding ($325,000) through a settlement fund established in 2005 in response to a gasoline spill on U.S. Highway 26 and subsequent fish kill during March 1999. A Restoration Plan and Environmental Assessment were completed collaboratively by CTWSRO and NOAA (NOAA 2008). Mitigation projects were identified in the plan for Beaver, Quartz, and Coyote creeks. Additional funding ($181,817) has been secured from Natural Resources Conservation Service (NRCS) to develop identified projects within the spill settlement plan.

Restoration Activities and Limiting Factors

Beaver Creek Enhancement Projects are a suite (described below: projects 3.1, 3.2 and 3.3) of restoration actions within the Beaver Creek Watershed, including Coyote and Quartz creek watersheds (Figure 11). This suite of projects will restore watershed processes, including fine sediment delivery and altered hydrology, identified as limiting factors in these watersheds and priorities for restoration in the MCSRP and the Deschutes Subbasin Plan.

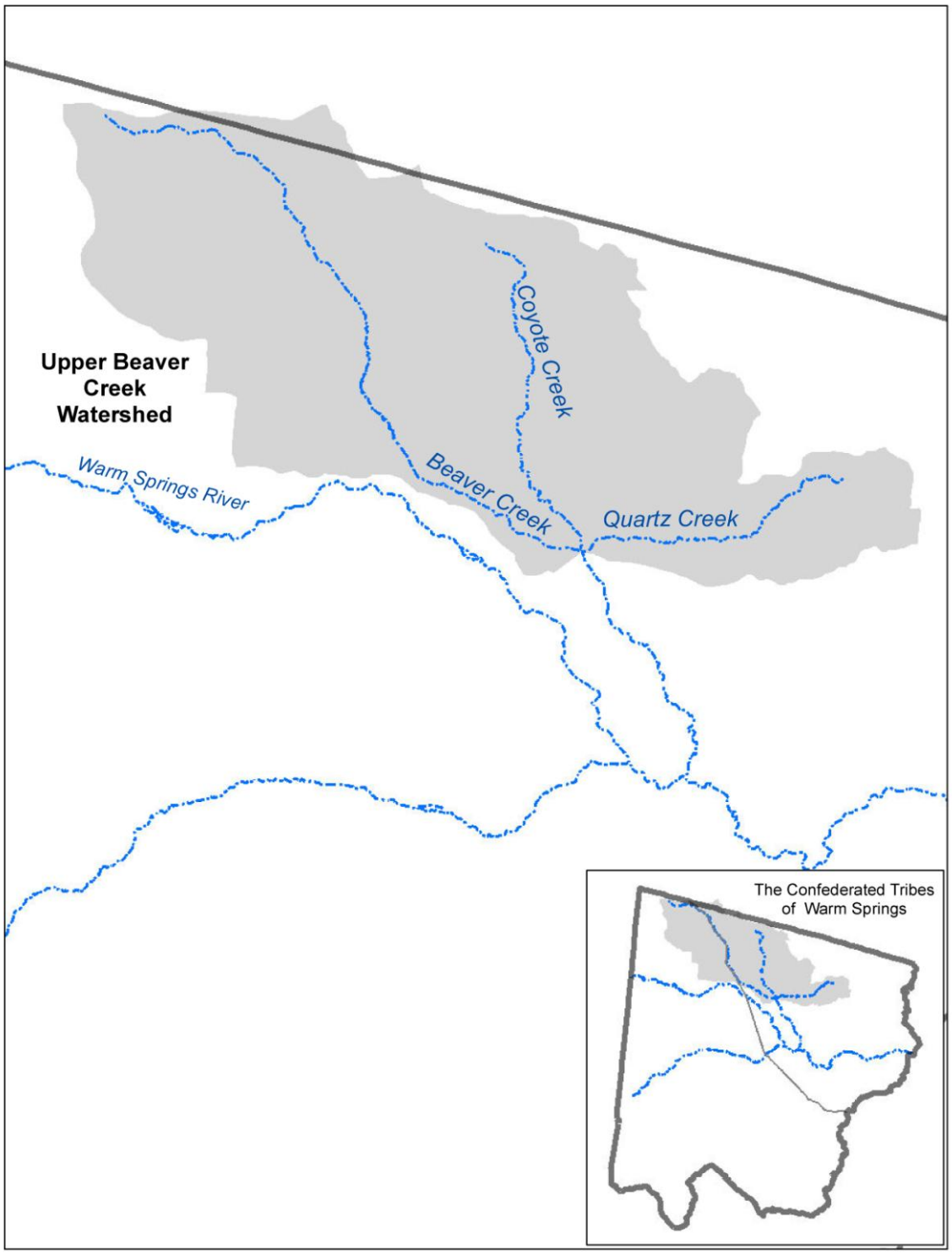

Figure 11. Vicinity map for Beaver Creek Watershed including Coyote and Quartz creeks, lower Deschutes River Subbasin.

The Habitat Program will facilitate coordination and project planning processes that will include the local Tribal public and technical staff from the CTWSRO, BNR, Range, Soils, Hydrology, Wildlife and Roads departments to ensure causes of degradation (road densities and grazing) in Beaver Creek are being addressed. High road densities in these watersheds will be reduced to be in compliance with IRMP standards and to enhance and improve watershed function (CTWSRO 1992*a*; CTWSRO 1992*b)*. The CTWSRHP will develop grazing rotations to protect important wetland and riparian resources to address altered hydrologic function. Additionally, other BNR departments will address grazing rotations for upland areas. Both efforts will be coordinated with the local grazing district to ensure public support and compliance. Funding has been secured to remove roads and improve grazing systems within the Quartz and Coyote creek watersheds, but additional road removals and grazing systems improvements are being implemented by other departments within the BNR. The CTWSRHP has taken the lead on assessing roads that are directly connected to the hydrologic network and have negatively impacted stream hydrology and increased sediment delivery. Other departments are accessing road densities from wildlife and compacted surfaces perspective.

Limiting Factors

Habitat complexity:

Increase pool habitat- Large pools (greater than 1m in depth) are lacking within the defined restoration area. Large wood structures (using trees with rootwads) will provide a scour mechanism to create and maintain pools with overhead cover. Passive (long-term seasonal hydrology) and active (excavation around placed wood) pool development will be used dependant on the appropriate method for the location.

Increase channel complexity and roughness- Large woody debris placement will provide habitat in the form of cover and velocity refugia eliminating the long stretches of riffle habitat that currently exist.

Altered hydrology

Restore wetland and riparian features- Degraded and incised wetland features will be restored to function appropriately as water storage and energy dissipation elements in the watershed. The objective in these projects is to restore watersheds such that water is captured, stored and slowly released.

Fine sediment

Reduce road densities- Roads, skid trails, and landings will be re-contoured and planted with vegetation to increase filtration and reduce runoff and overland flow. Road segments that are hydrologically connected to stream channels and show signs of surface erosion will be priority.

Restore stream channels and stream banks- Restoration to halt incision, promote channel aggradation, restore floodplain access, store water, reduce erosion and promote re-vegetation will occur in both Quartz and Coyote creeks.

Benefit of project to focal species:

Redd surveys conducted in lower Beaver Creek indicate that up to 40% of spring Chinook spawning within Beaver Creek occurs downstream of the confluence of with Quartz and Coyote creeks (CTWSRO, unpublished data). Baseline fine sediment data collected using bulk core sampling techniques shows that particles less that 6.4 mm (fine sediment) range from 34 – 47% of the streambed material in Beaver Creek (Table 4). Tribal IRMP standards call for levels less

Table 4. Summary of the cumulative (%) particle size distribution, from bulk core sampling techniques, for Beaver Creek, lower Deschutes River Subbasin, Oregon, 2003. The shaded line indicates the NOAA threshold for fine sediments.

	Stream					
	Beaver Creek					
	Reach 2	Reach 4	Reach 5	Reach 6	Reach 7	Reach 9
Sieve size (mm)	Cumulative % substrate by sieve size					
0.21	6	8	6	3	5	3
0.42	10	12	8	5	7	6
0.85	14	20	12	11	12	11
1.7	19	28	19	18	17	16
3.35	26	37	27	28	25	25
6.3	36	47	36	37	34	36
9.5	45	55	49	45	42	44
12.5	52	60	52	52	49	52
25	75	76	79	73	74	77
50	98	93	98	95	93	96
68	100	100	100	99	100	99

than 20% (CTWSRO 1992*a*; CTWSRO 1992*b)*. High sediment loads however were observed in not only Beaver Creek but Shitike Creek and Warm Springs River as well. This data illustrates fine sediment is negatively impacting watershed function and subsequently fish production.

Projects focused on reduction of sediment production and delivery to lower Beaver Creek will benefit spring Chinook and ESA listed summer steelhead by increasing survival to emergence, and increasing primary production of the aquatic system. Restoring wet meadow systems in Quartz and Coyote creeks will augment base stream flows by storing and slowly releasing water. Erosion will be reduced through increase riparian vegetation that stabilizes banks and filters fine sediment before it is delivered to the stream channel.

Relevance to and linkage to direction given in regional planning:
This project meets the goals and direction of the Tribal, subbasin and regional level recovery planning documents.

The IRMP goals state that aquatic resources should be managed to maintain or enhance populations of anadromous and resident fishes that meet cultural, subsistence and recreational needs of tribal members (CTWSRO 1992*a*; CTWSRO 1992*b)*. In addition watershed process should be managed to maintain or improve functional aquatic habitats for fishes and other water dependent resources. The IRMP also sets a standard for the level of fine sediment composition in the streambed of salmonid producing watersheds of less than 20% (CTWSRO 1992*a*; CTWSRO 1992*b)*.

Deschutes Subbasin Plan lists the "Management Strategies Specific to the Warm Springs River Habitat Complex" (Table 2). This section covers the Warm Springs River and tributaries. Sub-watershed strategies from the subbasin plan specific to this project include:

- Improve upland watershed processes 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 ecological function of 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, and;
- Manage riparian ecosystems to encourage restoration of beaver populations through restoration of woody vegetation.

The MCSRP specifically lists these projects in the lower Warm Springs River major spawning aggregate (Table 3). Degraded floodplain and channel structure, degraded riparian communities, altered hydrology, degraded water temperature and altered sediment routing have been identified as the factors limiting natural production. These projects in Beaver Creek directly or indirectly address many or all of the limiting factors.

Project 3.1. Upper Beaver Creek Enhancement Project

S-501 enhancement

This project will remove two culverts and a road prism and enhance off-channel habitat (Figure 12). The S-501 road is in the riparian/floodplain area of Beaver Creek and approximately 120 m will be decommissioned. Old bridge abutments will be removed as part of decommissioning road S-501. Following removal of the abutments, log jams will be strategically placed to enhance pool development and complexity. Culvert removal on Indian Creek will allow for an extension of anadromy as the existing culvert acts as a fish passage barrier. Banks will be re-sloped to historic dimensions and log structures will be placed to provide grade control.

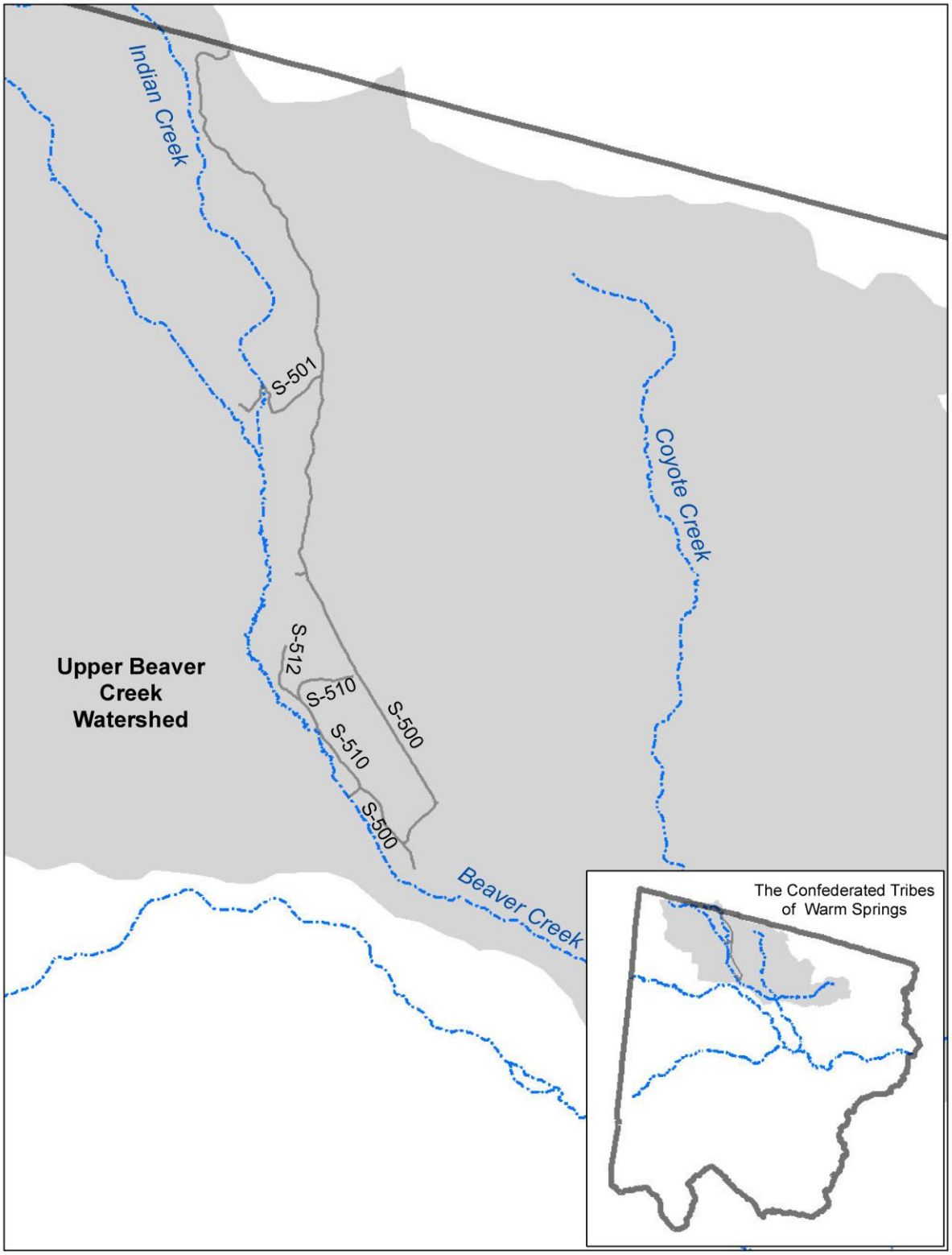

Figure 12. Map of Upper Beaver Creek Watershed restoration projects, lower Deschutes River Subbasin.

A side channel of Beaver Creek was rerouted and lost with the development of the S-501 road. It currently flows along the north side of the S-501 and returns to Beaver Creek. Flow will be redirected into its historical channel on the downstream side of the S-501. Riparian vegetation will be planted along channel realignment area as well as in the removed road bed.

S-500, S-510, and S-512 enhancement
Currently there are high densities of roads within the enhancement area (Figure 11). This project will remove a kilometer of road from the current road prism (S-500, S-510, and S-512). Roads within the enhancement site (S-500 and S-510) which are traveled by the tribal membership will be resurfaced with gravel to reduce upland sediment loads. In addition, LWD will be added to the stream along the restored segment of the S-512 road.

The ODFW surveys (1998) and stream surveys conducted by CTWSRO (CTWSRO, unpublished data, collected in 2011) found Beaver Creek lacked a large wood and pool component for the stream reach between Dahl Pine (rkm 23.2) and Robinson Park (rkm 32.3). Where the stream is impinged by the road prism, the road prism will be removed and trees with root wads will be positioned in the stream bank to increase pool habitats and channel roughness. Additional wood (>40 cm diameter) will be placed in a series of complexes, groups and single pieces, to encourage overhead cover, increase pool complexity, and pool development. These complexes improve conditions by retaining naturally recruited trees into the channel from the riparia.

Timeline:

	Year					
Objective	2011	2012	2013	2014	2015	2016
Contract Design	X					
Permitting and Compliance	X	X				
Conduct Public Scoping	X					
Acquire Implementation Funds	X					
Implement Project		X				
Reporting upon Project Completion			X			
Monitoring			X	X		

3.2. Coyote Creek Watershed Restoration

The objective is to remove anthropogenic disturbance, protect intact habitat, and plant native vegetation in riparian areas. The Log Springs area has been overgrazed causing sediment delivery to Coyote Creek, and subsequently to Beaver Creek (Figure 13).

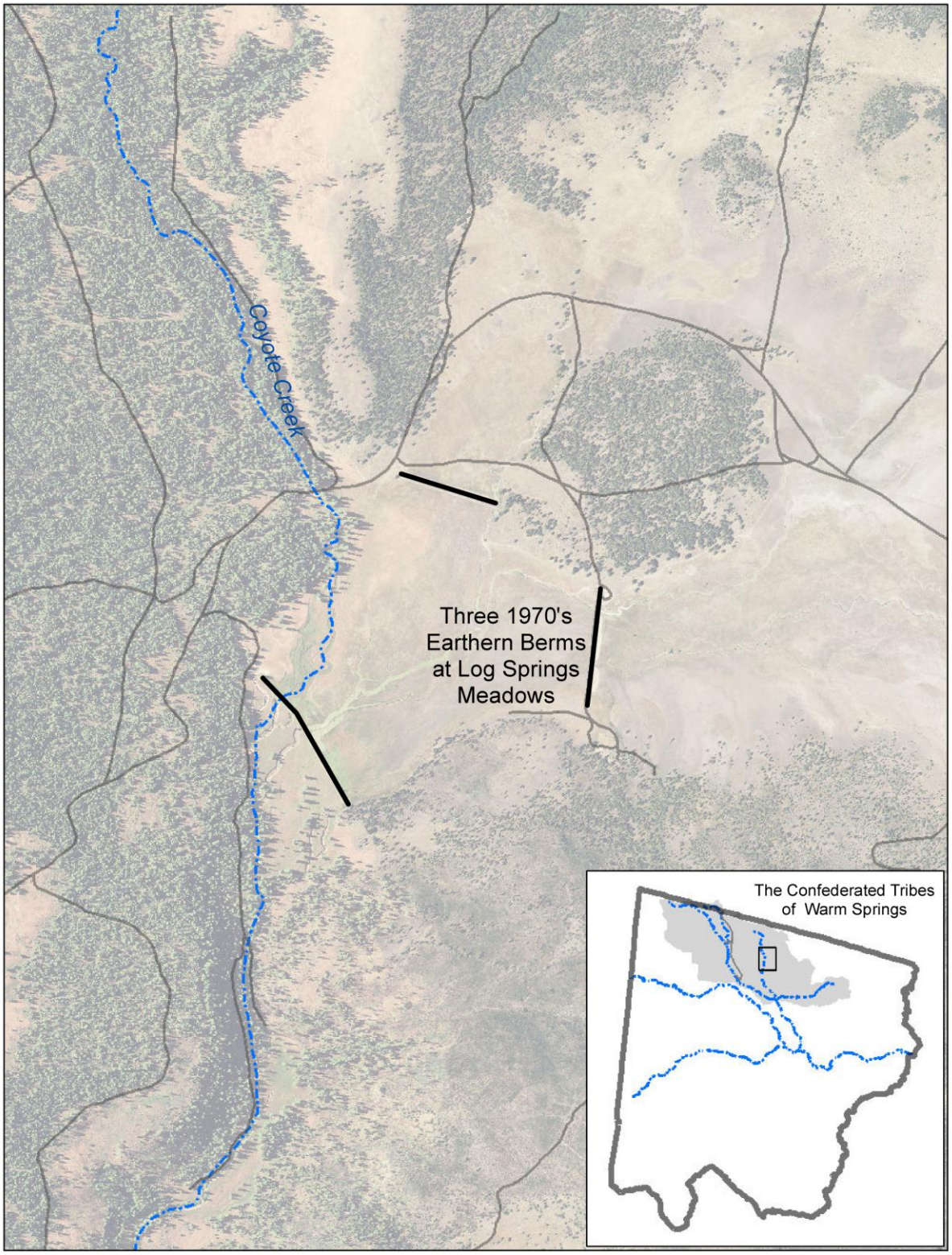

Figure 13. Map of Coyote Creek, identifying Log Springs Meadows and displaying road densities, lower Deschutes River Subbasin.

Meadow Improvements

In the 1970s, three earthen berms were constructed across Log Springs Meadow to remedy incision and erosion occurring from Coyote Creek (Figures 13 and 14). Berm drains were inadequate and have been breached during high flow events causing further erosion in Coyote Creek. This project will repair existing berms and improve wetland drainage. The necessitated actions are not a process-based restoration scheme but a site-specific action with the intent of correcting a legacy effects from the initial berm design.

In conjunction with berm repair CTWSRHP coordinate with NRCS to design and implement stream restoration actions that restore Log Springs Meadow. The restoration design will involve addition of grade control, creation of floodplain and floodplain connected wetland features, along with riparian planting.

In order to ensure that the improvements made will have the desired benefit and protected existing habitat features, fencing and grazing system improvements will be completed in coordination with CTWSRO grazing groups and Range Department.

Figure 14. Photo of berms located in Log Springs Meadow, Coyote Creek, lower Deschutes River Subbasin.

Road Density Reduction

Road density coupled with land use, within the Coyote Creek Watershed, has resulted in significant changes in sediment production and routing. These alterations have had significant impacts on important spawning areas within lower Beaver Creek. This project will reduce and eliminate roads that are hydrologic ally connected to the stream network (Figure 13). Currently, the number of kilometers of road to be removed is undetermined. However, road and skid trail densities range from 0.6 to 7 km per section, exceeding IRMP standards (CTWSRO 1992*a*; CTWSRO 1992*b)*. Based on IRMP road densities per section be less than: 2.8 km in commercial forested lands; 1.5 km in wildlife management zones; and 0.6 km in riparian areas.

Timeline

Coyote Creek Restoration

	Year					
Objective	2011	2012	2013	2014	2015	2016
Contract Design	X	X	X	X		
Permitting and Compliance	X	X	X	X		
Conduct Public Scoping	X	X	X			
Acquire Implementation Funds	X	X	X			
Implement Project			X	X	X	
Reporting upon Project Completion						X
Monitoring						X

3.3. Quartz Creek Watershed Restoration

The south and north forks of Quartz Creek (Figure 15) are severely incised and unstable banks deliver sediment to Beaver Creek due to anthropogenic activities within the watershed; particularly livestock grazing. Enhancement activities within the watershed will focus on improving riparian conditions and watershed function through fencing, off-site water developments for livestock, improvement to current grazing activities, and riparian planting.

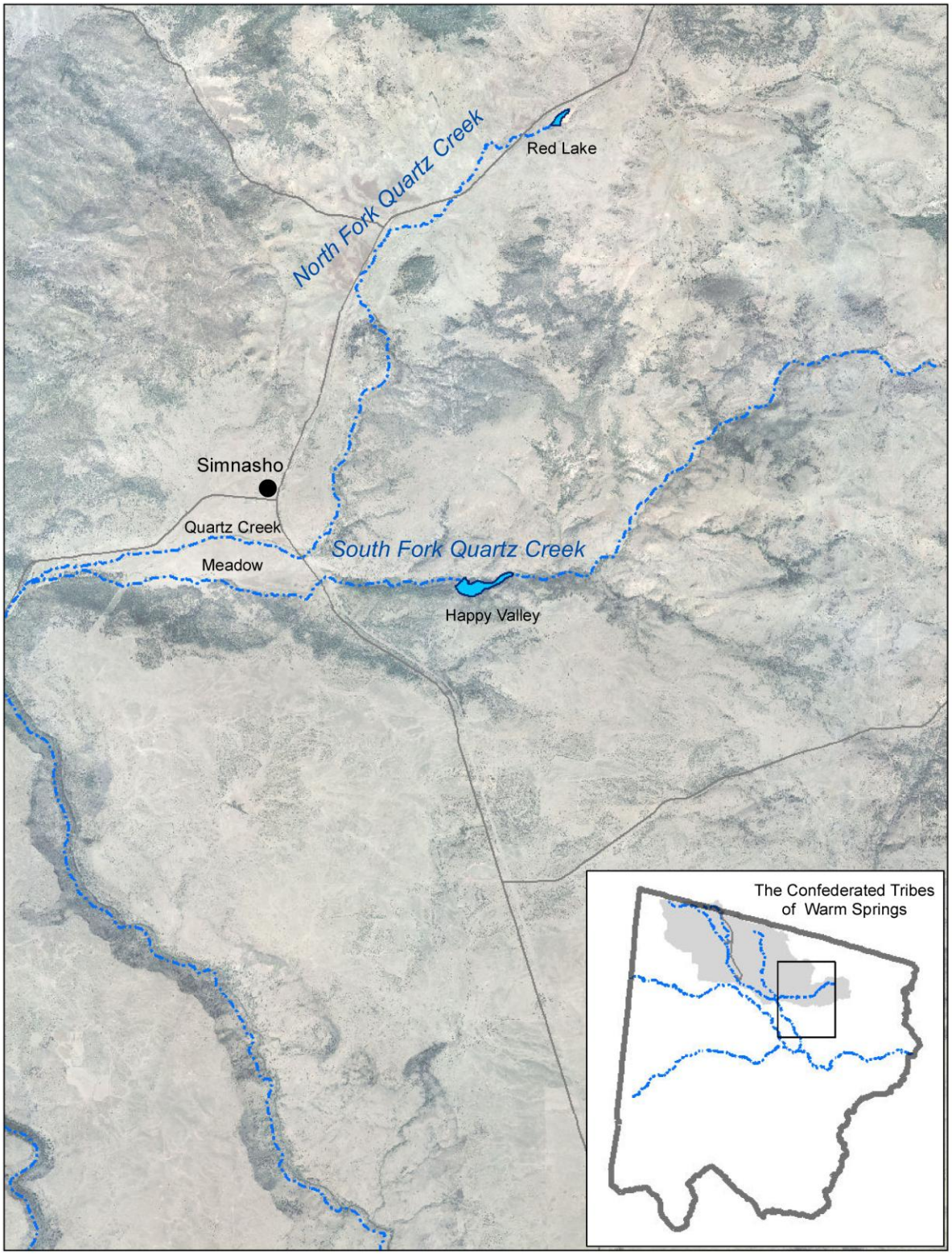

Figure 15. Map of north and south fork of Quartz Creek including Happy Valley Reservoir, Simnasho, and Red Lake, lower Deschutes River Subbasin.

Fencing

Approximately three kilometers of pasture fencing along south and north forks of Quartz Creek will be established to protect riparian vegetation and stream banks from livestock grazing. This will protect approximately 170 ha.

Currently there is 2,300 m of four-strand barb wire fence along lower Quartz Creek. The current fence is in disrepair and will be replaced in order to protect the channel from grazing.

Off-site Water Developments

The CTWSRO Range and Agriculture Department is working on improving irrigation for the Quartz Creek meadow. Water would be supplied from the Happy Valley Reservoir. This would allow for increased grazing opportunities and potential irrigating of agriculture lands; removing grazing pressure from sensitive riparian and wetland areas.

Springs, located in the area of Red Lake north of the community of Simnasho (Figure 15), can be used for livestock watering on the rangelands and riparian habitats in the area will be protected from livestock seeking water. A spring box would provide the water for two troughs. In addition to developing the spring box for livestock watering, a pasture system with fenced areas will be established to protect the north fork of Quartz Creek.

Grazing Improvements

Coupled with fencing and bank stabilization efforts through riparian planting, CTWSHRP will work with grazing groups to develop grazing plans beneficial to both the watershed and livestock owners.

Timeline

	Year					
Objective	2011	2012	2013	2014	2015	2016
Contract Design		X	X	X		
Permitting and Compliance		X	X	X		
Conduct Public Scoping	X	X	X	X		
Acquire Implementation Funds		X	X	X		
Implement Project					X	X
Reporting upon Project Completion						X
Monitoring						X

SECTION IV: HABITAT PROJECT MONITORING AND REPORTING

Post-project evaluation and monitoring, along with dissemination of results, is necessary for an adaptive management approach to ecological restoration. To effectively evaluate projects implemented through the CTWSHRP three principle elements (adapted from Kondolf 1995) will be required for each project that will include:

- Clear objectives to identity potential failures and provide a framework for project evaluation;
- Baseline data to evaluate changes resulting from the project (*e.g.,* effectiveness), and;
- Long term commitment to monitoring over the life of the project or at minimum 10 years to understand the effects/results and inform an adaptive management feedback loop.

Restoration projects viewed as experiments and implemented using guidelines established under the scientific method can advance understanding of species response to habitat restoration projects. Many (if not all) of the techniques proposed for use through this funding agreement are standard restoration practices and are widely used across the Pacific Northwest. Specific monitoring will address physical components of the project while a second suite of monitoring will address biological indicators. Data from post-project monitoring can be used to measure species response to changes in habitat characteristics as a result of restoration activities. The level of detailed monitoring will be based on site specific treatment and will be guided by the regional direction for implementation and effectiveness monitoring of restoration actions (*e.g.,* PNAMP protocols and methods).

Projects selected for implementation through the CTWSHRP will employ a reporting system developed by NOAA Fisheries to support PNAMP. This effort has developed a comprehensive series of reporting metrics and protocols to track restoration actions at the project scale. Projects designed and implemented through the CTWSHRP along with the specific reporting metric for each project type is presented in Appendix I. In addition, Appendix II presents a suite of monitoring actions that will be implemented to evaluate project effectiveness. Monitoring will be conducted using approved protocols available through PNAMP (www.monitoringmethods.org/Protocol).

Effectiveness monitoring will occur at two spatial scales; monitoring at the scale appropriate to the restoration action, which will be a component of the restoration proposal, and monitoring that is done at the watershed scale and is part of CTWRSO BNR's program, such as other BPA-funded projects. The monitoring process addresses the question of how successful a project ultimately is at restoring the ecosystem or component parts, relative to its initial goals and objectives. Effectiveness monitoring strategies for the three restoration projects described in this narrative are briefly described below.

Potters Pond to Boulder Creek Restoration, Mill Creek

Habitat restoration objectives that will be monitored include:

1. Increase pool habitat
2. Increase channel complexity and roughness
3. Increase sinuosity
4. Reduce channel width:depth ratio
5. Enhance spawning habitat
6. Increase floodplain connectivity
7. Increase off channel habitat
8. Increase riparian vegetation
9. Decrease fine sediment
10. Water temperature
11. Increase floodplain
12. Increase side channel and off channel wetland features

Monitoring physical aspects of this restoration action will be accomplished by annual habitat surveys in the restoration area to document changes (Objectives 1, 2, 3, 4, 5, 7). The stream survey protocol that has been adopted by CTWSHRP is the U.S. Forest Service, Region 6, Stream Survey Protocol (U.S. Forest Service 2010). Aspects of the PACFISH/INFISH Biological Opinion Effectiveness Monitoring (PIBO Effectiveness Monitoring) will also be implemented, including monitoring methods for stream cross sections and longitudinal profiles (Heitke et al. 2011) using engineering grade GPS receivers (GR-3, Topcon Positioning Systems, Inc., Livermore, CA). Pressure transducers (*e.g.*, WL 16 water level logger, Global Water Instrumentation, Gold River, CA) can be used to monitor water surface elevation with respect to floodplain elevations (data collected as part of restoration planning and as-built design) throughout the year to document the extent and timing that floodplain connectivity will be increased and how much habitat (*e.g.*, m^2, ha) that will be gained by the restoration action (Objectives 6, 7, 11, 12). Photo points will be used to document changes in riparian vegetation using the Oregon Watershed Enhancement Board photo point monitoring protocol (Objective 8; Shaff et al. 2007). Sediments (particle size and cumulative percent) will be monitoring using a McNeil core sampler in transects immediately downstream of identified spawning locations (Objective 9; Tussing 2009). Stream temperatures will be monitored year-round using water temperature loggers that record hourly (HOBO Pro v2 Water Temp, Onset Computer Corp., Pocasset, MA). Water loggers will be placed upstream, within, and downstream of the restoration site (Objective 10).

Monitoring will also include snorkel surveys to document relative abundance of fishes by species and size class by habitat unit. Snorkeling will occur shortly after the habitat survey so that relative abundance of fish can be correlated to habitat characteristics at the habitat unit scale. Spawning surveys will document redds annually in the restoration reach annually.

Large woody debris placements into the Warm Springs River

Habitat restoration objectives that will be monitored include:

1. Increase pool habitat
2. Increase channel complexity and roughness

The proposed restoration action in Warm Springs River is to add LWD throughout a 6 km reach upstream of U.S. Highway 26. Because the intent to increase pool habitat is an objective, the stream bed elevation immediately downstream of LWD structures will be monitored using PIBO Effectiveness Monitoring methods for stream cross sections and longitudinal profiles (Heitke et al. 2011) to determine pool development (Objective 1). Index sites for snorkeling will be located at each LWD structure. The small spatial scale of monitoring fish use is appropriate to the scale of the restoration action so that the response (relative abundance of fish) will not be diluted across the 6 km reach. Snorkeling will occur annually (timing and frequency within the year has yet to be determined but will need to capture variability in relative abundance during the sample period) to document relative abundance of fish by species and size class. Monitoring physical aspects of this restoration action will be accomplished by annual habitat surveys in the 6 km reach to document changes in channel complexity and roughness (Objective 2; Heitke et al. 2011; U.S. Forest Service 2010).

Beaver Creek Enhancement Projects

Habitat restoration objectives that will be monitored include:

1. Increase pool habitat
2. Increase channel complexity and roughness
3. Restore wetland and riparian features
4. Reduce road densities
5. Restore stream channels and stream banks

Monitoring physical aspects of this restoration action will be accomplished by annual habitat surveys in the restoration area to document changes in pool frequency, channel complexity and roughness and stream channels and banks (Objectives 1, 2, 5; Heitke et al. 2011; U.S. Forest Service 2010). Water storage through the year and area of inundation of wetlands and riparia may be monitored using pressure transducers (*e.g.*, WL 16 water level logger, Global Water Instrumentation, Gold River, CA) and water surface elevation with respect to floodplain elevations (data collected as part of restoration planning and as-built design; Objective 3). After road decommissioning, the BNR GIS (ArcGIS v. 10, ESRI, Inc., Redlands, CA) roads layer will be updated and a comparison of road densities before and after restoration can be described (Objective 4).

Benefits to fishes by the Beaver Creek Enhancement Projects are expected to be greater rearing habitat (increased pools) and an increase and/or quality in spawning habitat due to reduced sediment input that may cause embeddedness. Therefore, monitoring benefits to fish will include snorkeling index sites that include reaches where restoration actions have enhance pool frequency and channel complexity. Spawning surveys will document redds annually in the restoration reaches annually. Sediments (particle size and cumulative percent) will be monitoring using a McNeil core sampler in transects immediately downstream of identified spawning locations (Tussing 2009)

At the watershed scale, fish population responses to the restoration projects implemented through the CTWSHRP will be monitored through the BPA funded project 2008-311-00 (Natural Production Monitoring and Management). This project will also use monitoring protocols listed and approved through PNAMP. This project will annually monitor and report juvenile out-

migrant estimates, juvenile rearing densities, redd abundance, and adult escapement for spring Chinook and steelhead.

Water quality and water temperature will be monitored through BPA funded projects 2007-157-00 (Bull Trout Status and Abundance), 2002-016-00 (Pacific Lamprey Abundance) and the CTWSRO BNR Environmental Program through a strategy approved by the Region 6 office of the Environmental Protection Agency (EPA). This monitoring strategy involves three components:

- Baseline monitoring at 48 sites on the Reservation on a monthly basis;
- Non-point source monitoring using grab samples and continuous monitoring at eight sites on the Reservation, and;
- Monthly monitoring to evaluate compliance with Tribal water quality standards at 48 sites on the Reservation.

Based on treatment and site-specific conditions, water quality monitoring may be expanded to include restoration sites. All of these data are maintained within the CTWSRO BNR water quality database, checked for data quality and reported to BPA and EPA.

To monitor trends in the fine sediment composition of streambed substrate of Reservation streams the CTWSHRP has developed a monitoring strategy incorporating existing data (*e.g.,* Table 4) as a baseline and uses regional approved protocols and techniques from BPA's Integrated Status and Effectiveness Monitoring Program (Tussing 2009). This long term monitoring component will serve as a tool to evaluate IRMP compliance and the effectiveness of sediment reduction projects.

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. Currently the on-reservation CTWSRO Habitat Program has four full time staff, two vehicles, one ATV, four computers, fence supplies, tools and storage shed. Funding through this contract will support the growing needs of a full service restoration and land management operation.

Through the life of the Accords, 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 layout restoration projects, an additional ATV to assist with weed and vegetation management, computers and software to manage and administer the program. 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, HABITAT PROGRAM MANAGER
THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

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

Professional Experience
Fish Habitat Program Manager and Off Reservation Habitat Biologist
Confederated Tribes of Warm Springs, 2004-present
Duties include Habitat Program management and development. Restoration project design and implementation. Endangered Species Act consultation for Reservation projects. Represent Tribal interests within the ceded lands across eastern Oregon.

Fish Biologist—Water Rights and Protection Division
Yurok Tribal Fisheries Program, 2001 -2006
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.

Technician and Crew Lead Positions
Various employers, 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, HABITAT BIOLOGIST
THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

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

Professional Experience
On Reservation Habitat Biologist
Confederated Tribes of Warm Springs, 2007 – present
Participate in on Reservation environmental planning, design and implementation of restoration projects and supervise seasonal crews collecting habitat data and maintaining restoration projects.

Water Quality Planner
Nez Perce Tribe, 2005 - 2007
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.

Fish Biologist
Nez Perce Tribe, 2001 - 2005
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.

JASON GRANT, HABITAT BIOLOGIST
THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

Education
B.S. Fisheries and Wildlife Science from Oregon State University 2008

Professional Experience
Fish Habitat Biologist
Confederated Tribes of Warm Springs, 04/2011-present
Duties include leading a crew to conduct Reservation wide stream habitat inventories, morphological and biological monitoring and evaluation of stream restoration projects, and the formation and evaluation of fine sediment monitoring for Reservation streams.

Fish Habitat Biologist
Confederated Tribes of Umatilla, 2009-03/2011
Implemented stream restoration projects that included the administration of subcontracts. Monitored stream morphological and biological characteristics associated with restoration projects. Coordinated with private landowners and other agencies/entities to meet fish habitat program goals and objectives. Lead various crews in riparian planting and protection operations.

Fisheries Technician
USDA Forest Service, seasonally from 2006-2009
Worked in multiple fisheries technician positions where experience was gained in stream restoration implementation and subcontract administration, fish surveying by means of snorkeling and electro-shocking, and conducting stream surveys to aid in the formation of future restoration opportunities.

JOHNNY HOLLIDAY, SR., PROJECT COORDINATOR
THE CONFEDERATED TRIBES OF THE WARM SPRINGS RESERVATION OF OREGON

Education
Madras High School, Madras, Oregon

Professional Experience
Fish and Wildlife Technician II
Confederated Tribes of Warm Springs, 2008 - present
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.

Appendix I. Reporting (print on 11 x 17 paper)

Deschutes River Restoration Program Proposed Project Types, Reporting and Monitoring Metrics

Project and subtype	Definition	Objective	Long-term Monitoring
Instream Habitat			
Engineered Large Wood	Placement of large wood in a stream channel using pinning and ballast	1. Improve stream/channel morphology in the treated stream reach. 2. Increase juvenile salmon abundance in the treated stream reach.	Photopoints, channel cross section and longitudinal profiles, redd surveys, presence absence and juvenile salmonid surveys, basin wide outmigrant trapping, habitat surveys and water temperature monitoring
Large Wood Placement	Placement of large wood in a stream channel without pinning and ballast		
New Channel Creation	Construction of new channel increasing length, pools, riffles, glides		
Bank Stabilization	Use of wood, rock, vegetation, and/or bioengineering to stabilize stream banks		
Spawning Gravel Placement	Addition of spawning sized gravel to stream channels		
Boulder Placement	Addition of rounded boulders to stream channels		
Off Channel Habitat-side channel	Construction or reconnection of side channels		
Off Channel Habitat-slough creation	Construction or reconnection of slough features		
Off Channel Habitat-pond creation	Construction or reconnection of ponds		
Engineered Beaver Pond	Construction of simulated beaver ponds to provide habitat		
Sediment Reduction			
Road Removal	Complete removal of road surfaces from the land	1. Reduce to composition of fine sediment (particles less than 6.4mm) in the stream bed substrate.	Photopoints, redd surveys, fish presence absence surveys, long term bulk core sediment sampling, plant survival and composition surveys, channel cross section and longitudinal surveys
Road Resurfacing	Resurfacing a road with rock or another material to reduce surface erosion		
Road Relocation	Abandoning a road from a sensitive area and moving to a less sensitive location		
Road Crossing Improvement-rock	Addition of rock to reinforce a existing crossing while maintaining passage and channel geometry		
Road Crossing Improvement-culvert improvement	Instillation of a properly sized culvert		
Road Drainage System Improvements	Instillation of structures to control run off from roads		
Bank Stabilization-bioengineering	Use of wood, rock, vegetation, and/or bioengineering to stabilize stream banks		
Bank Stabilization- engineered large wood placement	Placement of large wood in a stream channel using pinning and ballast		
Engineered Beaver Pond	Construction of simulated beaver ponds to provide habitat to retain sediment		
Planting-riparian	Planting native species within riparian areas to stabilize banks and filter sediment		
Planting-upland	Planting native species within upland areas to retain and filter sediment		
Fish Passage			
Culvert Removal	Complete removal of culverts	1. Restore yearlong upstream and downstream passage on all anadromous and resident fish bearing streams	Fish presence absence and redd surveys, basin wide outmigrant trapping, and photopoints
Culvert Replacement	Replacement of culverts that are undersized, improperly placed, or unmaintained		
Instream Structure Removal	Removal of relic instream structures		

Deschutes River Restoration Program Proposed Project Types, Reporting and Monitoring Metrics (cont'd)

Project and subtype	Definition	Objective	Long-term Monitoring
Riparian Improvement			
Native Species Planting	Planting native species within riparian areas to stabilize banks and filter sediment	1. Restore streamside vegetation, increase bank stability, and reduce sedimentation. 2. Reduce to composition of fine sediment (particles less than 6.4mm) in the stream bed substrate.	Photopoints, redd surveys, fish presence absence surveys, long term bulk core sediment sampling, plant survival and composition surveys, channel cross section and longitudinal surveys, and annual weed surveys
Weed Control	Removal and/or control of non-native and noxious weeds		
Silvicultural Treatment-stand management	Prescribed burnings, stand thinnings, silivicultural practices, vegetation management		
Fencing	Fence construction to improve and reduce livestock use in sensitive sites		
Upland Improvement			
Silvicultural Treatment-stand management	Prescribed burnings, stand thinnings, silivicultural practices, vegetation management	1. Reduce to composition of fine sediment (particles less than 6.4mm) in the stream bed substrate. 2. Improve the ability of the watershed to capture, store, and safely release annual precipitation.	Photopoints, annual weed surveys, plant survival and composition surveys, long term bulk core sediment sampling, water development maintenance log
Juniper Removal	Thinning and removal of juniper to improve hydrology and upland vegetation composition		
Native Species Planting	Planting native species within riparian areas to stabilize banks and filter sediment		
Water Development- maintenance	Maintenance and improvement of existing water developments		
Water Development-new	Construction of new water developments to improve livestock distribution		
Weed Control	Removal and/or control of non-native and noxious weeds		
Fencing	Fence construction to improve livestock distribution in upland areas		
Wetland Improvement			
Weed Control	Removal and/or control of non-native and noxious weeds	1. Reduce to composition of fine sediment (particles less than 6.4mm) in the stream bed substrate 2. Improve the ability of the watershed to capture, store, and safely release annual precipitation.	Photopoints, plant survival and composition surveys, channel cross section and longitudinal surveys, and annual weed surveys
Fencing	Fence construction to improve and reduce livestock use in sensitive sites		
Wetland Creation	Construction of wetland features to store and process water		
Engineered Beaver Pond	Construction of simulated beaver ponds to provide habitat, retain sediment, and improve water storage		
Native Species Planting	Planting native species within wetland areas to stabilize banks and filter sediment		
Bank Stabilization-bioengineering	Use of wood, rock, vegetation, and/or bioengineering to stabilize stream banks		
Grazing Management			
Fencing-riparian	Fence construction to improve and reduce livestock use in sensitive sites	1. Restore streamside vegetation, increase bank stability, and reduce sedimentation. 2. Reduce to composition of fine sediment (particles less than 6.4mm) in the stream bed substrate. 3. Improve the ability of the watershed to capture, store, and safely release annual precipitation.	Photopoints, annual weed surveys, plant survival and composition surveys, long term bulk core sediment sampling, water development maintenance log
Fencing-pasture	Fence construction to improve livestock distribution		
Water Development- maintenance	Maintenance and improvement of existing water developments		
Water Development-new	Construction of new water developments to improve livestock distribution		
Weed Control	Removal and/or control of non-native and noxious weeds		

Appendix II. Monitoring (print on 11 x 17 paper)

Long term Monitoring	Definition	Protocol	Metric	Frequency
Photopoints	Photographic documentation of pre and post projects to visually track changes over time	OWEB Guide to Photo point monitoring	N/A	Every 2 years
Channel Morphology-cross section and longitudinal profiles	Survey documentation of the physical character of stream channels	PIBO Protocol for sampling stream channel attributes	Thalweg Depth, Wetted Width, Channel Form	years 1,3,5 and 10
Fine Sediment Sampling	Measurement of fine sediment levels in salmonid spawning gravels	PNAMP-ISEMP Field Manual of Scientific Protocols for Fine Sediment Sampling within the Upper Columbia Monitoring Strategy	Percent composition	Every 2 years
Aquatic Habitat Surveys	Measurement of aquatic habitat quantity and quality	USFS Region 6 Level 2 Aquatic Habitat Surveys		Every 10 years
Riparian Planting	Determine whether riparian plantings are effective in restoring riparian vegetation, stream bank stability, and reducing sedimentation.	SFRB MC-3 Protocol for monitoring the effectiveness of riparian planting projects	Number of Plants, Percent survival	years 1,3,5 and 10
Riparian Fencing	Determine whether livestock exclusion projects are effective in excluding livestock, restoring riparian vegetation and restoring stream bank stability.	SFRB MC-4 Protocol for monitoring the effectiveness of riparian livestock exclusion projects	stream k	years 1,3,5 and 10
Redd Surveys*	Census surveys of available spawning habitat to determine adult fish abundance	ISEMP Field Manual of Scientific Protocols for Steelhead and Salmon Redd Surveys within the Upper Columbia Monitoring Strategy	# of fish per km	Annually
Juvenile Fish Abundance (rearing)*	Fish abundance monitoring within summer rearing habitat to characterize status and trends at the watershed level.	ISEMP Field Manual of Scientific Protocols for Underwater Observations within the Upper Columbia Monitoring Strategy	# of fish per m^2	Annually
Basinwide Juvenile Salmonid Production (out-migrant trapping)*	Juvenile outmigrat trapping is used to estimate abundance (production), size and condition for populations or subgroups of anadromous salmonid stocks.	ISEMP Field Manual of Scientific Protocols for Downstream Migrant Trapping within the Upper Columbia Monitoring Strategy	Total number of fish by species and age class	Annually
Water Temperature**	Water Temperature recorded as seven day rolling maximum, minimum, and average	EPA Region 10		
Water Quality**	Selected water chemistry and quality parameters	EPA Region 10		Annually

*Basin wide fish population and abundance monitoring will be conducted through BPA project #2008-311-00 titled Natural Production Status and Trend Monitoring in the Deschutes Basin Project Narrative

**Monitoring conducted through Tribal Environmental Program