Proposal Summary

This page provides a read-only view of a Proposal. The sections below are organized to help review teams quickly and accurately review a proposal and therefore may not be in the same order as the proposal information is entered.

Proposal ISRP2011-2007-156-00 - Rock Creek Fish and Habitat Assessment Project Number: 2007-156-00

Basics

Proposal Number:	ISRP2011-2007-156-00
Proposal Status:	ISRP - Pending First Review
Review:	2011 Individual ISRP reviews
Portfolio:	2011 Individual ISRP review
Type:	Existing Project: 2007-156-00
Primary Contact:	Elaine Harvey
Created:	1/31/2011 by James Geiselman
Proponent Organizations:	Yakama Confederated Tribes

Project Title:	Rock Creek Fish and Habitat Assessment
Proposal Short Description:	The Rock Creek Fish and Habitat Assessment project's primary goals are to gather information on the anadromous salmonid populations' (steelhead, fall chinook, and coho) status within the subbasin, assess habitat conditions, and identify factors limiting anadromous salmonid populations. Information will be collected on the abundance, growth, genetics, diseases, habitat use, and life-history of salmonids in Rock Creek. This will be followed by scientifically based restoraion plan for Rock Creek.
Proposal Executive Summary:	The Yakama Nation Fisheries Resource Management Program is using a three-pronged approach to restore watershed health and aid recovery of salmonids and culturally important fish species in Rock Creek, a 223-square-mile subbasin tributary to the Columbia River upstream of John Day Dam. First, assess current fish use, water quality/quantity, and habitat conditions to determine areas of high steelhead productivity and survival, and the primary limiting habitat factors. Second, use the habitat and fish information to create and prioritize a list of actions to protect, restore, and enhance stream reaches. Last, conduct restoration actions and adaptively respond to restoration priorities, by monitoring to assess subbasin conditions and effectiveness of restoration activities.. The Middle Columbia River Steelhead (Oncorhynchus mykiss) Distinct Population Segment (DPS) was identified and listed as threatened on January 5, 2006 (71 FR 834). NOAA identified Rock Creek as Critical Habitat for the Middle Columbia Steelhead DPS (NOAA 2005). This project is a partnership between the Yakama Nation (YN) and the United States Geological Survey (USGS), conducted in cooperation with the National Oceanic and Atmospheric Administration (NOAA). Project activities include research, monitoring, and evaluation activities that develop, analyze, and report information pertaining to natural production, genetics, and ecological interactions in order to prioritize restoration and protection actions. The Rock Creek subbasin has been identified as a watershed with high potential productivity for a genetically distinct population of steelhead (as evidenced by spawner surveys and results of genetic analysis) but with significant habitat limitations (low flow, high stream temperatures; and riparian, channel and floodplain degradation). We plan to conduct electrofishing surveys and implant PIT tags in salmonids to assess the current distribution, abundance (using mark-recapture), growth, and life-histories of juvenile steelhead and coho in the anadromous portion of Rock Creek. Information on native and non-native fish species will be collected while surveying for salmonids. This data will document the distribution and relative abundance of individual fish species (including predators and competitors) to estimate the extent to which biotic factors influence salmonid productivity and survival. Juvenile fish assessments will allow us to identify key reaches and habitats (e.g., pool refugia) for future restoration or enhancement. Salmonid movement, timing, and habitat use will be determined via two PIT-tag interrogation systems installed at river mile 3 and river mile 8. These systems will be used to assess parr-to-smolt survival and smolt-to-adult survival. Spawning ground surveys will be conducted to learn adult fish distribution and abundance. The kelting rate and use of Rock Creek by stray adult and juvenile steelhead, and other species will continue to be evaluated with the PIT-tag interrogation systems. A sub-sample of O. mykiss samples will be obtained during fish sampling for disease profiling to understand if disease is limiting the population. Genetic tissue samples and fish scales will be collected during the fish surveys for analysis of age composition and the genetic composition of the O. mykiss population in the Rock Creek system. The genetic analysis will establish a baseline signature of genetic divergence among sub-populations and allow managers to determine the Rock Creek O. mykiss population's association with, and importance to, the rest of the Middle Columbia Steelhead DPS. Genetics will also allow us to understand the proportion of stray hatchery fish competing or introgressing with the native steelhead population. Additional time is needed for fish PIT-tagged as juveniles to return and be detected as adults to understand the complete life cycle. An understanding of how and where steelhead use Rock Creek, and an understanding of which life history strategies are successful, is fundamental prior to implementing any meaningful restoration strategy. Identifying and prioritizing sites and prescribing treatments is difficult and can be misguided or inefficient without basic RM&E information to guide proposed habitat actions. Habitat surveys have been conducted and preliminary Ecosystem Diagnosis and Treatment model runs made, however data gaps still exist concerning the annual variability in fish distribution, habitat availability, and water temperatures. More information is needed before we have confidence in the model inputs, and therefore, in the results. Efforts have begun to conduct riparian plantings and to assess headwater forested areas and their role in the altered watershed hydrology of the basin. While some initial habitat restoration activities have begun, we believe that there is still substantial uncertainty regarding which reaches and what actions are appropriate for targeted habitat restoration work. Data collected and analyzed through this proposal, combined with separately funded geomorphic assessments, will lead to a more complete understanding of limiting factors, habitat processes, and subsequently, appropriate restoration actions.

Purpose:	Habitat
Emphasis:	RM and E
Species Benefit:	Anadromous: 100.0% Resident: 0.0% Wildlife: 0.0%
2009 F&W Program:	Yes
Fish Accords:	Fish Accord - LRT - Yakama
Biological Opinions:	FCRPS 2008 (RPA 35, RPA 56.1)

Proposal History

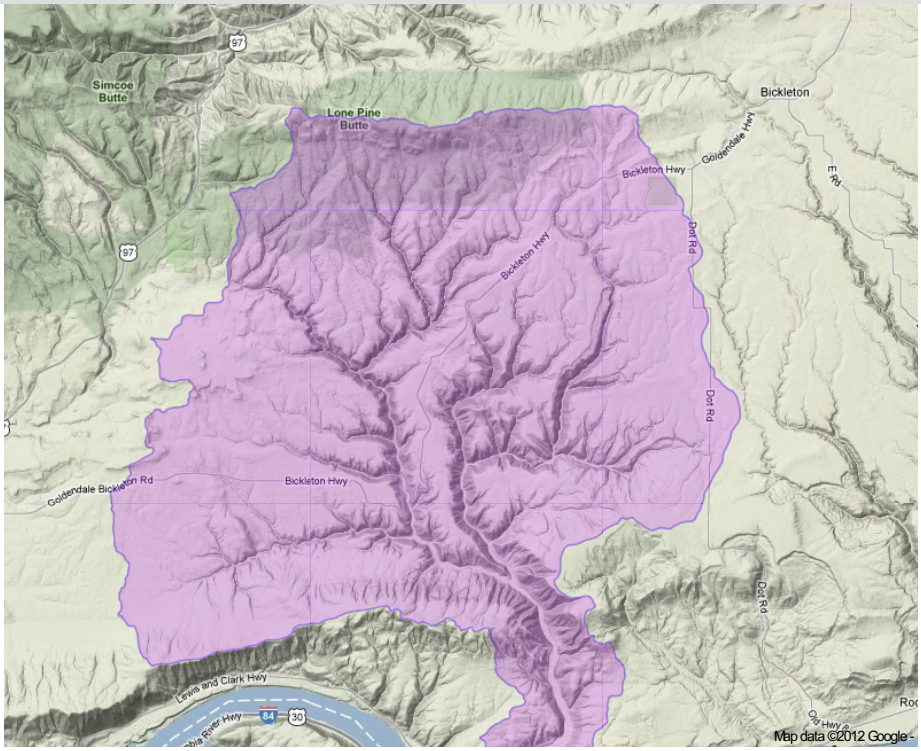
Date	Time	Type	From	To	By	Archive
1/31/2011	5:56 PM	Status		Draft	James Geiselman	
5/23/2011	5:30 PM	Status	Draft	ISRP - Pending First Review	Bryan Mercier	Download
1/10/2012	4:19 PM	Status	ISRP - Pending First Review	Draft	Dal Marsters	

2/1/2012	11:44 AM	Status	Draft	ISRP - Pending First Review	Michael Ferrante	Download

Contacts

Contacts:	Bill Sharp (Project Lead) Joe Zendt (Technical Contact) Elaine Harvey (Technical Contact) Paul Ward (Supervisor) Peter Lofy (Supervisor) Mary Haight (Project Manager) Michael Mayer (Inactive) (Env. Compliance Lead)

Location



Tributaries

HUC Name: Rock Creek **HUC Level:** HUC5 **HUC #:** 1707010113

Work Elements associated with this location: *22. Maintain Vegetation*, *47. Plant Vegetation*, *53. Remove Vegetation*, *70. Install Fish Monitoring Equipment*, *99. Outreach and Education*, *114. Identify and Select Projects*, *156. Develop RM&E Methods and Designs*, *157. Collect/Generate/Validate Field and Lab Data*, *158. Mark/Tag Animals*, *159. Transfer/Consolidate Regionally Standardized Data*, *161. Disseminate Raw/Summary Data and Results*, *162. Analyze/Interpret Data*, *189. Coordination-Columbia Basinwide*, *191. Watershed Coordination*

Project Significance & Problem Statement

Project Significance to Regional Programs:
Council's 2006 Research Plan

The Columbia River Basin Research Plan (CRBRP) lists 12 focal research areas, each with critical uncertainties that need to be addressed. The work of the Rock Creek Project will contribute information to four of these focal research areas and their associated critical uncertainties.

Tributary and Mainstem Habitat –
Work with Middle Columbia River (MCR) steelhead in Rock Creek will help address questions related to the full life cycle of this salmonid species.
Critical uncertainties that Rock Creek data can contribute to understanding:
1) To what extent do tributary habitat restoration actions affect the survival, productivity, distribution, and abundance of native fish populations?
2) Are the current procedures being used to identify limiting habitat factors accurate?

Harvest –
PIT-tagging of MCR steelhead in Rock Creek provides marked fish to determine losses of wild adult steelhead between Bonneville Dam and Rock Creek due to tribal harvest and sport fishery mortality.
Critical uncertainties that Rock Creek data can contribute to addressing:
1) What are the effects of fishery interceptions and harvest in mixed-stock areas, such as the ocean and mainstem Columbia, on the abundance, productivity and viability of ESUs or populations, and how can fishery interceptions and harvests of ESUs or populations, both hatchery and wild, best be managed to minimize the effects of harvest on the abundance, productivity, and viability of those ESUs and populations?

Population Structure and Diversity –
Work with MCR steelhead in the Rock Creek subbasin will provide data to evaluate processes influencing their distribution, interconnection, and population dynamics through time and space. Estimation of populations of smolts and adults and PIT tagging of parr coupled with instream PIT tag readers in mainstem and major tributary junction to provide data on movement and rearing habits will contribute to understanding of co-occurring life-history types and use of tributary and mainstem habitats.
Critical uncertainties that Rock Creek data can contribute to addressing:
1)What approaches to population recovery and habitat restoration are most effective in regaining meta-population structure and diversity that will increase viability of fish and wildlife in the Columbia River Basin?

Subbasin Plan Objectives

The objectives of this proposal directly address several of the primary objectives identified in the Lower Middle Mainstem Subbasin Plan, pages 347- 351. The Subbasin Plan identified salmonid pathogen analyses in Rock Creek as high priority since Rock Creek has high summer water temperatures and therefore an increased susceptibility to pathogens. Another objective identified by the plan is a genetics evaluation of steelhead in Rock Creek to determine if hatchery fish are competing or interbreeding with natural origin fish. The plan also identified an objective that is similar to the Army Corps of Engineers studies on survival of steelhead kelts migrating out of the Rock Creek subbasin and through the mainstem Columbia to the ocean and back to Rock Creek as return spawners.

Implementation of habitat projects, along with monitoring of habitat and water temperatures will help address the Subbasin Plan goals of lowering water temperatures, improving flows, and restoring habitat diversity.

ISRP/ISAB Tagging Report

The ISRP/ISAB Tagging Report (ISRP/ISAB 2009) makes a number of recommendations for improvements and better collection of data with various tagging methods. Because the Rock Creek Project is using PIT tags and includes monitoring of parr to smolt to adult life history strategies and survivals, we will be deploying multiple instream PIT-tag detection systems. These methods and data should help further knowledge related to recommendation 3.5, which states: "We recommend for PIT tags, further development of prototype in-stream transceivers for detection in tributaries to monitor smolt and adult movements in both large and small tributaries to better understand salmonid behavior and migration timing, fate of juvenile, smolt, and adult migrants before and after dam passage and to spawning grounds." Additionally, the Tagging Report states, "lack of PIT-tag monitoring systems in the tributaries where significant populations of wild salmonids occur. Monitoring of PIT-tagged adults into and PIT-tagged juveniles out of these tributaries will provide data to better understand life histories and survival rates of salmonids and hatchery stray-rates in these tributaries". A disadvantage of PIT tagging as a fish monitoring tool listed in the Tagging Report is that, "Not enough PIT-tag detection systems are currently installed to yield information on the research questions outlined in the in-stream applications section below, e.g., fish movement during the fall and winter months, or learning about different life-history strategies of salmonids." Installation of multiple instream PIT-tag detection systems in the mainstem Rock Creek and its main tributary will help further the understanding of fish movement and life-histories that can be gained with these systems.

The Tagging Report lists, as examples of data contributing to better understanding of salmonid behavior and migration timing, the fall migrants documented at Beaver Creek in the Methow Subbasin and Rattlesnake Creek in the White Salmon Subbasin. Both of these projects were done by personnel from USGS Columbia River Research Laboratory (CRRL) who will be cooperating with the Yakama Nation in the Rock Creek project. These varied life history expressions are critical to a complete understanding of salmonid population dynamics and may be critical to the persevation of the species with inevitable environmental changes through restoration, climate change, or introduced species.

In-stream detection does require some ability to estimate detection efficiencies at different life-stages and flows. Personnel from USGS have been exploring methods for estimting efficiencies (Connolly et al. 2008), and guidelines have been provided (Connolly 2010) in the PNAMP Special Publication, Tagging, Telemetry, and Marking Measures for Monitoring Fish Populations (Chapter 7, Wolf and O'Neal 2010).

Also, the status of progress toward broad biological objectives from the NPCC Fish and Wildlife Program (FWP) cannot be judged without monitoring data. For instance, in order to evaluate progress towards the objectives of restoring "the widest possible set of healthy naturally reproducing populations of salmon and steelhead in each relevant province by 2012" and having populations that have "an 80 percent probability of maintaining themselves for 200 years at a level that can support harvest rates of at least 30 percent" (NPPC 2000), monitoring data is needed. The project is consistent with the primary research, monitoring, and evaluation strategies identified in the FWP (i.e., 1. Identify and resolve key uncertainties for the program; 2. Monitor, evaluate, and apply results; and 3. Make information from this program readily available).

In order to ensure that specific methods of data collection and analysis used as a part of this project are consistent with regional efforts to standardize methodology, biologists will be actively involved with the Pacific Northwest Aquatic Monitoring Partnership (PNAMP) and other regional data standardization efforts. Products and developments from these efforts will be used to ensure that information generated from the project is compatible with information generated in other subbasins and is useful for regionwide assessments. Methodologies from other regionally-accepted publications such as Roni (2005) will also be used where applicable, especially where linking reach-scale habitat actions to watershed-scale monitoring can be accomplished.

Problem Statement:

We believe there is a clear understanding of the vital role tributaries play in restoring the fraction of habitat left in the Columbia Basin, due to the extensive impacts of the basin's hydroelectric development on fish habitat. In the majority of other tributaries in the Columbia Basin, there are numerous additional hurdles, beyond the mainstem hydroelectric dams, to overcome (i.e. irrigation withdrawals, urbanization . . . etc.). The number of habitat impacts to Rock Creek are fewer, but nonetheless have severely affected habitat function. We know, from living tribal members, that Rock Creek used to flow continuously to the Columbia River every month of the year. This has not been the case for decades. Yet steelhead persist in this basin, and through the continued R,M&E efforts proposed here, we are gaining valuable insight into their spatial structure, abundance, and productivity.

This project and subsequent proposal were developed based on direct requests from tribal members (councilmen, religious leaders, longhouse members) to restore this culturally important part of the Yakama Nation's Ceded Lands. Yakama Nation Fisheries staff sees this as our obligation to these members and the fisheries resource to do everything we can within our ability to honor, protect and restore Rock Creek. The Yakama Nation considers this investment in understanding and recovering this small, but important, genetically-distinct, natively-adapted steelhead population to be critical to the recovery and long term adaptability of the species within the Yakama Nation southern Ceded Lands.

An understanding of how and where steelhead use Rock Creek, and an understanding of which life-history strategies are successful is fundamental prior to implementing any meaningful restoration strategy. Identifying and prioritizing sites and prescribed treatments is difficult and can be misguided or inefficient without basic RM&E information to guide proposed habitat actions. Given that parts of Rock Cr. go dry each year, determining which areas provide beneficial steelhead habitat components, which components are lacking and in need of improvement, and which areas potentially produce successful anadromous fish vs. acting as a sink or mortality trap is a complex process. Relatively simple habitat projects (e.g. riparian planting) have already begun in some areas under this project, and project sponsors are planning to investigate opportunities to assess and improve headwater meadow conditions to bolster watershed storage. Other more complex projects, like instream channel modifications, will need assessment results, project planning, and will be prescribed in 2-3 years after a more complete understanding of fish and habitat interactions is completed.

The Rock Creek subbasin has been identified as a watershed with high potential productivity for steelhead (as evidenced by spawner surveys) but with significant habitat limitations (low summer flows, high stream temperatures, and riparian, channel and floodplain degradation). Prior to this study there was a minimal knowledge of fish populations and habitat conditions in the Rock Creek subbasin (Lower Mid-Columbia Mainstem Subbasin Plan, NPCC 2005, p. 354). The Subbasin Plan states that, "There is significant need for ongoing monitoring and evaluation within the Rock Creek watershed" and that "an extensive monitoring and evaluation effort within Rock Creek is considered a high priority" (Lower Mid-Columbia Mainstem Subbasin Plan, NPCC 2005, p. 16). This project is in the process of addressing this information gap.

Available information suggests Rock Creek is a unusual and potentially productive resource (Lower Mid-Columbia Mainstem Plan, NPCC 2005, p. 66). NOAA identified Rock Creek as Critical Habitat for threatened Middle Columbia Steelhead (NOAA Fisheries Northwest Region Critical Habitat Designations for West Coast Salmon and Steelhead in Washington, August 2005). A distinct population of steelhead (Oncorhynchus mykiss) was identified by NOAA, and confirmed through preliminary genetic analysis. Redd counts by the Yakama Nation have identified high use by steelhead (Lower Mid-Columbia Mainstem Subbasin Plan, NPCC 2005, p. 169), however the proportion of fish that are native or stray into the basin is just beginning to be understood. Since spring 2008, annual spawner surveys (3-pass) have been conducted for steelhead, coho, and fall chinook in the Rock Creek subbasin, and a pattern of spawning habitat use is emerging.

Rock Creek is home to the Rock Creek "Kah-milthpah" Band of the Confederated Tribes and Bands of the Yakama Nation and is within the tribal southern Ceded Lands. The Yakama Nation has vested interest in the status of Rock Creek salmon, steelhead, and lamprey populations since it is an important fishery to the Rock Creek Band for ceremonial and subsistence purposes. Tribal fishers are reluctant to fish for salmon or steelhead in Rock Creek with the steelhead listed as a "Threatened" species by the Endangered Species Act. The goal of this project is to address limiting factors and restore the population to healthy numbers.

The Lower Mid-Columbia Mainstem Subbasin Plan (NPCC 2005) includes information from Rock Creek that was collected specifically for that planning effort. The fish assessment and management plan for the Washington portion focuses on Rock Creek because of its unique and important value to the Yakama Nation. Limiting factors for the associated focal species of steelhead, coho, fall Chinook, and lamprey are:

1. Altered temperature and flow regimes have affected fish life histories such as spawn timing, incubation and rearing, and have decreased suitable habitat

2. Steelhead populations have been dramatically reduced from pre-settlement abundance levels

3. Population levels of Pacific lamprey have been dramatically reduced from pre-settlement levels

4. Summer/early fall tributary habitat availability is reduced in comparison to pre-settlement, pre-impoundment environment

5. There has been a loss of habitat diversity and thermal refugia because of loss of off-channel habitat

6. Hydrology has been altered by habitat degradation and has increased peak flows; loss of storage and lack of late summer base flows

7. In tributaries, lack of habitat diversity (pools with cover), lack or decrease of large woody debris, and trapping of beavers has exacerbated low flow problems

8. Food web in lower river has been altered and/or reduced due to habitat simplification and impoundment

9 Predation risk to salmonids from native fish (northern pike minnow), from non-native fish (catfish and smallmouth bass), and from birds is elevated.

10. Survival of steelhead kelts (mature spawned-out fish with the potential to spawn again) migrating out of the Rock Creek watershed and through the mainstem Columbia to the ocean is reduced, due to the Columbia River hydropower system. This was once a major life-history strategy.

11. Hatchery fish and barged fish stray and compete with natural-origin fish for space and food resources

12. High temperatures in tributaries and the innundated mainstem Columbia River have resulted in increased metabolism, stress, and susceptibility of native salmonids to pathogens

13. Population and ecological effect of beavers have been significantly reduced and altered, reducing habitat complexity, water storage, and altering sediment composition.

14. Increased percentages of fine sediment from background levels in spawning gravels and interstitial spaces have resulted from habitat degradation due to recent land use practices (last 150 years).

Some preliminary EDT analysis and results have been completed and are presented the 2010 annual report (still in internal review). Some basic habitat and fish distribution information has been gathered, but there are still significant data gaps. Certain geographic areas are yet to be adequately sampled, fish sampling is ongoing, preliminary results are still being analyzed, and reach-specific fish survival data is yet to be gathered (in the form of PIT-tag detections and adult returns). Data collected by this project will feed additional analysis and refinements to the EDT model and help it accurately reflect watershed conditions.

The Yakama Nation beleives that there is still substantial uncertainty regarding which reaches and actions are appropriate for targeted habitat restoration work. In fact, during a 2011 review of Washington state Salmon Recovery Funding Board (SRFB) project proposals, a local technical review committee (comprised of various agency personnel familiar with Rock Creek and knowledgeable in fish biology and habitat, hydrology, and geomorphology) evaluated a proposal to install engineered log jams and enhance pool habitat at a site a middle reach of Rock Creek. The review committee considered that action premature given the lack of knowledge and understanding of physical habitat processes resulting in the observed degradation. That project proposal has changed into a specific assessment of geomorphic conditions throughout much of the middle and lower portions of the Rock Cr. watershed. That SRFB funded project will collect data that is complementary to this BPA project and both assessments will lead to a more complete understanding of limiting factors, habitat processes, and appropriate restoration actions.

In addition, under this BPA project, initial investigations are also beginning to assess upper watershed forested areas (and headwater meadow conditions in particular) and their role in watershed hydrology and condition.

High stream temperatures, low summer flows, and flashy watershed hydrology characterize multiple streams in this region. Successful restoration actions have been conducted in some regional streams, and restoration approaches and techniques applied in other similar places may be utilized in Rock Creek. However, the major unknowns in Rock Creek remain, such as which specific techniques/actions should be implemented, where they would be most effective, and where they might be ineffective or even detrimental (e.g., installing structure or creating pool habitat that becomes a late summer mortality trap). As described in Beechie et al. 2008, watershed assessments are a necessary step in the process of identifying needed actions and prioritizing the list of actions. The approach envisioned here is to identify which areas have, or have the potential for, high steelhead productivity and survival, couple that information with physical habitat and geomorphic assessments to determine the primary limiting factors and processes, and focus on areas where habitat can feasibly be restored, enhanced, or reconnected to the point that steelhead populations experience population benefit.

Objectives & Deliverables

Objectives

OBJ-1: **Assess salmonid distribution, life history, growth, genetics, and biological factors limiting population abundance and productivity.**

Before an effective restoration plan can be implemented, information about the productivity, abundance, and spatial structure of the steelhead population is needed. The objective is to: 1) assess the habitat use, movement, growth, health, and abundance of steelhead parr ; and 2) gain information on adult steelhead migration timing, holding and spawning locations, and reproductive success in the Rock Creek system. This information will help to understand the controlling factors that limit capacity andl help prioritize and gauge the effectiveness of restoration actions.

OBJ-2: **Determine native and non-native fish assemblage and distribution.**

The assemblage, relative abundance, and distribution of native and non-native fish species likely influence salmonid abundance, productivity, and distribution in Rock Creek, and influence several variables of the EDT model (predation, competition, fish community richness). The extent to which introduced predators' abundance, population structure, and habitat use overlap with those of steelhead may vary annually and may or may not be sufficient to influence the steelhead population. This information is needed to design effective restoration actions and identify locations.
Current lamprey use in Rock Creek is unknown, although lamprey were present historically and continue to be a species of cultural importance.

OBJ-3: **Determine habitat conditions that may limit salmonid productivity and abundance.**

Gain information on the habitat and rearing conditions for salmonids in the Rock Creek system. This data, combined with the salmonid abundance and life history information, will allow us to ascertain which habitat conditions most limit the steelhead population. Habitat and fish data will be incorporated into the Ecosystem Diagnostic and Treatment (EDT) model for further assessment of limiting factors and prioritization of locations in the subbasin with greatest habitat rehabilitation potential.

OBJ-4: **Identifiy protection/restoration sites and actions**

Identify locations and actions in the subbasin with the greatest potential for restoration or protection of key salmonid habitat. Secure willing landowners to participate in implementing protection/restoration projects (through outreach).

Deliverables

DELV-1: **Assessment of adult salmonid migration behavior, spawner abundance, habitat use, and out of basin stray rate.**

Information on the distribution and abundance of spawning salmonids will be collected during muti-pass spawning ground surveys. Life history information will be collected by movements detected through two instream PIT-tag interrogation systems (PTIS), installed in Rock Creek at river kilometer 4 and at the confluence of Rock and Squaw creeks (rkm 13), as well as by the scales of carcasses found during spawning ground surveys. The PTIS's in Rock Creek and the mainstem Columbia River and together with the PITAGIS database will allow us to determine the migration behavior and timing of adult steelhead into and kelt movement out of Rock Creek. Through the use of the Rock Creek PTIS's, we will gain information on life history variability and stray rates of out of basin stocks tagged by other agencies. When adult steelhead, PIT-tagged as juveniles in Rock Creek return, we can estimate smolt-to-adult return rates, repeat spawner rates, migration timing, and spawn timing. *Note: While the bulk of the funding and effort for adult spawner abundance and habitat use surveys will be be completed by 2012, we are requesting some funds to continue to operate the PTIS systems in 2013 and 2014 to gain information on smolt to adult return rates and the migration behavior of adult salmonids tagged in Rock Creek.

Start: 2012 End: 2014
Budget: $120,000
Associated Work Elements: 114. Identify and Select Projects, 156. Develop RM&E Methods and Designs, 157. Collect/Generate/Validate Field and Lab Data, 161. Disseminate Raw/Summary Data and Results, 162. Analyze/Interpret Data
Protocols:
Adult salmonid migration behavior, spawner abundance, habitat use, and out of basin stray rate (2007-156-00).

DELV-2: **Assessment of juvenile salmonid distribution, abundance, life history strategies, and growth.**

Salmonid population abundance and distribution will be measured during summer months in pools after Rock Creek becomes intermittent. The Yakama Nation and USGS will cooperate to estimate anadromous salmonid distribution, abundance, movement, life history, habitat use, and growth with the use of PIT tags and mark-recapture population estimates in randomly selected, systematically stratified pools. Prior to population estimates, intensive habitat surveys of reaches will be conducted during summer low-flow conditions. These surveys will identify and measure dimensions (e.g., length, weight, and depth) of stream habitat units generally following Bisson et al. (1982) and Bain and Stevenson (1999). Habitat surveys will be conducted in Rock Creek prior to each population survey to quantify habitat availability in reference to the habitats that will be electrofished. Approximately 1,200 juvenile steelhead (> 70 mm fork length) will be PIT-tagged annually during population surveys. In cooperation with USGS, the Yakama Nation will download, maintain, and repair the PTIS systems installed at river kilometer 4 and at the confluence of Rock and Squaw creeks (rkm 13). Electrofishing, PIT-tagging, and PTISs will be used as a means of monitoring juvenile steelhead movement, growth, and smolt-to-adult return rates in the Rock Creek watershed. Tagged fish movements will also be monitored through Columbia River dams (wired with detectors) to aid in understanding mainstem behavior and migration timing. Scales will be taken from a subsample of juveniles during electrofishing surveys to determine age and stock composition of juvenile salmonids in Rock Creek. We will create a fish tagging/interrogation/recapture database. A report detailing findings will be submitted after several years of abundance, distribution, and movement data have been collected. *Note: While the bulk of the funding and effort for juvenile salmonid distribution and abundance surveys will be completed by 2012, we are requesting some funds to continue to operate the PTIS systems in 2013 and 2014 to gain information on smolt to adult return rates and the migration behavior adult salmonids tagged in Rock Creek as juveniles from 2009 to 2012.

Start: 2012 End: 2014
Budget: $110,000
Associated Work Elements: 114. Identify and Select Projects, 157. Collect/Generate/Validate Field and Lab Data, 158. Mark/Tag Animals, 161. Disseminate Raw/Summary Data and Results
Protocols:
Abundance, habitat use, life-history, and growth of salmonids and distribution and composition of all fish species (2007-156-00).

DELV-3: **Assessment of the genetics of the steelhead population.**

Prior to this study, the genetic composition of O. mykiss within Rock Creek, their relatedness to adjacent drainages and extent of introgression with hatchery fish was unknown. Tissue samples (fin clips) will be collected during juvenile salmonid population surveys from sites in the mainstem and its tributaries. Samples will also be collected from known anadromous reaches and reaches above barriers. Samples will be collected and preserved (95% ethanol) for future genetic analyses. A total of five years of tissue sampling will be conducted to characterize Rock Creek steelhead as recommended by Shawn Narum, Columbia River Intertribal Fisheries Commission (CRITFC) geneticist. This is similar to the initial Klickitat River investigation. Samples will be sent to CRITFC for genetic analyses. Rock Creek biologists will work with CRITFC geneticists to analyze the genetics information. The purpose is to understand if the Rock Creek steelhead population has unique characteristics, and to determine the extent of hatchery steelhead introgression and competition with Rock Creek steelhead for spawning and rearing resources.

Start: 2012 End: 2012
Budget: $12,000
Associated Work Elements: 157. Collect/Generate/Validate Field and Lab Data, 159. Transfer/Consolidate Regionally Standardized Data, 162. Analyze/Interpret Data
Protocols:
Genetics: Diversity, Fitness or Variation (2007-156-00)

DELV-4: **Fish species composition and assessment of lamprey use.**

Fish species composition and relative abundance will be assessed in all reaches that we obtain permission to sample. A randomly selected, systematically stratified subsample of pools will be electrofished and all fish species encountered will be captured. Because fish species composition likely varies annually depending upon water availability and temperature, we intend to conduct this effort over several years. A subsample of each species (n=30) will be weighed and measured and relative abundance will be noted in each habitat unit sampled. This information will allow us to estimate the overlap in habitat use of steelhead and native and non-native predators and competitors in Rock Creek.
As a byproduct of the juvenile and adult salmonid population and habitat assessments, we intend to look for lamprey adults and juveniles to assess the extent of lamprey use of the watershed in its current condition. If habitats are found that my contain lamprey we intend to share information with the Yakama Nation pacific Lamprey Restoration Project (BPA Project# 200847000) so that a more thorough survey for their presence may be conducted using equipment designed to collect lamprey more quantitatively.

Start: 2012 End: 2012
Budget: $5,835
Associated Work Elements: 114. Identify and Select Projects, 156. Develop RM&E Methods and Designs, 157. Collect/Generate/Validate Field and Lab Data, 162. Analyze/Interpret Data, 189. Coordination-Columbia Basinwide, 191. Watershed Coordination
Protocols:
Abundance, habitat use, life-history, and growth of salmonids and distribution and composition of all fish species (2007-156-00).

DELV-5: **Determination of the presence and severity of pathogens in salmonids.**

This project will assess the presence and severity of salmonid pathogens, which prior to this study was unknown. Pathogen sampling will be conducted for two more years to create a profile of pathogen presence for salmonids and other native species in the subbasin. A sub-sample of fish captured during population studies and most fish incidentally killed during sampling for distribution and abundance will be put on ice and delivered to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center (LCRFHC) which will provide a thorough disease profile as part of the U.S Fish and Wildlife Service's National Wild Fish Health Survey. A total of 30 samples (including all fish species) will be collected from the mainstem Rock Creek and Squaw Creek Site locations including three survey sites in lower, middle, and upper reaches of mainstem Rock Creek. A baseline data set describing existing levels of fish pathogens in the watershed, will be uploaded to the Klickitat Rock Creek database

Start: 2012 End: 2012
Budget: $4,000
Associated Work Elements: 157. Collect/Generate/Validate Field and Lab Data, 162. Analyze/Interpret Data
Protocols:
Disease Prevalence (2007-156-00)

DELV-6: **Assessment of habitat conditions and limiting factors.**

The EDT Stream Reach Editor (SRE) has an updated database for Rock Creek resulting from the past two years (2009 and 2010) of habitat data collection, including the additional 2011 data that will be incorporated into the model.

The model required data for a total of 46 environmental and biological variables which was divided into four major categories: hydrologic characteristics, stream corridor structure, water quality, and biological community. Ratings for attributes were derived from actual stream habitat surveys, orthophoto and topographic map analyses, General Land Office survey maps and notes, light detection and ranging (LIDAR) imagery, water quality monitoring data, and fish presence/absence surveys. Gaps in attribute data were filled using available scientific published literature and from professional observations. A total of 27 attributes were collected in the field. Mobrand Biometrics (1999) handbook, The EDT Method provides guidelines to analyze individual environmental and biological attribute data. Each attribute was evaluated prior to applying an index value into the SRE. Index values were assigned for each environmental attribute for each reach. SRE index values were based on the survival of each adult or juvenile fish. Level of proof for each index value indicated the evaluation of accuracy in the model. Index values ranged from 0.5, meaning less severe conditions to the fish to 5.0, meaning the most severe. Some index values were actual percentages for wetted channel surface area such as habitat types or percentage gradient for each reach.

A final model iteration will be conducted with all data collected from 2012 to create a list of limiting factors in the Rock Creek subbasin at a reach level.

Water temperature and water quality parameters (pH, conductivity, dissolved oxygen, turbidity) will continued to be monitored at 8 sites (Rock Creek mainstem and Squaw, Luna Gulch, Badger Gulch, and Quartz creeks) throughout the subbasin. Additional automated water temperature recorders will be installed over the summer at approximately 20 randomly selected pools associated with steelhead electrofishing efforts to determine summer rearing conditions. All data will be stored in the Rock Creek database as well as entered into the EDT dataset. This information will assist in the identification and development of future restoration projects in the Rock Creek watershed.

*note: while the majority of habitat data has already been collected we intend to continue to monitor water temperature in 2013 and 2014 to gather pre- and post- habitat restoration information and long-term data.

Start: 2012 End: 2014
Budget: $96,894
Associated Work Elements: 157. Collect/Generate/Validate Field and Lab Data, 161. Disseminate Raw/Summary Data and Results, 162. Analyze/Interpret Data, 191. Watershed Coordination
Protocols:
Habitat measurements and assessment (2007-156-00)

DELV-7: **Identify restoration project sites and actions**

A geomorphic study of Rock Creek and two of its key tributary streams will be conducted in 2012 and analyses of its findings will be presented in a report in 2013 by the Eastern Klickitat Conservation District and Yakama Nation Fisheries. Fish and habitat data collected from this project will be shared with the geomorphic study to locate likely sites where restoration efforts can be focused.

Project staff will coordinate with other agencies and seek additional funding resources and costshare oppurtunities for conducting on the ground habitat improvement work in the subbasin in future years. Utilizing the EDT scenario builder, restoration scenarios will be created for identified reaches in the subbasin. Scenarios will be created after the geomorphic study and sites are identified for likely restoration. Upon complete of the scenario iterations a list of priority habitat actions will be created.

Start: 2012 End: 2014
Budget: $60,000

Associated Work Elements: 162. Analyze/Interpret Data
Protocols:
Habitat measurements and assessment (2007-156-00)

DELV-8: **Riparian remediation**

During the 2012 fiscal year, riparian re-vegetation will be conducted at several sites in mainstem Rock Creek to supplement previous tree plantings from spring 2008, 2009, 2010 and 2011. Trees types include: alder, dogwood, willow, cottonwood, and pine. Trees will be fenced to limit browsing by ungulates. Also, willow cuttings will be collected and planted, with a portion saved to create a nursery for planting the next year. Weed removal at riparian tree planting sites will be conducted using manual and mechanical treatments. The primary invasive species are non-native thistles and knapweed. Based on the geomorphic study and EDT scenario results additional sites will be located for fiscal years 2013-2014 for riparian remediation.

Start: 2012 End: 2014
Budget: $35,000
Associated Work Elements: 22. Maintain Vegetation, 47. Plant Vegetation
Protocols:
Habitat measurements and assessment (2007-156-00)

DELV-9: **On the ground restoration projects**

Based on the prioritization of restoration and protection actions list created in 2012, restoration projects will start in the planning stages. Landowner involvement and permission will be necessary. Project timeline and budgets will be created for each restoration and protection action. Applicable permit applications will be sought and submitted. Project timeframes are dependant on permit application turn arounds and any time window restrictions. On the ground habitat restoration and protection actions are planned for years 2013 - 2017 in the Rock Creek subbasin.

Start: 2013 End: 2014
Budget: $521,135
Associated Work Elements: 22. Maintain Vegetation, 47. Plant Vegetation, 53. Remove Vegetation, 99. Outreach and Education, 191. Watershed Coordination
Protocols:
Habitat measurements and assessment (2007-156-00)

How the Deliverables serve to achieve the Objectives

OBJ-1. Assess salmonid distribution, life history, growth, genetics, and biological factors limiting population abundance and productivity.

DELV-1: Assessment of adult salmonid migration behavior, spawner abundance, habitat use, and out of basin stray rate.

How DELV-1 helps achieve OBJ-1: Collecting information on steelhead migration behavior, spawner distribution and abundance, and stray rates will help to characterize objective 1.

DELV-2: Assessment of juvenile salmonid distribution, abundance, life history strategies, and growth.

How DELV-2 helps achieve OBJ-1: Assessmemt of juvenile salmonid information described in DELV-2 directly addresses the information need outlined in OBJ-1

DELV-3: Assessment of the genetics of the steelhead population.

How DELV-3 helps achieve OBJ-1: Assessmemt of genetics of the steelhead population described in DELV-3 directly addresses the information need outlined in OBJ-1. This is to understand where the Rock Creek population fit in a regional context, understand the influence of hatchery steelhead competing or spawning with Rock Creek steelhead and understanding the spatial structure and diversity of the Rock Creek steelhead popuation.

DELV-5: Determination of the presence and severity of pathogens in salmonids.

How DELV-5 helps achieve OBJ-1: Collecting information about the presence and severity of diseases can help to understand the biological factors limiting steelhead abundance (Objective 1). The presence and severity of disease may also be related to stray out of basin fish (Objective 1), and habitat conditions such as temperature and water quality, or other habitat conditions (Objective 3) that increase stress, which can increase the severity of disease.

OBJ-2. Determine native and non-native fish assemblage and distribution.

DELV-4: Fish species composition and assessment of lamprey use.

How DELV-4 helps achieve OBJ-2: Information collected to understand the distribution and habitat overlap of native and non-native fish species will help to understand the level of competition and predation being experienced by ESA listed salmonids. Where and how many smallmouth bass, pikeminnow and brown bullheads occupy the same habitat units as steelhead will influence the survival and growth (Objective 1) of steelhead for example. Gaining information on the distribution and relative abundence of all fish species, including lamprey can affect restoration actions as well (Objective 4)

OBJ-3. Determine habitat conditions that may limit salmonid productivity and abundance.

DELV-6: Assessment of habitat conditions and limiting factors.

How DELV-6 helps achieve OBJ-3: Collecting habitat metrics are necessary to conduct analysis and determine habitat conditions that may limit salmonid productivity (Objective 1) and identify sites and actions necessary for restoration (Objective 4).

OBJ-4. Identifiy protection/restoration sites and actions

DELV-7: Identify restoration project sites and actions

How DELV-7 helps achieve OBJ-4: Assessing stream habitat conditions and the salmonid populations (steelhead and coho primarily) response to those conditions (Objectives 1 through 3) will lead to the identification of restoration sites and actions (Objective 4, Deliverable 7). Habitat restoration efforts, without any knowledge of Rock Creek's steelhead population, which includes research for several years to learn distribution, movement, and abundance, due to annual variability, could lead to a mis-prioritization of actions and areas. A thoughtful and effective restoration plan can only be produced after understanding the physical and biological factors that are limiting recovery.

DELV-8: Riparian remediation

How DELV-8 helps achieve OBJ-4: Riparian remedation is one restoration action that has been identified to begin to restore Rock Creek after a century of degradation. The overarching goal of this project is to restore Rock Creek salmonid populations. All of the actions undertaken in this project will lead to restoration projects, like riparian remediation. Only with a scientific approach, to establish how steelhead interact with the Rock Creek landscape, can an effective restoration actions be identified and prioritized.

DELV-9: On the ground restoration projects

How DELV-9 helps achieve OBJ-4: Conduct instream restoration in Rock Creek and its tributaries and continue specific monitoring and evaluation specific to each restoration project.

Project History

Financials

Budgets

Expense	SOY	Working Budget	Contracted Amount	Modified Contract Amount	Expenditures *
FY2006					
FY2007	$0	$100,000			
General	$0	$100,000			
FY2008	$0	$231,914	$231,914	$155,033	$73,125

Fish Accord - LRT - Yakama	$100,000	$231,914	$231,914	$155,033	$73,125
FY2009	$291,307	$369,524	$655,568	$380,617	$287,241
Fish Accord - LRT - Yakama	$291,307	$369,524	$655,568	$380,617	$287,241
FY2010	$298,590	$298,590	$2,114	$303,684	$230,092
Fish Accord - LRT - Yakama	$298,590	$298,590	$2,114	$303,684	$230,092
FY2011	$287,207	$287,207	$215,914	$266,176	$329,716
Fish Accord - LRT - Yakama	$287,207	$287,207	$215,914	$266,176	$329,716
FY2012	$313,729	$313,729	$312,506	$312,506	$139,191
Fish Accord - LRT - Yakama	$313,729	$313,729	$312,506	$312,506	$139,191

Total Expense Budget (FY2007-FY2011): $1,287,235; Total Expense Expenditures (FY2007-FY2011) *: $920,174

No Capital budgets

* Expenditures data includes accruals and are based on data through 31-Jan-2012

Project Cost Share: FY2011 0 % FY2010 15 % FY2009 13 % FY2008 4 % FY2007 0 %

Fiscal Year	Cost Share Partner	Total Proposed Contribution	Total Confirmed Contribution
FY2010	Yakama Confederated Tribes		$31,000
FY2010	US Geological Survey (USGS)		$20,000

Explanation of Recent Financial Performance:
The average project spending is $269,568/year. Of 51 total months of funding, the project will have collected 27 months of data including deliverables which required a NOAA Fisheries take permit. Since the start of this project a total of 45 months of data collection was conducted under the BPA HIP II Programmatic Permit.

Explanation of Financial History:
The Rock Creek Fish and Habitat Assessment project started in December 2007 with the primary goal of collecting baseline biotic and abiotic environmental data for the subbasin. The specific application of the baseline data collection is to assess salmonid abundance and distribution, presence or absence of fish pathogens, genetic analysis of O. mykiss, water quality and temperature monitoring, habitat monitoring, and EDT modeling. The goal of this assessment is to provide synthesized data to prioritize habitat restoration actions. Prior to this project, there have been no efforts toward continuous monitoring and evaluation within the subbasin.

The original funding award for the project was $100,000. In mid-2008, an additional $191,207 was awarded to the project resulting from a newly signed MOA with lower river tribes The SOW was amended to incorporate the additional funds and new work elements, including a subcontract with USGS for the installation and maintenance of two instream PIT tag readers. USGS continues to collect and analyze the PIT-tag data, and also assists with salmonid population surveys. The FY07/08 contract performance period totalled 18 months, ending May 2009, during which minimal field data was collected due to the late arrival of a NOAA Section 10 take permit. The final contract value totalled $230,642.

In June, 2009, the Rock Creek Project began a two-year contract, which ended May 2011, during which one field season of full data collection occurred. The field season was interrupted June 2010-April 2011, when the NOAA Section 10 take permit was exceeded. Only non-take related field data was collected during this time. Total funding for these fiscal years was $652,402 or approximately $326,000/FY09 and FY10.

In June 2011, a 12-month BPA/Yakama Nation contract was signed, however, only 9-months of funding was approved by BPA in order to provide the opportunity for ISRP to comment on the project's revised RM&E proposal in Feb. 2012. BPA has released $213,849 of the requested $285,131 in FY11 contract funding.

Reporting & Contracted Deliverables Performance

Annual Progress Reports
Expected (since FY2004): 4
Completed: 3
On time: 2

Status Reports
Completed: 24
On time: 7
Avg Days Late: 14

Earliest Contract	Subsequent Contract(s)	Title	Contractor	Start	End	Status	Accepted Reports	Count of Contract Deliverables Complete	Green	Yellow	Red	Total	% Green and Complete	Canceled
BPA-3696		PIT Tags - Rock Creek Fish Habitat	Bonneville Power Administration	10/2007	09/2008	Active	4	1	0	0	0	1	100.00%	0
36535	43057, 54748	2007-156-00 EXP ROCK CREEK FISH AND HABITAT ASSESSMENT	Yakama Confederated Tribes	12/2007	05/2013	Pending	17	63	22	0	4	89	95.51%	0
BPA-4336		PIT Tags - Rock Creek Fish & Habitat	Bonneville Power Administration	10/2008	09/2009	Active	1	1	0	0	0	1	100.00%	0
BPA-4566		PIT Tags - Rock Creek Fish & Habitat Assess	Bonneville Power Administration	10/2009	09/2010	Active	1	1	0	0	0	1	100.00%	0
BPA-5724		PIT Tags - Rock Creek Fish & Habitat Assessment	Bonneville Power Administration	10/2010	09/2011	Active	1	1	0	0	0	1	100.00%	0
BPA-6392		PIT Tags - Rock Creek Fish &	Bonneville Power	10/2011	09/2012	Active	0	0	0	0	0	0		0

Habitat Assessment	Administration							
Project Totals	**24**	**67**	**22**	**0**	**4**	**93**	**95.70%**	**0**

Elevated Contracted Deliverables in Pisces (2004 to present)

Contract	WE Ref	Contracted Deliverable Title	Due	Completed
36535	A: 157	Spawning Surveys: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	C: 157	Genetic Sampling: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	D: 162	Genetic Analysis: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	E: 157	Habitat Surveys: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	F: 157	Water Monitoring: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	G: 157	Pathogen Sampling: Rock Creek Database with Results presented in Annual Report	11/15/2008	11/15/2008
36535	L: 99	At least one visit to at least one of the local elementary schools by Rock Creek staff person.	11/15/2008	11/15/2008
36535	M: 162	Data will be available through the EDT Mobrand website under Rock Creek Watershed Database.	11/15/2008	11/15/2008
36535	Q: 98	Project Management Activities	11/30/2008	11/30/2008
36535	S: 47	Conduct planting at two sites	3/15/2009	3/15/2009
36535	W: 99	At least one visit to at least one of the local elementary schools by Rock Creek staff person.	3/15/2009	3/15/2009
36535	Y: 162	Data will be available through the EDT Mobrand website under Rock Creek Watershed Database.	3/15/2009	3/15/2009
36535	T: 157	Spawning Surveys: Rock Creek Database with Results presented in Annual Report	3/31/2009	3/31/2009
43057	P: 132	Finalize Year 1 Annual Report & Upload to PISCES	7/17/2009	7/17/2009
43057	M: 99	At least one visit to at least one of the local elementary schools by Rock Creek staff person.	3/31/2010	3/31/2010
43057	I: 158	PITAGIS database	5/15/2010	5/15/2010
43057	S: 47	Conduct planting at two sites	5/15/2010	5/15/2010
43057	O: 162	Rock Creek Prioritization List	5/28/2010	5/28/2010
43057	B: 157	Spawning Surveys: Rock Creek Database with Results presented in Annual Report	5/31/2010	5/31/2010
43057	H: 157	Pathogen Sampling: Rock Creek Database with Results presented in Annual Report	5/31/2010	5/31/2010
43057	AO: 53	Invasive weed control at three sites.	4/30/2011	4/30/2011
43057	AN: 47	Conduct planting at two sites	5/15/2011	5/15/2011
43057	AD: 158	PITAGIS database	5/31/2011	5/31/2011
54748	B: 132	Finalize 2009 Annual Report & Upload to PISCES	11/25/2011	11/25/2011

View full Project Summary report (lists all Contracted Deliverables and Quantitative Metrics)

Explanation of Performance:

Ninety-six percent of the project deliverables are green. Four red deliverables reflect:
1) no juvenile population surveys, pit tagging and scale analysis conducted field season 2008 due to delays in receiving the NOAA Section 10 take permit.
2) collection of fewer genetic samples fall 2009 during PIT-tagging and presence/absence surveys than needed to send to subcontractor for analysis. Analysis was conducted once 2010 samples were collected and combined with 2011 fall survey samples.
3) pathogen sampling not completed Jun10-Apr11 because NOAA Section 10 take permit was exceeded.
4) subcontractor only able to produce fish population estimates through June 2010 because of cessation of sampling Jun10-Apr11. However, pit tag interrogation continued to completion.

Major Accomplishments

Major Accomplishments:

OBJ-1. Assess salmonid distribution, life history, growth, genetics, and biological factors limiting population abundance and productivity.

Spawning ground surveys

Fall Chinook

Fall Chinook surveys were conducted beginning in early November through late December. Fall Chinook spawning occurs between RM 0 and RM 2.5. The majority of observed spawning occurs adjacent to the Rock Creek Lake (Army Corps Park) near the inundated portion of Rock Creek. Two live adults and two redds were observed and recorded and no carcasses were found during the 2008 spawning season (Table 1). In 2009, there was insufficient instream flow and connectivity to allow fish passage upstream of the mouth of Rock Creek. During the 2010 survey, six redds were observed, with two live adults and two carcasses found (Table 1).

Coho

Coho surveys were conducted between November and January. Coho spawning usually occurred between RM 0 and RM 2.5. During the 2008 spawning season, one live adult was observed but no redds or carcasses were located (Table 1). There was limited stream flow during the 2008 spawning season which precluded coho salmon from migrating upstream past RM 0.5 to spawn. During the 2009 spawning season, a total of 16 redds were located, 5 live adults were counted, and 8 carcasses were found along streamside. In 2010, a total of 2 coho redds were documented, 3 live adults, and no carcasses were observed (Table 1).

Steelhead

Steelhead surveys were conducted between February and March, covering approximately 14 miles with between 2 – 3 passes at each survey reach. High spring flows and turbidity limit safe access to some survey reaches during certain times. Steelhead spawning has been widespread throughout much of the Rock Creek subbasin. A total of 45 redds were located and a total of 37 live adults were enumerated during the 2008 spawning season. The majority of observed and documented steelhead redds in 2008 were located in the mainstem Rock Creek from RM 1- RM 9 and in Squaw Creek from RM 1- RM 8. A total of 127 redds were located and a total of 104 live adults were counted during the 2009 spawning season with a majority of the redds located in the mainstem Rock Creek RM 1- RM 21 and Squaw Creek RM 1 - RM 8. In 2010, with the ability to cover more spawning area, we surveyed 27 river miles in Rock Creek and its tributaries. A total of 287 redds were recorded and a total of 154 live adults were enumerated in the subbasin and two carcasses were found along the streamside (Table 1).

Table 1. 2008-2010 cumulative steelhead, coho, and Fall chinook redd count and spawner abundance survey data

2008-2010 Rock Creek cumulative steelhead redd count and spawner abundance surveys

	Subbasin Redd Total	Rivermiles Total Surveyed	Live Total Observed	Carcass Total	Mainstem Redd % Contribution	Tributary Redd % Contribution	Mainstem Live % Contribution	Tributary live % Contribution
2008	45	12.5	37	0	36	73	81	19
2009	127	14.7	104	3	70	30	19	81
2010	287	27	154	2	64	36	47	53

2008 -2010 Rock Creek cumulative coho redd count and spawner abundance surveys

	Subbasin Redd Total	Rivermiles Total Surveyed	Live Total Observed	Carcass Total
2008	0	2.5	1	0
2009	16	2.5	5	8
2010	2	2.5	3	0

* Note that surveys were only conducted in mainstem Rock Creek and an attempt to cover spawning ares 2- 3 passes was conducted

2008 -2010 Rock Creek cumulative Fall chinook redd count and spawner abundance surveys

	Subbasin Redd Total	Rivermiles Total Surveyed	Live Total Observed	Carcass Total
2008	2	2.5	2	0
2009	0	2.5	0	0
2010	6	2.2	2	2

* Note that surveys were only conducted in mainstem Rock Creek and an attempt to cover spawning ares 2- 3 passes was conducted

Pathogen Sampling and Analysis

Pathogen sampling was done annually for juvenile steelhead (*Oncorhynchus mykiss*), Coho salmon (*Oncorhynchus kisutch*), bridgelip suckers (*Catostomus columbianus*), speckled dace (*Rhinichthys osculus*) and redside shiner (*Richardsonius balteatus*). The samples were taken to the U.S. Fish and Wildlife Service's Lower Columbia River Fish Health Center (LCRFHC) for analysis. The results concluded that the mainstem Rock Creek fish we submitted were in relatively good health and few pathogens were detected. The juvenile steelhead pathogen analyses tested positive for *Renibacterium salmoniarum*, the causative bacteria for bacterial kidney disease (BKD). This does not mean the fish were heavily infected. The type of test, ELISA and PCR, are sensitive techniques and can pick up small amounts of bacteria. Also, the fish that were examined did not have any obvious kidney lesions or swelling. For a thorough baseline profile of pathogen presence in the Rock Creek subbasin it was recommended by the LCRFHC that samples be collected for a minimum of five years.

During fish surveys in 2009, 2010, and 2011, USGS and YN personnel noticed blackspot (*Uvulifer ambloplitis)* and copepods (*Salmincola californiensis*) on juvenile steelhead and juvenile coho in the field.

Genetic analysis

The purpose of genetic analysis of Rock Creek steelhead is to understand the genetic composition of the population and its relatedness to adjacent drainage population in the region. A key component of the Middle Columbia River Steelhead Distinct Population Segments (DPS) Recovery Plan includes a genetics assessment of steelhead in Rock Creek to determine whether the steelhead are a unique strain or a sub-population in the Middle Columbia region.

Samples collected from Rock and Squaw Creek, sent to CRITFC for the genetic analyses, indicated a high level of variability across the three Rock Creek collections. A Fishers exact test indicated significant population heterogeneity between the three collections and significant population differences regionally. A phylogenetic analysis across the entire Columbia River estuary to the upper Salmon River indicated that the Rock Creek collections appear to be most genetically similar to the Middle Columbia River populations. The 2008 detailed genetics report found that Rock Creek steelhead are genetically distinct population from other populations in the region (Figure 1).

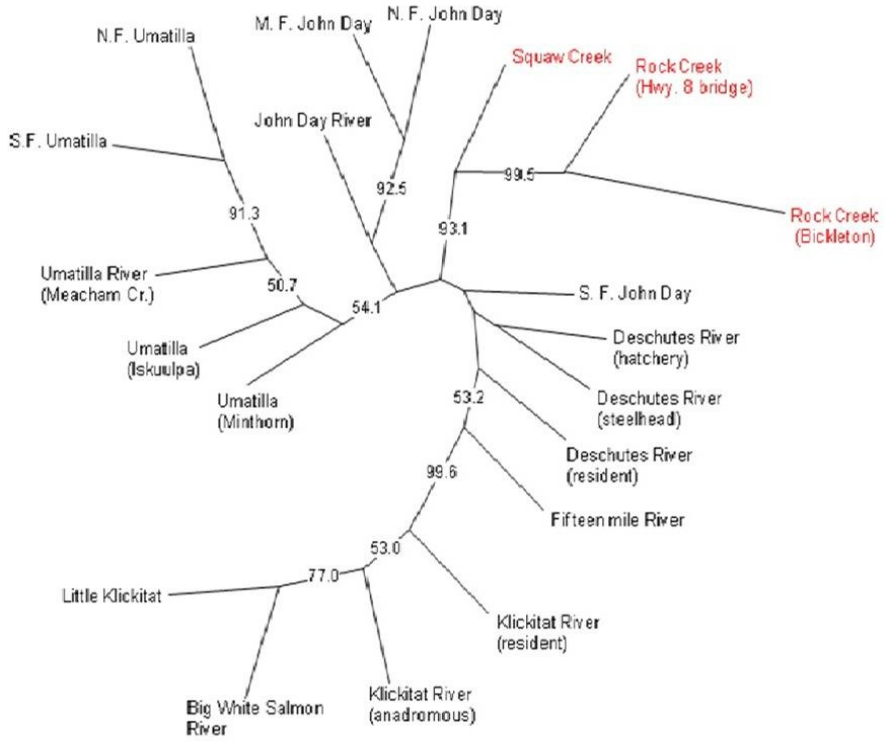


Figure 1. Neighbor-Joining (radial) tree topology identifying the genetic distance relationship between Rock and Squaw Creek collections and populations from SPAN in the lower mid-Columbia region. Bootstrap support consistent with greater than 50% consensus in the topology is shown at branch nodes.

Juvenile salmonid population estimates

In the fall of 2009, we partnered with USGS to electrofish two randomly selected pools per 2 km sections over all Rock Creek that we had permission to sample, to understand fish distribution, distribute PIT-tags in juvenile trout within the watershed (covered in the movement section below), and assess habitat and access conditions for the following years population estimates. In the spring of 2010, we electrofished randomly selected pools, and we began conducting mark-recapture population estimates in a subset of those pools. Unfortunately, an unusually strong thunderstorm occurred overnight when we had blocknets installed and steelhead fry were impinged on the nets in 2010. This event caused us to exceed our permit for allowable take and all fish sampling ceased until spring of 2011. In 2011, population estimates were not conducted in the spring to reduce the number of fish handled, but Petersen mark-recapture population estimates were conducted in eight pools in Rock Creek and four pools in Squaw Creek during the fall. Steelhead fry were highly abundant in all habitat areas sampled in the spring. In the fall of 2011, steelhead parr were present and often abundant in nearly every pool that was sampled. However in the fall of 2009, steelhead parr were not found in the lower 12 km of Rock Creek. Also, in contrast to the previous years, coho were found in nearly every pool in 2012 and the results are displayed in the figures below (Figure 2). This annual variability in fish distribution illustrates the need for an additional year of study to understand these populations in Rock Creek.

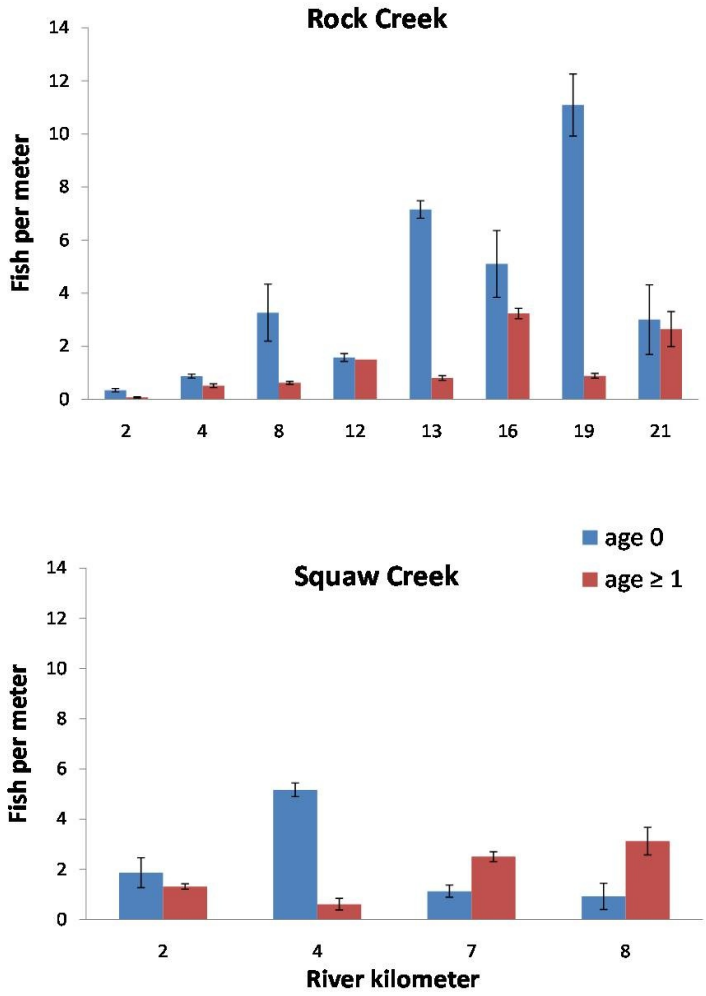


Figure 2. Population estimates of steelhead in Rock and Squaw Creek, Washington.

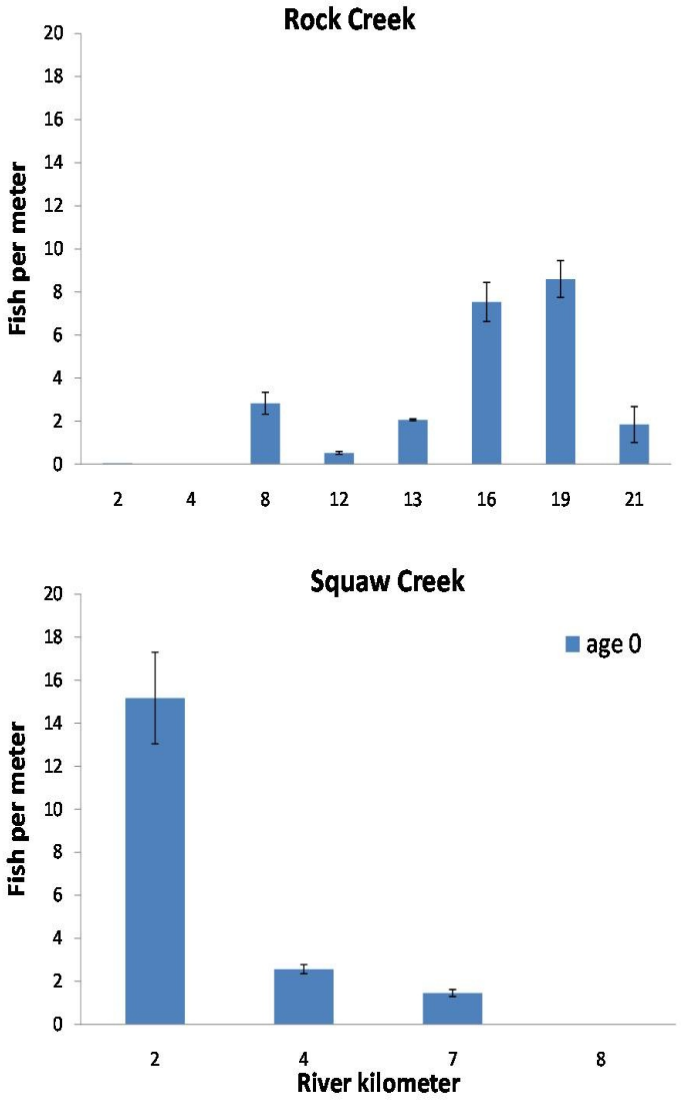


Figure 3. Population estimates of Coho salmon in Rock and Squaw Creek, Washington.

PIT Tag Interrogation

Juvenile detections

During the summer of 2009, two PIT-Tag interrogation systems (PTISs) were installed in Rock Creek (Figure 4). The Rock Creek Longhouse PTIS is located at river kilometer 5. The Squaw Creek PTIS is located at the confluence of Squaw Creek at river kilometer 13. Since their operation began in November of 2009, 225 of 657 PIT-tagged juvenile steelhead have been detected at one or both of the PTISs.

A total of 555 juvenile steelhead were PIT tagged in the fall of 2009. A high proportion (35 %) of those PIT-tagged fish were subsequently detected at one or more PTISs the following year (Table 2). IN 2009, a total of 182 fish were detected at the Squaw Creek PTIS and 174 fish were detected at the Rock Creek Longhouse PTIS. In 2010, 27 of 102 juvenile steelhead that were PIT tagged were detected at a PTIS; however fish were only tagged in the spring of 2010, after the juvenile outmigration season. We electrofished in both the spring and fall of 2011. We PIT-tagged 1,151 juvenile steelhead in 2011. As of January 1, 2012, 19 of those fish have been detected at a PTIS. Since most movement occurs March through May, it is critical to continue funding to operate the PTISs to detect the smolt outmirgration this spring.

Steelhead outmigrated from Rock Creek from late March through mid May (Figure 6). Several fish migrated past the Squaw Creek PTIS in the winter, reared for several months in lower Rock Creek, and then outmigrated in the spring. This indicates that lower Rock Creek was used seasonally by steelhead prior to outmigrating as smolts. Fish tagged in rkm 1 through 3 of Squaw Creek outmigrated earlier than fish tagged in rkm 7 and 8 of Squaw Creek (Figure 6). Further PIT tagging and analysis of PTIS detections will allow us to determine the primary areas of smolt productivity, the extent of rearing in lower Rock Creek, and the timing of outmigration in relation to flow and temperature conditions, which will aid in prioritization areas for restoration and/or preservation.

We are currently calculating detection efficiencies at these arrays; however, preliminary analysis indicates very high detection efficiencies (>90%) for PIT-tagged fish at both sites. Fewer fish tagged in Rock Creek were detected in the Columbia River; however, detection probabilities ranged between 4 - 13% at John Day Dam and 3 - 7% at Bonneville Dam during the 2010 spring outmigration period.

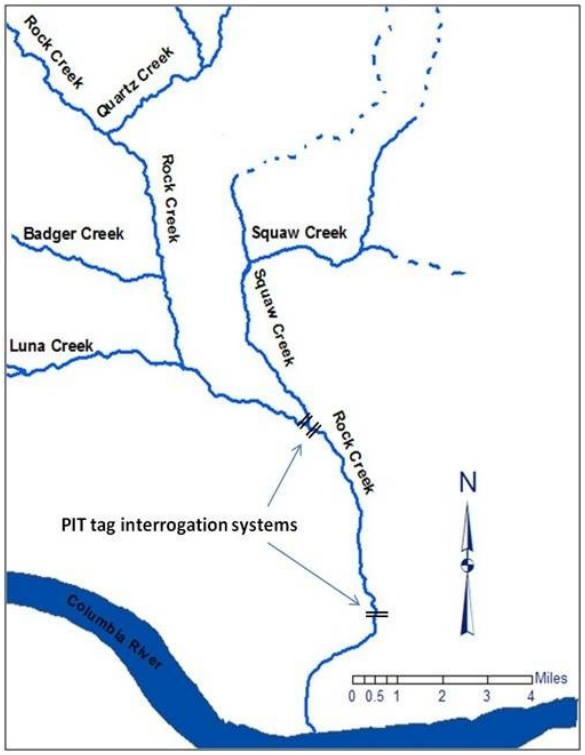


Figure 4. Locations of PIT-tag interrogation systems (PTIS) in Rock Creek subbasin.

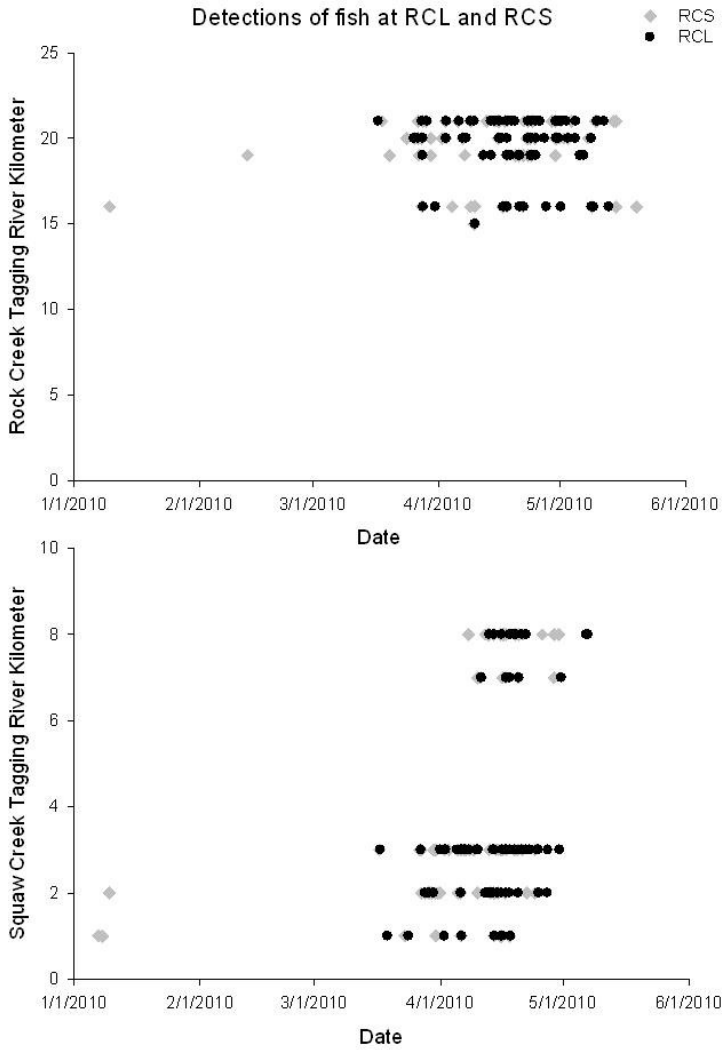


Figure 5. The river kilometer of tagging in Rock and Squaw creeks and the date of detection at PIT-tag interrogation sites at the confluence of Rock and Squaw creeks (RCS, rkm 13) and at the Rock Creek Longhouse (RCL, rkm 5). Fish were tagged in the fall of 2009 and detected in the spring of 2010.

Table 2. Total number of *Oncorhynchus mykiss* PIT tagged in the Rock Creek subbasin in the fall of 2009 and the number of tag detections and interrogations through November 1, 2011. The number in parentheses is the percentage of tagged fish that were detected at any site.

			Rock Creek interrogations		Columbia River juvenile interrogations			Columbia River adult interrogations	
Reach River kilometer	PIT tags deployed	Total number of fish detected	RCS (rkm 13)	RCL (rkm 5)	John Day Dam	Bonneville Dam	Estuary Trawl	Bonneville Dam	McNary Dam
Rock Cr. mouth to Squaw Cr.									
2	3	0	–	--	–	--	–	--	--
Rkm 13 (Squaw Cr. confluence) to RKM 22									
15	7	2 (29)	2	1	0	0	0	0	0
16	99	35 (35)	28	30	8	14	0	0	0
20	116	28 (24)	25	23	7	5	0	0	0
21	78	41 (53)	36	36	13	4	2	1	1
Squaw Creek									
1	24	10 (42)	10	9	3	2	1	0	0
2	54	26 (48)	26	22	9	4	1	0	0
3	99	35 (35)	34	33	13	7	0	1	0
7	54	16 (30)	16	15	3	1	0	0	0
8	21	5 (24)	5	5	2	2	0	1	0
Total	**555**	**198 (36)**	**182**	**174**	**58**	**39**	**4**	**3**	**1**

Adult steelhead PIT-tag detections

From August 2009 to June 2011, a total of 23 adult steelhead PIT tagged by other agencies, were detected spending a portion of their life history in Rock Creek (Table 3). Eleven fish were tagged as juveniles at Lower Granite Dam and transported by barge, indicating that the highest proportion of stray steelhead using Rock Creek are barged. Five fish were tagged and released from hatcheries in Idaho, one at the Hagerman Hatchery, one at the Irrigon Hatchery, one at Clearwater Hatchery, and two at the Magic Valley Hatchery. One fish was tagged in Trout Creek, a tributary of the Deschutes River. Six of the 23 steelhead were tagged as adults at the Bonneville Dam adult fish facility and had unknown juvenile rearing locations. Eight of the 23 fish were of hatchery origin, the other 15 fish were of wild origin. Nineteen of the 23 steelhead (83%) were detected about 100 km upriver of Rock Creek at the McNary Dam adult fish ladder prior to traveling into Rock Creek. The adult steelhead entered Rock Creek beginning in January, with most entering in March and the last one entering on April 12, 2011. Twelve of the 23 fish traveled, and likely spawned, upstream of the Squaw Creek interrogation system. Much more of this information will be available as the fish we tagged as juveniles begin to return as adults.

The following is an example of the type and detail of adult steelhead life history knowledge gained via interrogation systems in Rock Creek coupled with the Columbia River interrogation systems: One wild steelhead, tagged at the adult fish facility in Bonneville Dam on 8/11/2009, was detected in the McNary adult fish ladder on 9/7/2009. It then presumably fell back over McNary Dam and entered Rock Creek on 2/6/2010 and traveled past the Squaw Creek PTIS into Squaw Creek on 2/8/10. The steelhead passed downstream at Squaw Creek on 2/23/2010, likely after spawning in Squaw Creek, and traveled downstream past the Longhouse PTIS on 2/27/2010. The fish was detected at the Bonneville corner collector (BCC) PTIS on 4/14/2010 after passing through John Day and The Dalles Dam, which do not have PIT tag detection facilities, on its way back to the ocean. On 8/21/2010 it was detected again, in the adult ladders at Bonneville Dam and on 9/21/2010 at McNary Dam. This fish then entered Rock Creek for a second time on 2/8/2011, and traveled past the Squaw Creek PTIS on 3/3/2011. The steelhead passed downstream at Squaw Creek on 3/13/2011, and traveled past the Longhouse PTIS on 3/22/2011 as a two time spawner and kelt. A more detailed analysis of all adult steelhead movements will be presented after additional detections are recorded and patterns become more evident.

Table 3. Total number of PIT-tagged adult steelhead that were detected at the Rock Creek Longhouse (RCL) or Rock Creek at Squaw Creek confluence (RCS) PIT-tag interrogation systems and the detections as adults at other Columbia and Snake river sites. The steelhead were tagged as juveniles or adults in the Columbia River watershed. The release and interrogation locations were denoted by the river kilometers from the mouth of the Columbia, with each tributary junction denoted by periods, up to the release or interrogations site.

			Rock Creek interrogations		Columbia River juvenile interrogations			Columbia River adult interrogations	
Reach River kilometer	PIT tags deployed	Total number of fish detected	RCS (rkm 13)	RCL (rkm 5)	John Day Dam	Bonneville Dam	Estuary Trawl	Bonneville Dam	McNary Dam
Rock Cr. mouth to Squaw Cr.									
2	3	0	–	--	–	--	–	--	--
Rkm 13 (Squaw Cr. confluence) to RKM 22									
15	7	2 (29)	2	1	0	0	0	0	0
16	99	35 (35)	28	30	8	14	0	0	0
20	116	28 (24)	25	23	7	5	0	0	0
21	78	41 (53)	36	36	13	4	2	1	1
Squaw Creek									
1	24	10 (42)	10	9	3	2	1	0	0
2	54	26 (48)	26	22	9	4	1	0	0
3	99	35 (35)	34	33	13	7	0	1	0
7	54	16 (30)	16	15	3	1	0	0	0
8	21	5 (24)	5	5	2	2	0	1	0
Total	**555**	**198 (36)**	**182**	**174**	**58**	**39**	**4**	**3**	**1**

OBJ-2. Determine native and non-native fish assemblage and distribution.

Species Composition

We found a total of nine species of fish (Table 4) during our sampling in 2009 through 2011: steelhead (*Oncorhynchus mykiss*), Coho salmon (*Oncorhynchus kisutch*), shorthead sculpin (Cottus confuses), speckled dace (*Rhinichthys osculus*), red sided shiner (*Richardsonius balteatus*), bridgeip suckers (*Catostomus columbianus*), northern pike minnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieu*), and brown bullhead (*Ameiurus nebulosus*).

In 2009, steelhead were rare in Rock Creek downstream of the Squaw Creek confluence (rkm 13), with only 4 individuals captured. However, sampling during 2009 occurred only in the fall after much of Rock Creek had become intermittent. Steelhead were common and even abundant upstream of rkm 13 and in Squaw Creek, during 2009. We found steelhead to be abundant throughout all areas sampled in Rock and Squaw Creek in the spring of 2010 and both spring and fall of 2011. This indicates that additional years of study are needed to understand the extent of salmonid mortality in Rock Creek below rkm 8.

In 2009, Juvenile coho were present in only 2 (rkm 6.9 and 15.3) of 36 pools sampled. We found only 8 coho compared to 783 steelhead. During the spring of 2010, coho were found in 7 of the 28 pools sampled, but were not abundant. We found only 12 individuals compared to over 950 steelhead. In 2011, we found coho in 40 of the 57 pools sampled throughout Rock and Squaw Creek. Coho were also far more abundant than in previous years. We found 2,002 individuals compared to 3,325 steelhead.

We did not find any smallmouth bass above rkm 4 during any of our sampling efforts in 2009 through 2011. Smallmouth bass were present below rkm 4, but not abundant. Highest abundance of bass was in the lower 1 km nearest the impounded reach.

Variations in our findings could be due to timing of sampling. In 2009, we electrofished in the fall. Our sampling in 2010 only occurred in the spring. In 2011, we were able to complete the sampling as it was intended in 2010, with spring indexing of fish distribution and fall population estimates and indexing of fish distribution. Additional years of research would be helpful in gaining a thorough understanding of typical Rock Creek fish assemblage and distribution.

Table 4. Presence and absence of fish species found in Rock Creek during 2009-2011. P = present, A = absent.

	Rock Creek			Squaw Creek	
Reach	Rkm 2 to 4	Rkm 4-12	Rkm 13 to 22	Rkm 0-2	Rkm 2-8
Rainbow trout	P	P	P	P	P
Coho salmon	P	P	P	P	P
Shorthead sculpin	P	P	P	P	P
Speckled dace	P	P	P	P	P
Red sided shiner	P	P	P	P	A
Bridgelip Sucker	P	P	P	P	P
Northern Pikeminnow	P	P	A	A	A
Smallmouth bass	P	A	A	A	A
Brown Bullhead	P [a]	A	P [b]	A	A

OBJ-3. Determine habitat conditions that may limit salmonid productivity and abundance.

Habitat surveys

A census of all habitat for which we had permission to survey was conducted during the spring and fall of 2010 and the fall of 2011. During these surveys we measured the length of all dry sections and the length, wetted width, average depth, and maximum depth of all wet sections (mostly pools). This will allow us to calculate the total amount of available fish habitat remaining during the low flow period. The amount of habitat available for fish varied among years, but we have not completed the proofing and analysis of the data collected in 2011 to provide an estimate of that difference for this proposal. Additionally, habitat variables have been collected to input into the EDT model and the model has been re-run with this newly collected data. We are in the process of analyzing the EDT model outputs, and we plan to update the additional habitat and fish inputs to the model for a final run after this information has been collected and summarized in 2012.

Table 5. Percent of surveyed length that was dry and mean and maximum depth of pools during habitat surveys in June and September of 2010. Pool percent was calculated using total length.

Creek	Percent dry		Percent pools		Number of pools/100m		Mean Depth (cm)		Maximum Depth (cm)	
Reach	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
Rock Creek										
Rkm 5 - 13 [a]	NA	29	NA	28	NA	0.7	41	34	75	69
Rkm 13 - 20	0	38	19	18	0.6	0.7	43	31	79	60
Rkm 26 - 28	0	5	16	13	1.1	1.1	35	34	57	52
Squaw Creek										
Rkm 0 - 8	0	44	22	13	0.9	0.8	44	32	74	52
Quartz Creek										
Rkm 0-1	0	4	9	9	1.3	1.2	27	24	43	45

Temperature

Temperature and water quality measurements have been collected at 8 sites over the last several years, but are not displayed here. Temperature was collected at 18 additional locations in Rock and Squaw Creek during July-September of 2010. These are the same locations where populations estimates for salmonids occurred. This will aid in understanding how temperature affects fish distribution and population abundance in individual pools. A 16°C limit for surface water has been set by the Washington Department of Ecology as in indicator of stream health for salmonid habitat and a 20°C limit for non-salmonid habitat (Washington Department of Ecology, Chapter 173-201A, Water Quality Standards for the Surface Waters of the State of Washington). We recorded water temperatures that exceeded 16°C at all of the sites in 2010. Water temperature at 9 of 18 sites exceeded 20°C (Table 6).

We collected temperature at 15 locations during July-September of 2011. While water temperatures were high in both years, none were high enough to be directly lethal to trout. The temperature data from 2011 is currently being analyzed and is not ready to display in this proposal.

Table 6. Number of days per year when maximum water temperature exceeded 16 and 20 °C, and maximum water temperature recorded at locations in Rock Creek, July-September 2010. Data are from Onset Corporation's StowAway and Tidbit temperature loggers. Sites are listed from downstream to upstream.

		Number of days > 16	Number of days >20	Maximum
	RKM	2010	2010	2010
Rock Creek				
	11	81	45	23.8
	13	85	0	18.9
	14.2	86	18	21.2
	16.9	92	0	18.2
	18.7	59	2	21.0
	18.8	46	1	21.5
	25.7	29	0	19.8
	27.1	36	0	18.2
	27.5	38	0	18.1
Squaw Creek				
	0.7	31	21	21.7
	1.3	62	0	18.9
	1.8	27	5	23.5
	2.2	59	0	17.9
	7.3	52	0	18.9
	7.7	36	0	16.9
Quartz Creek				
	0	45	1	20.2
	0.5	50	6	20.8
	0.6	53	11	20.9

OBJ-4. Identifiy protection/restoration sites and actions.

A map of the land ownership within the watershed is depicted in Figure 6. The Rock Creek project lead had created relationships with many of the private landowners within the subbasin for access to their property for data collection and potential restoration projects. There is extensive government, tribal, and Nature Conservancy land within the mainstem Rock Creek and its tributaries. Public outreach has been conducted within Klickitat County and to local schools and summer student camps about the potential of preservation and restoration of salmon and steelhead in Rock Creek. Many local residents are supportive of the project, interested in its results, and are supportive of the restoration of salmon and steelhead in the subbasin.

A preliminary run of the EDT model has been conducted and several model outputs are available to understand modeling results. For brevity, we show habitat factors or Level 3 survival factors that affect production potential as examples of some of the model outputs (figure 7 and 8). This output condenses the most influential habitat factors across all life stages, and in the case of a geographic area analysis, across a number of reaches. This report is a display of the habitat factors that most reduce the diagnostic species population performance. Decreased food, channel stability, increased temperature and sediment load, and reduced key habitat quantity were found to be limiting factors in many reaches. Further analysis will be completed once model inputs have been updated, including fish life history and distribution information collected in 2012.

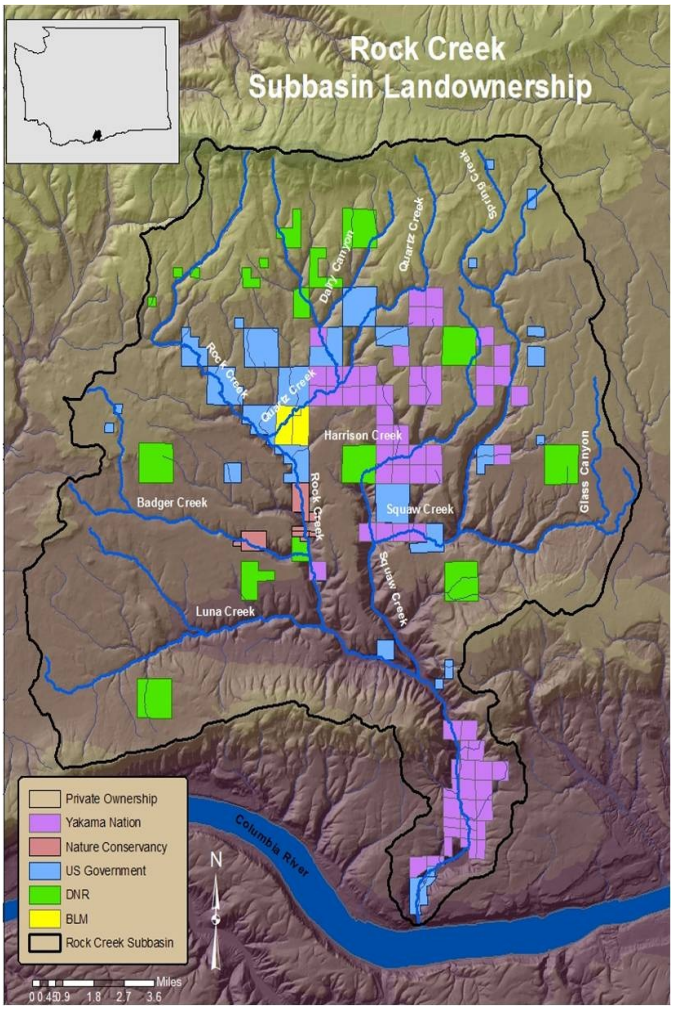


Figure 6. Map of landownership within the Rock Creek subbasin. [Private landownership within subbasin is depicted as having no color]

Table 7. Rock Creek coho protection and restoration summary.

Rock Creek (YN) Coho
Protection and Restoration Strategic Priority Summary

Geographic area priority			Attribute class priority for restoration															
Geographic area	Protection benefit	Restoration benefit	*Channel stability*	*Chemicals*	*Competition (w/ hatch)*	*Competition (other sp)*	*Flow*	*Food*	*Habitat diversity*	*Harassment/poaching*	*Obstructions*	*Oxygen*	*Pathogens*	*Predation*	*Sediment load*	*Temperature*	*Withdrawals*	*Key habitat quantity*
Luna	○	○	•				•	●	●	•					•			●
Rock Below Squaw	○	○	●		•		•	●	●					•	•	●		●
Rock Between Luna and Badger	○	○	•				•	⬤	●									●
Rock Between Squaw and Luna	○	○	•				•	●	•						•	●		●
Squaw Cr	○	○	•				•	●	•		●					●		●

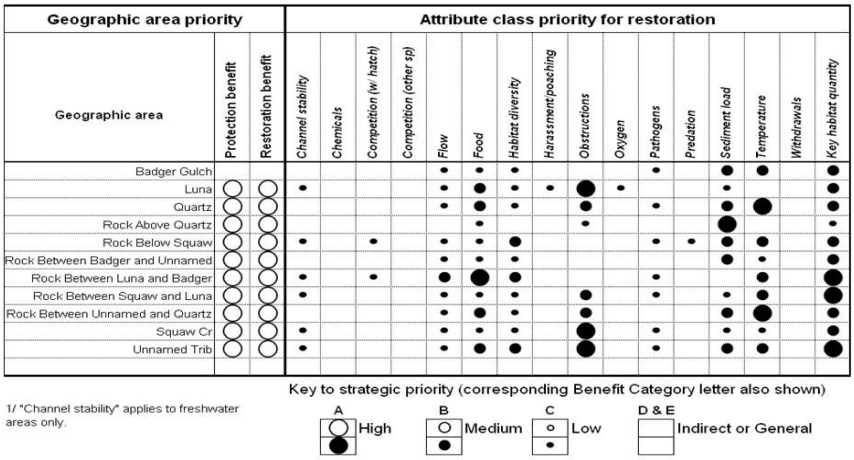
Key to strategic priority (corresponding Benefit Category letter also shown)

1/ "Channel stability" applies to freshwater areas only.

A ○ / ● High
B ○ / • Medium
C ○ / • Low
D & E Indirect or General

Table 8. Rock Creek summer steelhead protection and restoration summary.

Rock Creek (YN) Summer Steelhead
Protection and Restoration Strategic Priority Summary



1/ "Channel stability" applies to freshwater areas only.

Assessments

More details about assessments of this project are available in the Assessments area.

Review: FY07-09 Solicitation Review

Independent Scientific Review Panel Assessment:
- Completed Date: 8/31/2006
- Review: FY07-09 Solicitation Review
- Final ISRP Rating: Meets Scientific Review Criteria - In Part

Council Recommendation:
- Completed Date: 10/23/2006
- Review: FY07-09 Solicitation Review
- Recommendation: Fund

Response to past ISRP and Council comments and recommendations:
The project's goals include characterizing baseline conditions of the Rock Creek watershed and anadromous fish habitat to prioritize sites for restoration. Environmental and biological attribute data will be collected throughout the watershed. One of the key strategies and objectives listed in the subbasin plan for Rock Creek includes an evaluation of the genetics of Rock Creek steelhead. A genetics assessment was conducted on steelhead to determine if Rock Creek has its own unique strain and sub-populations. Population surveys were conducted to define the full extent of anadromous use and potential habitat. Habitat surveys were conducted in the mainstem and its tributaries to attain the current baseline conditions. Steelhead spawning surveys were conducted in the watershed and scale analysis performed on O. mykiss. Stream temperature and water quality monitoring is concurrently being conducted throughout the watershed.

This project addresses the Rock Creek Recovery Plan objectives for Middle Columbia River steelhead. Some of the key research needs indicated in the recovery plan include genetic studies to identify genotypic variation; population structure assessment; and identification of the natural water temperature in the lower river and whether fish could survive with higher average mainstem temperatures if in-stream diversity and side channel/floodplain habitats are present and diverse enough to provide thermal refugia.

Adaptive Management

Management Changes:
The project's management goals are the same in the original proposals; however, we are also focusing on filling the data gaps mentioned in the Recovery Plan for the Rock Creek Population of Middle Columbia River Steelhead DPS and the Lower Mid-Columbia Mainstem Subbasin Plan. Both plans are interrelated to the goals and objectives of this project. The Rock Creek subbasin monitoring and evaluation program will build on existing programs designed for monitoring tributary habitat in the Rock Creek subbasin and will emphasize regional coordination.

Project Documents & Reports

Public Attachments in Pisces

ID	Title	Type	Period	Contract	Uploaded
P114099	Rock Creek Fish & Habitat Assessment for the Prioritization of Restoration and Protection	Progress (Annual) Report	12/2007 - 5/2009	43057	11/3/09
P124859	Rock Creek Fish and Habitat Assessment for Prioritization of Restoration and Protection Actions	Progress (Annual) Report	6/2009 - 5/2010	54748	1/26/12

Other Project Documents on the Web

<none>

Project Relationships

The Project Relationships tracked automatically in cbfish.org provide a history of how work and budgets move between projects. The terms “Merged” and “Split” describe the transfer of some or all of the Work and budgets from one or more source projects to one or more target projects. For example, some of one project’s budget may be split from it and merged into a different project. Project relationships change for a variety of reasons including the creation of efficiency gains.

Project Relationships: <none>

Additional Relationships Explanation:

There are many data gaps identified in the NOAA Fisheries Recovery Plan for the Rock Creek Population of the Middle Columbia River Steelhead DPS and the Lower Mid-Columbia Mainstem Subbasin Plan which includes Rock Creek that this project seeks to fill. In addition, the Yakama Nation is working with NOAA to perform salmon recovery planning and actions in the Rock Creek subbasin. The activities described in this

proposal are currently the main driver of that effort.

In the fall of 2006, the Washington State Department of Ecology (DOE) designated portions of Rock Creek, Luna Gulch, Squaw Creek, and Quartz Creek as waters requiring supplemental protection and imposed a more stringent water temperature criterion during the salmonid spawning and incubation season. This designation has alerted private landowners to the water temperature issue and many wish to work together with the local conservation district, Yakama Nation, and DOE together towards reducing water temperatures and removal from the 303d list for impaired water quality.

Due to biologists efforts that are working on this BPA Rock Creek Fish and Habitat Assessment project (2007-156-00), in 2011, Rock Creek was added to the Klickitat County Lead Entity region for Salmon Recovery Funding Board (SRFB) funding. As a result of our efforts, the SRFB awarded the Eastern Klickitat Conservation District (EKCD) and Yakama Nation Fisheries a grant, planned for 2012, to conduct an extensive geomorphic study in Rock Creek and its key tributary streams. The study will include: geomorphic study of our project area, field surveys, geomorphic mapping, channel migration study, and a hydrogeologic study. This SRFB project intends to make a detailed assessment of the Rock Creek watershed, combine information gathered under the BPA funded project, and cooperate to analyze the data and to make recommendations on the most beneficial sites and actions for steelhead habitat improvement. Through the habitat restoration elements of this BPA funded project (2007-156-00), we plan to work in conjunction with EKCD to carry out the restoration elements of this project.

A CRITFC effort to characterize genetic structure of O. mykiss throughout the Columbia Basin is supported by the samples that we provide. In addition, NOAA's Bi-Op work to characterize genetic structure of O. mykiss throughout the Columbia Basin will benefit from the samples that we provide. Both of these efforts will use separate funding to run the samples we provide.

While nearly every watershed in the Columbia River has non-native predators (bass, walleye, catfish, etc.), and predators are in the mainstem reservoirs all the way to the estuary, the population level effect of these predators is beyond the scope of this proposal. However, a result of this proposal will be to assess the distribution and relative abundance of native and non-native predators in the portion of Rock Creek that is not inundated by the hydropower system. This will help inform the region wide effort to assess and mitigate for the impacts of these introduced predators, which are often protected by state fishing regulations.

The following relationships focus on BPA funded projects:

Project Number 1990-080-00 is the "Columbia Basin Pit-Tag Information System" by PSMFC. The purpose of this project is to store PIT tagging and recovery information. The Rock Creek project has and will continue to supply data to facilitate analysis of migration patterns, survival, and abundance of PIT-tagged salmonids. PTAGIS will store raw data, and the Rock Creek project will report on migratory timing, survival rates, and abundance information based on PIT tag analyses.

Project Number 2008-511-00 is a CRITFC project titled "Bonneville Dam GSI". In this project, adult salmonids including steelhead are genetically sampled and PIT tagged. Our Rock Creek project supports this by providing PIT-tag detection and recoveries in Rock Creek. PIT tags from the Bonneville Dam adult steelhead tagging project that are detected or recovered in Rock Creek have and will continue to be reported to PTAGIS for analysis by CRITFC. To date, the fish tagged as adults by CRITFC at Bonneville Dam and fish tagged as juveniles that are barged from Mc Nary Dam are the majority of the adults (n= approx. 30) that we have detected at Rock Creek.

Project number 2008-470-00 is a Yakama Nation project titled "Yakama Nation Ceded Lands Lamprey Evaluation and Restoration". One of the goals of this project is to understand Pacific lamprey distribution within the Yakama Nation ceded lands. Our Rock Creek project will put biologists in Rock Creek conducting spawning surveys, and juvenile fish assessments. During that effort we will record any evidence of lamprey use of the watershed and notify biologists associated with the lamprey project so that they can conduct a survey with equipment that is designed to sample lamprey.

Focal Species

Primary Focal Species
Steelhead (O. mykiss) - Middle Columbia River DPS (threatened)

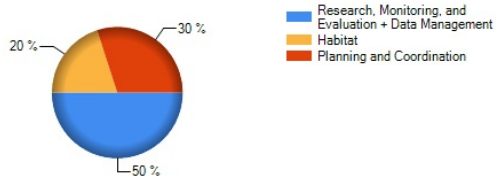
Secondary Focal Species
Chinook (O. tshawytscha) - Upper Columbia River Summer/Fall ESU
Coho (O. kisutch) - Unspecified Population
Lamprey, Pacific (Lampetra tridentata)
Trout, Rainbow (Oncorhynchus mykiss)

Emerging Limiting Factors
The Rock Creek hydrologic regime is predominantly a rain-on-snow transitional system with consistent spring peak and summer low flows. The lower reaches of Rock Creek become intermittent during the summer and early fall months because of lack of instream flow, with spring-fed pools providing refugia for native and non-native fish. With the continued threat of climate change, Rock Creek could eventually change from a rain-on-snow transitional system to a rainfall-dominated system which tends to have more flashy winter and early spring peak flows. There needs to be an in-depth hydraulic and geomorphic study conducted in the mid to lower reaches of the subbasin to determine the potential for stream restoration work to decrease summer temperatures, bring the water table back up and promote perennial instream flow in Rock Creek. Funding from the Salmon Recovery Funding Board has been secured and a cost share oppurtunity for this project to fund the Rock Creek geomorphic study, which will begin to address potential impacts of climate change and identify sites that are likely candidates for restoration in the subbasin.

Our previous electrofishing presence/absence surveys indicated that there are non-native species inhabiting Rock Creek such as bullhead catfish and smallmouth bass. These non-native species may reduce the survival of native salmonids in the subbasin. The spread of fish pathogens, predation, and competition are a few of the risks that non-native species pose to the native fish species of the subbasin. This project is in the process of collecting baseline fish species composition, relative abundance, and distribution data throughout the watershed. These data likely vary annually based upon climatic factors, among others. The lowermost mile of Rock Creek is inundated as a result of the John Day Dam. This large slackwater pool has created habitat for eurasian milfoil and other invasive aquatic plants and warm-water piscivorous fish species. In the impounded reach, fishermen fish for carp, walleye, perch, bluegill, crappie, and smallmouth bass. A study is needed on the inundated portion of Rock Creek, as well as other inundated tributaries and the mainstem of the Columbia River to determine the extent of the problem and to help make better management decisions in the future. This project does attempt to understand the status and distribution of non-native species in Rock Creek.

Types of Work

Work Classes



Work Elements
22. Maintain Vegetation
47. Plant Vegetation
53. Remove Vegetation
70. Install Fish Monitoring Equipment
99. Outreach and Education
114. Identify and Select Projects
156. Develop RM&E Methods and Designs
157. Collect/Generate/Validate Field and Lab Data
158. Mark/Tag Animals
159. Transfer/Consolidate Regionally Standardized Data
161. Disseminate Raw/Summary Data and Results
162. Analyze/Interpret Data
189. Coordination-Columbia Basinwide
191. Watershed Coordination

Tagging

Populations	Origin	# of PIT Tags per year	Type of PIT Tag	Years to be tagged	Comments
Steelhead (O. mykiss) - Middle Columbia River DPS (threatened)	Wild	1200	FDX - Full Duplex	2009 - 2012	Genetic samples will also be taken from a subsample of PIT-tagged fish during the time of juvenile populations surveys.

Please explain why the tagging technology used in this project was selected. Include a discussion of how the cost and applicability of the selected tagging technology influenced your selection. Enter "NA" if not applicable to your project.
Passive Integrated Transponder (PIT) tags were chosen for this projects use. When selecting a tag type, one must consider existing infrastructure, benefits to this and other projects, cost, tag availability, application, and the quality and quantity of tag recovery information. This project will use PIT tag detectors at two fixed sites in Rock Creek and one of its tributary streams, handheld detectors during surveys, adult and juvenile fixed sites at Bonneville Dam (BON), and a mobile tracking site in the estuary.

In addition, this data could be added to the Comparative Survival Study (CSS). Other tag types such as CWTs, or strontium marks require fish to be sacrificed. Acoustic and radio tags do not have the battery life needed for the up to 8 year life after tagging needed for this project, and it is cost prohibitive for this small project to purchase and monitor acoustic or radio tagged fish in the mainstem Columbia River. Genetic marks require sampling many fish to find the few associated with our study, and the USACE has limited steelhead sampling at BON due to temperature concerns. In the end, PIT tags were the only cost-effective tagging alternative for the proposed survival modeling.

In summary, PIT tags were chosen for their small size, long life, and low cost. Small sized tags allow tagging of steelhead as small as 70 mm (FL), long tag life allows detection of individual fish at multiple life-stages, the low cost of PIT tags allows the tagging of many individuals relatively cheaply, and allows for adult and juvenile abundance estimates, survival estimates, exploration of life histories and various parr rearing strategies.

Describe any of the innovative approaches that your projects proposes that are in direct support of the ISAB/ISRP's recommendations to improve techniques for surgical insertion of internal tags, or external attachment of acoustic, radio, or data storage tags that reduce handling time, fish injury and stress. Enter "NA" if not applicable to your project.
NA

For specific tagging technologies, please address the tagging report's recommendations for genetic markers, otolith thermal marking, PIT tags, acoustic tags and radio tags for improving technologies in any way applicable. Enter "NA" if not applicable to your project.
ISAB/ISRP recommends that there be development of in-stream transceivers for detection in tributaries. Rock Creek subbasin in fact has two installed, which are running and collecting data on out-migrating smolts, returning adults, strays, and fish movement through the mainstem Rock Creek and Squaw Creek tributary.

If your project involves ocean port sampling and lower river sampling for coded wire tag (CWT) recovery, address the tagging and tag recovery issues (statistical validity of tagging rates, tag recovery rates, and fishery sampling rates) presented in the Pacific Salmon Commission's Action Plan to Address the CWT Expert Panel (PSC Tech. Rep. No. 25, March 2008).
NA

Explain how your tagging and tag recovery rates ensure a statistically valid result for your project. Enter "NA" if not applicable to your project.

Yakama Nation Fisheries Resource Management Program subcontracted with US Geological Survey - Western Fisheries Research Center (Columbia River Research Laboratory) to install two PIT-tag Multiplex units in Rock Creek and one of its key tributaries (Squaw Creek) in the summer of 2009. During the fall of 2009 approximately 800 juvenile steelhead were PIT-tagged and released. In 2011, 1,150 steelhead and coho were PIT tagged and released. A high proportion (>30%) of the tagged fish migrated out of the mainstem Rock Creek and into the Columbia River in 2010, fish tagged in 2011 have not yet migrated. Some of the smolts were detected at Bonneville Dam and at the Columbia River estuary increaseing detection probability and our understanding of the steelhead life-history. Individual smolt outmigration passage through 2 detection sites with total 12 antennas indicated good efficiency rates (>90%) for the PIT-tag detection systems in Rock Creek. Adult steelhead were detected entering Rock Creek and Squaw Creek beginning in January through May spawning season. These fish were originally PIT-tagged at the Bonneville Dam as adults or hatcheries or Mc Nary dam prior to barging as juveniles. Our NMFS permit allows us to capture, handle, tag, and release a total of 1200 juvenile steelhead annually. This sample size was selected to allow us to detect the range of life-history variability and to detect smolt to adult return rates and timing. If we tag 1000 fish per year, and expect a 3% return rate, we will have 30 adult fish returning per year to understand adult migration behavior prior to spawning. While we would like a larger sample size, logistical and financial constraints limited us to tagging up to 1200 fish per year, which we believe is sufficient to resolve our fish behavior questions.

Data Management

What tools (e.g., guidance material, technologies, decision support models) are you creating and using that support data management and sharing?
Data is available in electronic format as well in annual reports.

Describe the process used to facilitate receiving and sharing of data, such as standardizing data entry format through a template or data steward, including data exchange templates that describe the data collection methods, and the provision of an interface that makes data electronically accessible.
Data are entered into a standardized Excel spreadsheets which are then incorporated into an Access database for further analysis. The primary type of data shared and retrieved is stream temperature (hourly, seasonal). Individual site metadata detailing location, dates, times, et cetra are contained with original files of raw data. All other data such as abundance, distribution, redd counts and locations, et cetra are also associated with metadata.

What type of data are you collecting and how are you documenting supporting metadata?
The primary type of data shared is stream temperature (hourly, seasonal). Individual site metadata detailing location, dates, times, et cetra are contained with original files of raw data. PIT tagging and PIT tag detection data have associated metadata, and are shared through PTAGIS. All other data such as abundance, distribution, redd counts and locations, et cetra are also associated with metadata. We will follow PNAMP or other regionally accepted metadata standards.

Please describe the sources from which you are compiling data, as well as what proportion of data is from the primary source versus secondary or other sources?
All data is compiled through primary resources.

Describe the accessibility of the data and what the requirements are to access them?
Until the recommendations in the Columbia River Basin Collaborative Data Sharing Strategy are fully funded and implemented, the Yakama Nation intends to fulfill data sharing requests through its WWW.yakamafish-nsn.gov web site, through PTAGIS, or as necessary, through electronic mail with requestors. Data sharing will be contingent on, and consistent with tribal and regional policy guidelines. All annual reports are uploaded to PISCES and available through the BPA website. Any data distributed is associated within the same file with metadata describing methods of collection, dates locations, times, protocols used, accuracy standards, et cetra.

RM&E

What type(s) of RM&E will you be doing?
Status and Trend Monitoring
Uncertainties Research

Where will you post or publish the data your project generates?
PTAGIS Website
ICF International Ecosystem Biometrics
Yakima-Klickitat Fisheries Project website
BPA Pisces

Large Habitat Programs

Describe the process to solicit for, review and select projects; and include the criteria by which projects are rated and selected.

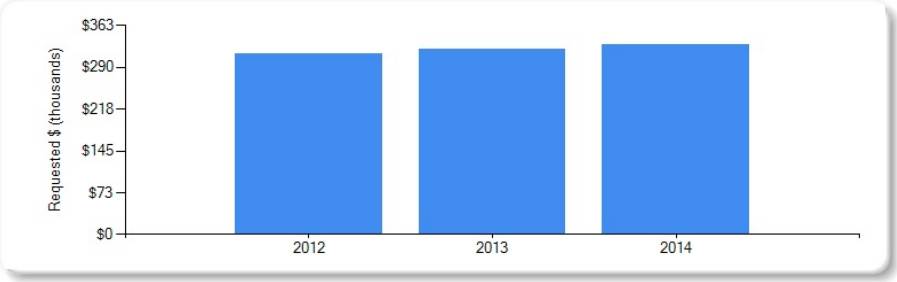
Currently there is no Large Habitat Program and right now we are in the RM&E stage of the project. The plan is to have a clear understanding of critical habitat areas that are vital to the survival of juvenile salmonids (distribution, abundance, and survival to smolting) with an understanding of adult spawning distribution and abundance. Landowner awareness and acceptance is another important aspect of conducting habitat restoration and preservation projects. Concurrently, Yakama Nation Fisheries plan to explore wetland/meadow restoration opportunities in the headwaters of Rock Creek and meeting with the private timber company landowner on the prospects of this type of restoration. Currently Yakama Nation Fisheries conducts small scale invasive weed control and riparian tree planting in lower Rock Creek annually for three years. In the spring of 2012, there is a plan to work in cooperation with the Eastern

Klickitat Conservation District to conduct an extensive geomorphic study of Rock Creek and two of its key tributaries (Squaw and Luna Creeks). Habitat, water quality, fish presense and absence, and spawner survey data collected in previous years from this project will be combined with the geomorphic analysis to make recommendations on the most likely sites and actions for habitat improvement.

Project Deliverables & Budget

Project Deliverable	Start	End	Budget
DELV-1 Assessment of adult salmonid migration behavior, spawner abundance, habitat use, and out of basin stray rate.	2012	2014	$120,000
DELV-2 Assessment of juvenile salmonid distribution, abundance, life history strategies, and growth.	2012	2014	$110,000
DELV-3 Assessment of the genetics of the steelhead population.	2012	2012	$12,000
DELV-4 Fish species composition and assessment of lamprey use.	2012	2012	$5,835
DELV-5 Determination of the presence and severity of pathogens in salmonids.	2012	2012	$4,000
DELV-6 Assessment of habitat conditions and limiting factors.	2012	2014	$96,894
DELV-7 Identify restoration project sites and actions	2012	2014	$60,000
DELV-8 Riparian remediation	2012	2014	$35,000
DELV-9 On the ground restoration projects	2013	2014	$521,135
		Total	**$964,864**

Requested Budget by Fiscal Year



Fiscal Year	Actual Request	Explanation
2012	$313,729	Accords Budget. Estimate based on current budget plus 2.5% inflation
2013	$321,548	Accords Budget. Based on previous year's budget plus 2.5% inflation
2014	$329,587	Accords Budget. Based on previous year's budget plus 2.5% inflation
Total	**$964,864**	

Item	Notes	FY 2012	FY 2013	FY 2014
Personnel		$144,000	$147,600	$151,290
Travel		$1,500	$0	$0
Prof. Meetings & Training		$1,500	$0	$0
Vehicles		$19,799	$20,294	$20,802
Facilities/Equipment	(See textbox below)	$0	$0	$0
Rent/Utilities		$8,820	$9,040	$9,266
Capital Equipment		$0	$0	$0
Overhead/Indirect		$37,265	$38,196	$39,150
Other	e.g., subcontracts	$100,153	$106,418	$109,079
PIT Tags		$692	$0	$0
Total		**$313,729**	**$321,548**	**$329,587**

Major Facilities and Equipment explanation:
The Rock Creek Fish and Habitat Assessment Project is housed at the Yakama Nation's Goldendale Field Office where the GSA vehicles and all other equipment are stored. Field equipment occasionally needs to be replaced, and the project currently has two GSA vehicles. The project has three computers for project and data input use. We have two PIT-tag multiplex units which are locked up near the creek where they collect data. We do need to order new meters occasionally for water quality monitoring and water temperature monitoring.

RM&E Protocols and Methods

RM&E Protocol	Deliverable	Method Name and Citation
Adult salmonid migration behavior, spawner abundance, habitat use, and out of basin stray rate (2007-156-00).	DELV-1	Adult PIT tagging (Fryer, J.K. 2009) Adult Spawners Age and growth of salmonids from scales Carcass Count: Site Selection and Sampling Frequency (Crawford, B.A., Mosey, T.R., & Johnson, D.H. 2007) Carcass Count: Survey (Crawford, B.A., Mosey, T.R., & Johnson, D.H. 2007) Estimating Adult Spawner Abundance (Crawford, B.A. 2011) Foot-based Live Fish Survey (Crawford, B.A., Mosey, T.R., & Johnson, D.H. 2007) Insteam PIT tag detection array (M.H. Bond, C.V. Hanson, R. Baertsch, S.A. Hayes, and R.B. MacFarlane 2007) ISEMP Standard PIT Tag Array Operations Manual (Orme, R. 2009) Operating PIT-tag interrogation stations PIT Tag Monitoring (Nez Perce Tribe 2010) PIT Tag Recovery – Electronic Detection (US Geological Survey, Oregon State University, Real Time Research 2010) PIT Tagging (Columbia Basin Fish and Wildlife Authority PIT Tag Steering Committee 1999) Redd Count Survey (Gallagher, S.P., Hahn, P.K., & Johnson, D.H. 2007) Redd Survey Methodology (Okanogan Basin Monitoring and Evaluation Program 2007) Spawner Abundance 2 (Bruce A. Crawford, Thaddeus R. Mosey, and David H. Johnson

		2007) Spawning Survey-Spawners (Murdoch, K. 2008) Trawled PIT tag detector (Ledgerwood, R.D., Ferguson, J.W., Ryan, B.A., Dawley, E.M., & Nunnallee, E.P. 2004) Use of Instream PIT tag Arrays to Monitor Migration Use of PIT tags to estimate stray rates Adult Escapement to Tributary (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E., Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2008) Adult Run Timing (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E., Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2008) Adult Spawner Escapement (Connolly, P.J., Jezorek, I.G., Martens, K.D., & Prentice, E.F. 2008) adult spawner spatial distribution Adult Spawner Spatial Distribution 2 (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E., Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2009) Age and growth analysis of salmonids Carcass Count: Mark-Recapture Analysis (Crawford, B.A., Mosey, T.R., & Johnson, D.H. 2007) Estimation of Hatchery Strays Redd Count Analysis (Gallagher, S.P., Hahn, P.K., & Johnson, D.H. 2007) Survival estimates based on PIT Tag dataset Travel time estimates based on PIT Tag dataset Using PIT tags to determine upstream migratory parameters of salmonids (Fryer, Jeffery K. 2008) CJS survival estimation (Smith, S.G., Skalski, J.R., Schlechte, W., Hoffmann, A. & Cassen, V. 1994) Distribution: Temporal (Adult) Estimate smolt survival using PIT tags Evaluating seasonal movements among critical habitats for salmonids
Abundance, habitat use, life-history, and growth of salmonids and distribution and composition of all fish species (2007-156-00).	DELV-2, DELV-4	Use of Instream PIT tag Arrays to Monitor Migration Geomorphic Channel Units (Moore, K.M.S., Jones, K.K., & Dambacher, J.M. 1997) PIT Tagging (Columbia Basin Fish and Wildlife Authority PIT Tag Steering Committee 1999) Juvenile fish monitoring and evaluation methods (Johnson, D.H., Shier, B.M., O'Neal, J.S., Knutzen, J.A., Augerot, X., O'Neil, T.A., & Peasons, T.N. 2007) Mark-recapture population estimates (Seber, G.A.F. 1982) Age and growth analysis of salmonids Estimate smolt survival using PIT tags Evaluating seasonal movements among critical habitats for salmonids Evaluating variability in the expression of the migratory life-history variant within a watershed Juvenile fish survival Juvenile to adult return rate for salmonids Multi-State Mark Recapture Model (R. A. Buchanan, J. R. Skalski 2007) Out-migration Survival (Yakama Nation 2008) PIT-tag Release-Recapture Model (Skalski, J.R., S.G. Smith, R.N. Iwamoto, J.G. Williams, A. Hoffman 1998) single release mark-recapture Survival estimates based on PIT Tag dataset Travel time estimates based on PIT Tag dataset Age at emigration (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E., Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2008) Age Structure Fish Community - Data Analysis (Roegner, G.C., Diefenderfer, H.L., Borde, A.B., Thom, R.M., Dawley, E.M., Whiting, A.H., Zimmerman, S.A., & Johnson, G.E. 2008) Fish survival using mark-recapture (White, G.C., & Burnham, K.P. 1999) Growth Rate: Individual(s) Juvenile Emigration Timing (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E.,

		Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2008) Multi-State Mark Recapture Model (R. A. Buchanan, J. R. Skalski, S. G. Smith 2006) Tag Release-Recapture Model 5 (Lady, J., Skalski, J.R. 1998) Age and growth of salmonids from scales Electro Fishing (Moberg, J. 2009) Electrofishing - Backpack - Mark (Temple, G.M., & Pearsons, T.N. 2007) Electrofishing - Backpack - Recapture (Temple, G.M. & Pearsons, T.N. 2007) Electrofishing - Fish Processing and Recovery (Temple, G.M., & Pearsons, T.N. 2007) Electrofishing - Site Selection (Temple, G.M., & Pearsons, T.N. 2007) mark-recapture using PIT tags PIT Tag Marking (Columbia Basin Fish and Wildlife Authority PIT Tag Steering Committee 1999) Salmonid processing during stream surveys Tagging salmonids during baseflow electrofishing stream surveys Fish Community - Data Collection (Roegner, G.C., Diefenderfer, H.L., Borde, A.B., Thom, R.M., Dawley, E.M., Whiting, A.H., Zimmerman, S.A., & Johnson, G.E. 2008) Juvenile Salmonid Scale Processing and Age Reading (Ellswoth, K. 2009)
Genetics: Diversity, Fitness or Variation (2007-156-00)	DELV-3	Genetic Diversity (Beasley, C.A., Berejikian, B.A., Carmichael, R.W., Fast, D.E., Galbreath, P.F., Ford, M.J., Hesse, J.A., McDonald, L.L., Murdoch, A.R., Peven, C.M., & Venditti, D.A. 2008) Geomorphic Channel Units (Moore, K.M.S., Jones, K.K., & Dambacher, J.M. 1997) PIT Tagging (Columbia Basin Fish and Wildlife Authority PIT Tag Steering Committee 1999) Juvenile fish monitoring and evaluation methods (Johnson, D.H., Shier, B.M., O'Neal, J.S., Knutzen, J.A., Augerot, X., O'Neil, T.A., & Peasons, T.N. 2007) Spawner Abundance 2 (Bruce A. Crawford, Thaddeus R. Mosey, and David H. Johnson 2007) Mark-recapture population estimates (Seber, G.A.F. 1982) 2008-504-00: Error rate analysis and quality control. (Matala, A. P., W. R. Ardren, D. Hand, D. Olson and H. Schaller 2008) 2008-504-00: Population Genetic Analyses (Matala, A. P. and B. Parker 2010) Backpack electrofishing Detecting Fish Species Assemblages Using Backpack Electrofishing or Snorkeling (Crawford, B.A., & Arnett, J. 2011) Electro Fishing (Moberg, J. 2009) Electrofishing - Backpack - Mark (Temple, G.M., & Pearsons, T.N. 2007) Electrofishing - Determine Electrofisher Settings (Temple, G.M, & Pearsons, T.N. 2007) Electrofishing - Fish Processing and Recovery (Temple, G.M., & Pearsons, T.N. 2007) Fin tissue sampling for genetic analysis (Berntson, E. A., P. Moran, and R. Waples) Fish abundance using electrofishing
Disease Prevalence (2007-156-00)	DELV-5	Geomorphic Channel Units (Moore, K.M.S., Jones, K.K., & Dambacher, J.M. 1997) Juvenile fish monitoring and evaluation methods (Johnson, D.H., Shier, B.M., O'Neal, J.S., Knutzen, J.A., Augerot, X., O'Neil, T.A., & Peasons, T.N. 2007) National Wild Fish Health Survey Laboratory Procedures (Heil, N. 2009) Mark-recapture population estimates (Seber, G.A.F. 1982) Backpack electrofishing Detecting Fish Species Assemblages Using Backpack Electrofishing or Snorkeling (Crawford, B.A., & Arnett, J. 2011) Electro Fishing (Moberg, J. 2009) Electro Fishing-Survey Event (Mober, J. 2009) Electrofishing - Backpack - Mark (Temple, G.M., & Pearsons, T.N. 2007) Electrofishing - Determine Electrofisher Settings (Temple, G.M, & Pearsons, T.N. 2007) Electrofishing - Fish Processing and Recovery (Temple, G.M., & Pearsons, T.N. 2007)

		Electrofishing - Site Selection (Temple, G.M., & Pearsons, T.N. 2007) Fish abundance using electrofishing Length of Fish Species (Nielsen, L.A., & Johnson, D.L. 1983) Length: Juveniles
Habitat measurements and assessment (2007-156-00)	DELV-6, DELV-7, DELV-8, DELV-9	Geomorphic Channel Units (Moore, K.M.S., Jones, K.K., & Dambacher, J.M. 1997) Modeling Sampling Design and Statistical Analysis methods for the integrated biological and physical of streams (Stevens, D.L. 2002) Stream Habitat Survey Analysis Water Quality (temperature and salinity) - Data Analysis (Roegner, G.C., Diefenderfer, H.L., Borde, A.B., Thom, R.M., Dawley, E.M., Whiting, A.H., Zimmerman, S.A., & Johnson, G.E. 2008) Bankfull Width (Heitke, Jeremiah D.; Archer, Eric K.; Leary, Ryan J.; and Roper, Brett B. 2011) BPT Hobo Deployment Canopy Cover Survey CHaMP - Channel Units (Bouwes, N., J. Moberg, N. Weber, B. Bouwes, S. Bennett, C. Beasley, C.E. Jordan, P. Nelle, M. Polino, S. Rentmeester, B. Semmens, C. Volk, M.B. Ward, and J. White. 2011) CHaMP - Fish Cover Elements (Bouwes, N., J. Moberg, N. Weber, B. Bouwes, S. Bennett, C. Beasley, C.E. Jordan, P. Nelle, M. Polino, S. Rentmeester, B. Semmens, C. Volk, M.B. Ward, and J. White. 2011) CHaMP - Large Woody Debris (new) (Bouwes, N., J. Moberg, N. Weber, B. Bouwes, S. Bennett, C. Beasley, C.E. Jordan, P. Nelle, M. Polino, S. Rentmeester, B. Semmens, C. Volk, M.B. Ward, and J. White. 2011) CHaMP - Ocular Channel Unit Substrate Composition (Bouwes, N., J. Moberg, N. Weber, B. Bouwes, S. Bennett, C. Beasley, C.E. Jordan, P. Nelle, M. Polino, S. Rentmeester, B. Semmens, C. Volk, M.B. Ward, and J. White. 2011) Channel Morphology: Pools (Lanigan, S., Eldred, P., Gallo, K., & Moyer, C. 2009) Channel Substrate Survey: Wolman Pebble Counts Determining Macro-Invertebrate Species Assemblages (Crawford, B.A., & Arnett, J. 2011) Pebble Counts (Heitke, Jeremiah D.; Archer, Eric K.; Leary, Ryan J.; and Roper, Brett B. 2011) Pool Tail Fines (Heitke, Jeremiah D.; Archer, Eric K.; Leary, Ryan J.; and Roper, Brett B. 2011) Water Quality Data Collection Water Quality-Dissolved Oxygen (Moberg, J. 2008) Water Quality-pH (Moberg, J. 2008)

Cost Share

Source / Organization	Fiscal Year	Proposed Amount	Type	Description
US Geological Survey (USGS)	2012	$25,000	In-Kind	USGS will provide the technical equipment needed for electrofishing, field PIT-tagging, and PIT-tag interrogation system installation equipment.
Yakama Confederated Tribes	2011	$20,000	In-Kind	Yakama Nation Confederated Tribes will contribute in materials and staff time and labor.
US Fish and Wildlife Service (USFWS)	2011	$5,000	In-Kind	Conduct the pathogen analysis of juvenile fish from the Rock Creek subbasin
Local project sponsors	2012	$63,400	In-Kind	SRFB funding for Rock Creek Assessment and Conceptional Design Project (2012-13) in coordination through the Eastern Klickitat Conservation District and Yakama Nation. (Salmon Recovery Funding Board)

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Key Personnel

Elaine Espirito Harvey	Fish Biologist	YN	60%	Subbasin Planner for Rock Creek, most on the ground knowledge of Rock Creek, currently working on EDT and habitat project in the

				watershed

Experience

2006-Present Fisheries Biologist, Yakama Nation Fisheries Program

2003-2006 Fisheries & Wildlife Technician, Yakama Nation Fisheries Program & Yakama Nation Wildlife Program

Education

2010 M.S. in Resource Management, Central Washington University

2003 B.S. in Fisheries Science, University of Washington

Expertise

My areas of expertise are in the management of fish and fish habitat with my focus on conserving wild fish stocks and protecting and managing fish habitats.

Publications and Reports

2008 Rock Creek Fish and Habitat Assessment Project Annual Report (Project No. 2007-156-00)

Brady Allen	Research Fish Biologist	USGS	30%	Expertise in fish ecology, fish population assessments, PIT-tag technologies, radio telemetry, habitat assessments, and modeling. Role as field crew leader and data management, analysis, and summary.

Experience

2000-Present. Research Fishery Biologist, U.S. Geological Survey, Columbia River Research Laboratory, Cook, WA.

Current responsibilities: Assessment of salmonid productivity in the Rattlesnake Creek watershed. Ecosystem Diagnosis and Treatment modeling of the White Salmon River watershed.

1999-2000. Biologist 2, Johnson Controls World Services Inc. Stationed at Columbia River Research Station, Cook, WA.

1996-1999. Graduate Research Assistant. Department of Fish and Wildlife, Colorado State University. Fort Collins, CO.

1996-1996. Fisheries Technician, Oregon Department of Fish and Wildlife, Research Division, Corvallis OR.

1993-1996. Research Assistant. Department of Zoology, Oregon State University. Corvallis OR.

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Education:

School	Degree and Date Received
Colorado State University, Fort Collins	M.S. Fisheries Science, 1999
University of Oregon, Eugene	B. S. Biology, 1993

Expertise:

My primary areas of expertise are stream fish ecology, population dynamics, PIT-tag technologies, radio telemetry, habitat assessments and habitat modeling.

Publications and Reports

Allen, M. B., P. J. Connolly, and K. Martens. December 2003. Report A: Characterization of flow, temperature, habitat conditions and fish populations in the Rattlesnake Creek watershed. Pages 1-159 in P. J. Connolly, editor. 2003. Assess current and potential salmonid production in Rattlesnake Creek associated with restoration efforts. 2002 Annual Report. Prepared for: Bonneville Power Administration, Portland, Oregon. Project 2001-025-00.

Allen, M. B., P. J. Connolly, and K. Martens. January 2003. Report A: Characterization of flow, temperature, habitat conditions and fish populations in the Rattlesnake Creek watershed. Pages 1-65 in P. J. Connolly, editor. 2003. Assess current and potential salmonid production in Rattlesnake Creek associated with restoration efforts. 2001 Annual Report. Prepared for: Bonneville Power Administration, Portland, Oregon. Project 2001-025-00.

Allen M.B. and E.P. Bergersen. 2002. Factors influencing the distribution of Myxobolus cerebralis the causative agent of whirling disease, in the Cache la Poudre River, Colorado. Diseases of Aquatic Organisms. 49:51-60.

Allen, M.B., B.J. Hausmann, J.L. Schei, T.L. Liedtke, L.S. Brown, A.J. Daniel and J. Beeman. 2002. An evaluation of tailrace egress of chinook salmon that pass via the sluiceway under each spill scenario tested at The Dalles Dam, 2001. U.S. Army Corps of Engineers Annual Report.

Allen, M.B., T.L. Liedtke, A.J. Daniel, J.P. Begala, M.S. Salway and J Beeman. 2001. Monitoring Tailrace Egress in the Stilling Basin, the Ice-Trash Sluiceway, and the Powerhouse of The Dalles Dam, 2000. U.S. Army Corps of Engineers Annual Report.

Allen, M.B. 1999. Factors influencing the distribution of Myxobolus cerebralis the causative agent of whirling disease, in the Cache la Poudre River, Colorado. Masters Thesis, Colorado State University, Fort Collins.

Pat Connolly	Research Fish Biologist	USGS	10%	Supervisor, research biologist with extensive monitoring experience

Experience

1997-Present Research Fishery Biologist, U.S. Geological Survey, Biological Resources Division, Columbia River Research Laboratory, Cook, WA.

1994-1997 Consultant to Wind River Restoration Team, WA.

1990-1996 Research Assistant, Oregon State University, Corvallis.

1988-1991 Fish Biologist--Subbasin Planner, Oregon Dept. Fish & Wildlife, Corvallis.

1987-1988 Fish Biologist--Research, Oregon Dept. Fish & Wildlife, Columbia River Research, Clackamas, OR.

1985-1987 Fish Biologist, Beak Consultants Inc., Portland, OR.

1984-1985 Fishery Biologist, U.S. Fish and Wildlife Service, National Fisheries Research Center, Columbia River Field Station, Cook, WA.

1983 Fish Habitat Surveyor, Idaho Transportation Dept., Coeur d'Alene, ID.

Education:

School	Degree and Date Received
Oregon State University, Corvallis	Ph.D. Fisheries Science, 1996
University of Idaho, Moscow	M.S. Zoology, 1983

Centre College of Kentucky, Danville B.S. Biology, 1977

Expertise: The primary areas of my expertise include stream fish ecology and population dynamics. I have contributed to numerous studies involving anadromous and resident salmonids as well as non-salmonids of the Pacific Northwest.

Publications and Reports (five most relevant)

Connolly, P.J. 1999. Juvenile steelhead and rearing conditions. Pages E1-E20 in P.J. Connolly, editor. Wind River watershed project. Volume I, Project number 9801900, Prepared for: Bonneville Power Administration, Portland, Oregon.

Connolly, P.J., and J.D. Hall. 1999. Biomass of coastal cutthroat trout in unlogged and previously clear-cut basins in the central Coast Range of Oregon. Transactions of the American Fisheries Society. 128:890-899.

Connolly, P.J. 1997. Status of juvenile steelhead rearing in Trout and Panther creeks of the Wind River Basin. Prepared for: Washington Trout, Duvall, WA.

Connolly, P.J. 1997. Influence of stream characteristics and age-class interactions on populations of coastal cutthroat trout. Pages 173-174 *in* J.D. Hall, P.A. Bisson, and R.E. Gresswell, editors. Sea-run cutthroat trout: biology, management, and future conservation. Oregon Chapter, American Fisheries Society, Corvallis.

Connolly, P.J. 1996. Resident cutthroat trout in the central Coast Range of Oregon: logging effects, habitat associations, and sampling protocols. Doctoral thesis, Oregon State University, Corvallis.

Notes

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Data current as of: 2/2/2012 10:35 AM