WASHINGTON STATE Recreation and Conservation Office

Final Report

Project #12-1038, Snake River - Asotin IMW 2012

Submitted by Steve Martin on 05/29/2013 Accepted by Keith Dublanica on 05/29/2013

CONTACTS

Primary Sponsor: Walla Walla Community College

Lead Entity: Snake River Salmon Rec Bd LE

Managing Agency: Rec. and Conserv. Office

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DESCRIPTION OF THE COMPLETED PROJECT

Project Start Date: 10/01/2011 **FundingEnd Date:** 09/30/2012 **RCO Closure Date:**

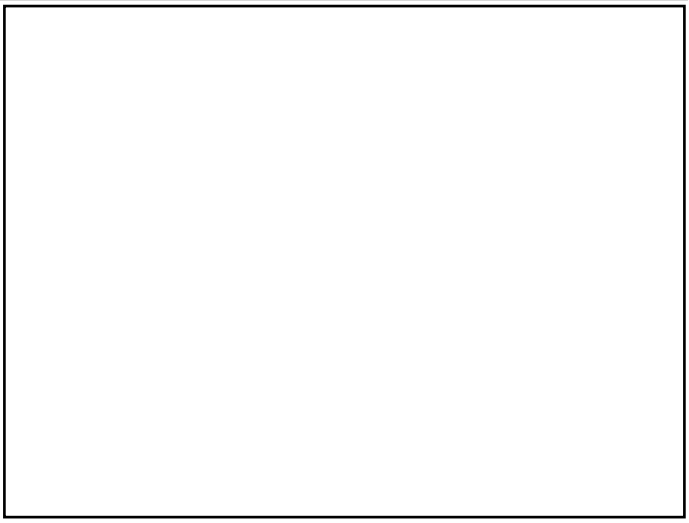
This project was a continuation of the Asotin Creek multi-year IMW project. The project was, and remains, an Intensively Monitoring Watershed monitoring project. The project focused on three tributaries to the Asotin Creek in Southwest Washington. The tributaries are: Charley Creek, North Fork Asotin Creek, and South Fork Asotin Creek. The purpose of this on-going project is to link steelhead responses to specific mechanisms related to habitat restoration. The fundamental approach is to treat restoration as an experiment and concentrate a large restoration effort in order to increase the likelihood of detecting a population increase. This type of project will increase our understanding of what restoration activities are most effective, demonstrate how changes in habitat influence survivial of various life stages of steelhead, determine what mangitude of restoration is required to cause a significant population response, and ultimately provide information to better evaluate the efficacy of habitat restoration. The restoration effort is focused on summer run steelhead habitat. The funds for this grant award provided a continuation of the IMW effort in the Asotin. This phase included:

1) Continue baseline monitoring of 12 permanent sites for fish abundance and habitat condition,
2) Implemention of the restoration treatment plan based that was approved by the Regional Technical Team (the vast majority of the treatments were funded by a seperate RCO grant)
3) Monitoring a wide variety of response variables

SITE LOCATION

General Area of Project: Asotin Creek is a tributary of the Snake River, flowing through the town of Asotin in SE Washington. The IMW is located in the upper Asotin watershed, including Charlie Creek, North Fork Asotin

Waterbodies: Asotin Ck



Cong District:	05
Cong District 2012:	05
County:	Asotin
Leg District:	09
Leg District 2012:	09
Salmon Recov Reg 05:	Snake River
WAU:	Agricultural Lands
WRIA:	Middle Snake

Sponsor Clarifications:

Sponsor verified the above information is correct and complete.

PROJECT NARRATIVE

Project History

· Asotin Creek in southeast Washington was chosen as a site to develop an Intensively Monitored Watershed Project (IMW) in 2008. The purpose of the IMW program is to implement stream restoration actions in an experimental framework to determine the effectiveness of restoration at increasing steelhead production and to identify casual mechanisms of the fish response to help guide restoration actions in other watersheds.

· Asotin Creek is designated a wild steelhead refuge and steelhead are the focus of the IMW.

The IMW is a multiagency cooperative project coordinated by the Snake River Salmon recovery Board (SRSRB) and monitoring activities are closely coordinated with the ongoing Washington Department of Fish and Wildlife (WDFW) Asotin Steelhead Assessment project.

· Restoration began in the summer of 2012 and be implemented in a hierarchical-staircase design in three tributaries to Asotin Creek over three consecutive years. Monitoring of the restoration effectiveness will continue until 2018.

· The IMW is being implemented in an adaptive management approach and as such we have revised the overall design and monitoring efforts in response to new information and ongoing analysis. There have also been several logistical and political issues that have required us to adapt the original IMW design. The attached 4-year PreTreatment report summarizes the design revisions and replaces all previous IMW plans.

· Asotin Creek is a small tributary that enters the Snake River directly at rKM 522.224 at the town of Asotin Washington. The watershed straddles the Columbia Plateau and Blue Mountains level III ecoregions. The terrain is steep with deep narrow canyons in a basalt dominated lithology, surrounded by semi-arid sagebrush steppe at lower elevations and open conifer dominated forests at higher elevations. An extensive watershed assessment in the early 1990's identified stream temperature, riparian condition, fine sediment, lack of large woody debris and pool habitat, and fecal coliforms as limiting factors. Extensive upland and management improvements and riparian fencing in the late 1990's and early 2000's are thought to have decreased sediments entering the streams. The IMW is being implemented in the lower 12 km of three tributaries to the mainstem Asotin Creek: Charley Creek, North Fork Asotin Creek, South Fork Asotin Creek (hereafter the study streams collectively and Charley Creek, North Fork, and South Fork individually).

· The study streams consist primarily of highly homogenized and degraded habitats, which are thought to be limiting steelhead production. One of the primary limiting factors in the study streams is a lack of pool habitat and fish cover, which is thought to be directly correlated to the relatively low abundance, density and mean size of LWD compared to reference conditions and assumed historic recruitment levels. Therefore, LWD restoration treatments have been proposed for the Asotin IMW.

· We performed a power analysis of several experimental designs and monitoring schemes to assess our original IMW design. The analysis showed that under anticipated levels of variance in juvenile abundance and pool frequency all designs would be able to detect a 25% change in abundance after restoration. However, under "worst-case" levels of variance (i.e., upper 95% confidence levels) an alternative design in which restoration was implemented in all three study streams was more likely to detect changes compared to our original design of treating only one stream. Based on the power analysis results we revised our experimental design.

· The Asotin Creek IMW has a hierarchical-staircase experimental design where the lower 12 km of each study stream is divided into three 4 km long sections and one section of each creek will be treated (i.e., restoration applied) with the remaining sections acting as controls. Treatments will be staggered over three years with one section treated each year starting in 2012. A total of 12 km will be treated. The staggered implementation of the restoration (i.e., staircase design) provides explicit opportunities within the adaptive management plan to refine and adapt implementation and monitoring specifics as may be necessary.

Restoration Design

· The addition of LWD to streams to improve habitat complexity and quality is not a new restoration intervention. However, we argue that most projects place undue focus on the size and stability of LWD with frequent attempts to anchor LWD in place. From a system-wide perspective, we think that the low density of LWD is a much bigger problem than the size, and systems with healthy rates of LWD recruitment see much more dynamic behavior in their LWD (i.e., it moves occasionally). We seek to produce a population-level response in steelhead in the Asotin Creek Watershed by treating over 12 km of stream in three study streams with 500 - 600 LWD structures. We expect this to fundamentally alter the complexity of habitat at a system scale inducing an increase in steelhead production at the subbasin scale.

· To achieve the sort of LWD densities we are hoping to with traditional LWD treatment methods would be extremely expensive, highly disruptive to the existing riparian vegetation, and logistically infeasible to implement over the broad range of steelhead habitat in the Columbia Basin. Instead we, propose to test the effectiveness of a simple, unobtrusive, method of installing Dynamic Woody Structures (DWS), which are constructed of wood posts, driven into the streambed, and augmented with LWD cut to lengths that can be moved by hand.

· Dynamic Woody Structures are installed with a hand-carried hydraulic post-pounder by a crew of 2-4 people. Typical installation time is on the order of 1-2 hours per structure and material costs are < $200. Thus, if the treatment method proves effective, this is potentially an easy and cost-effective method to implement in other watersheds.

· The DWS are designed to produce an immediate hydraulic response by constricting the flow width. Like natural LWD accumulations, this alteration of the flow field creates more hydraulic heterogeneity, providing shear zones for energy conservation for fish next to swift areas with high rates of invertebrate drift. Moreover, the convergent flow produced by the constriction is likely to scour and/or maintain pools at high flows, and divergent flow downstream of the DWS where the stream width expands, may promote active bars that provide good spawning habitat.

Monitoring Design

· To maximize our ability to understand the effectiveness of the restoration and the causal mechanisms of changes in steelhead production and habitat change we are building a multi- scalar Biophysical Framework using geo-referenced data in GIS. To build this framework we have acquired aerial and ground based LiDAR, aerial photography, and GIS layers on soils, geology, stream networks, topography, and are deriving landscape units, slope classes, and other products at multiple scales within the Asotin Creek watershed.

· To compliment these watershed scale biophysical data sources we are using existing and newly installed discharge and temperature monitoring stations throughout the Asotin and its tributaries, “fish-in, fish-out” monitoring at a WDFW adult weir and smolt trap, and historic redd counts and juvenile abundance estimates going back to the 1980s.
· We have developed a set of permanent fish (12) and habitat (36) monitoring sites across the three study streams to assess abundance, growth, survival, and production of juvenile steelhead. We use two pass mark-recapture and PIT tagging to assess fish and the Columbia Habitat Monitoring Protocol (CHaMP) to monitor stream habitat at the permanent sites. We also use mobile PIT tag surveys and rapid habitat assessments over the entire length of the study streams to compliment the site scale monitoring.
· To allow detection of adults and juveniles leaving and entering the watershed and the study streams and to estimate movement between study streams, we have established PIT tag interrogation sites in Asotin Creek at the mouth, upstream of George Creek on the Asotin Creek mainstem, and near the mouths of Charley Creek, North Fork, and South Fork.
· From these monitoring efforts we will calculate a variety of fish and habitat metrics to determine the biological and physical responses to restoration at the section of stream scale. Fish metrics we will calculate include smolts/spawner, juveniles/spawner, juvenile abundance (fish/m2), growth (g/day), survival rates (season), and movement rates (m/day, season, year). Habitat metrics will include pool frequency, LWD count and volume, habitat unit density (i.e., number of units/100 m2), sediment budgets (deposition and erosion rates and volumes). Fish and habitat characteristics will be integrated into models of carrying capacity using temperature, flow, and topographic data to determine changes in the total carrying capacity of treatment and control areas.

Pre-Restoration Lessons Learned

· Estimates of smolt production and adult escapement are available from 2004-2005 respectively and watershed scale productivity estimates will be available for the pre and post period of the IMW (i.e., 2008-2012 and 2012-2018).
· Annually an average ~ 36,000 smolts have out-migrated and 654 adult steelhead have returned to Asotin Creek since 2004 and 2005 respectively.
· The majority of steelhead smolts are age 1 and 2, and the majority of returning adults spend one to two years in the ocean.
· WDFW have PIT tagged 15,324 juvenile steelhead at the smolt trap and an additional 12,512 juveniles have been PIT tagged at the fish sites within the study streams.
· Juvenile steelhead abundance, growth, movement, and survival have been estimated in the study streams using mark-recapture, interrogation site detections, and mobile PIT tag surveys. There is relatively high variability between population metrics across sites, streams, and years; however, control and treatment sites have similar trends across years which will improve detection of population changes due to restoration.
· On average South Fork had higher densities of juvenile steelhead, North Fork and South Fork had higher growth, all streams had minimal movement of juveniles within and between sites, and true survival was highest in Charley Creek and South Fork. Juvenile steelhead from the study streams (i.e., tributaries) are using the mainstem of Asotin Creek for up to a year to continue rearing before outmigrating.
· Total juvenile production averaged 12.1 g/ha/day (SD = 24.7, Min = -11.1, Max = 145.5) across all sites and also showed high variability between time periods, streams, and sites. Preliminary analysis found no strong correlations between production and common habitat metrics (e.g., frequency of pools and wood) though there was weak correlation with production and average daily sun hours at a site.
· Results from a trial restoration assessment are encouraging and suggest that the dynamic wood structures (DWS) we are proposing are a cost-effective and efficient way to generate habitat complexity using large wood. Geomorphic change detection indicates that scour pools, eddy bars, and undercuts are being generated by the DWS.
· Biophysical assessment of the study creeks is providing detailed, flow, temperature, and landscape level control information that will inform restoration planning and help interpret the effectiveness of the restoration structures and the response of fish populations and overall productivity.
· Future work will focus on generating juvenile productivity estimates for the study streams, further assessing the distribution of spawning and juvenile movement, and developing multivariate models to explain variation in steelhead juvenile and smolt production.

Contractors

EcoLogical Research, Inc developed the experimental design, collects the field data and constructed projects in 2012. Stephen Bennett is the lead manager of the Asotin IMW Contract for EcoLogical Researc, Inc.

Outcomes

This project is the culmination of 4-years worth of design development and data collection. The outcome is a final experimenal design includign the monitoring design and restoration designs for the IMW.

AMENDMENTS

#	Type	Applied Date	Description
1	Cost Change	07/02/2012	To add $23,000 to the Asotin IMW that were originally identified for landowner outreach efforts associated with the Lower Columbia IMW. Since the grant was awarded to Washington by PSMFC, the Lower Columbia Regional Organization has had two staff leave. This loss in capacity will not allow the Lower Columbia to use the funds and implement the targeted outreach. Those funds will be used for the Asotin IMW as it is currently underfunded and in a full implementation phase.

OVERALL PROJECT COSTS

Funding Formula:	Requested		Original		Final	
Pacific States Projects:	$165,214.00	(100%)	$165,214.00	(100%)	$187,888.25	(100%)
Total:	$165,214.00	(100%)	$165,214.00	(100%)	$187,888.25	(100%)

Paid To Date:	$187,888.25	**Last Released Billing:**	06/03/2013
Remaining RCO Funds:	$0.00	**Pending Billing:**	No
Advance Balance:	$0.00	**Match Bank:** $0.00	**Number of Billings:** 5
Admin Limit:	$0.00	**Admin Spent:**	$0.00
A&E Limit:	$0.00	**A&E Spent:**	$0.00

Billed Cost Summary:	Original Agreement	Expended	Non-Reimbursable	Total Billed
Non-Capital				
Non-Capital Costs		$187,888.25		$187,888.25
Equipment				
Non-Capital Total	$188,214.00	$187,888.25		$187,888.25
Total	$188,214.00	$187,888.25		$187,888.25

Project Cost Metrics:	Original Agreement	Final
PCSRF Federal Funds:		
State Funds:	$187,888.25	$187,888.25
Pending Billing - RCO Share Approved:		
Retainage - RCO amount retained:		$0.00
Amount of other monetary funding:	$0.00	$0.00
Project identifier for the other monetary funding:	None	none
Source of other monetary funding:	None	none
Value of Donated Unpaid Labor (Volunteers):	$0.00	$0.00
Source of Donated Un-paid labor contributions:	N/A	n/a
Number of hours volunteers contributed to the project:		0
Describe how the value of the volunteers was determined:		n/a
Value of Donated Paid Labor:	$0.00	$0.00
Source of Donated Paid Contributions:		n/a
Value of Other In-Kind Contributions:	$0.00	$0.00
Source of Other In-Kind Contributions:		n/a
Description of other In-Kind contributions:	N/A	n/a

PROJECT METRICS

	Original Agreement	Final
Completion Date		
Projected date of completion:	09/30/2012	12/31/2012
Project Goals		
Goals, purpose, and expected benefits:	The purpose of the project is to link salmon and steelhead responses to specific mechanisms related to habitat restoration. The fundamental approach is to treat restoration as an experiment and concentrate a large restoration effort in order to increase the likelihood of detecting a population increase. This type of project will increase our understanding of what restoration activities are most effective, demonstrate how changes in habitat influence survival of various life stages of salmon and steelhead, determine what magnitude of restoration is required to cause a significant population response, and ultimately provide information to better evaluate the efficacy of habitat restoration.	The purpose of the project was to link salmon and steelhead responses to specific mechanisms related to habitat restoration. The fundamental approach remains to treat restoration as an experiment and concentrate a large restoration effort in order to increase the likelihood of detecting a population increase. This type of project will increase our understanding of what restoration activities are most effective, demonstrate how changes in habitat influence survival of various life stages of salmon and steelhead, determine what magnitude of restoration is required to cause a significant population response, and ultimately provide information to better evaluate the efficacy of habitat restoration.

WORKSITE #1: Asotin Creek 2012

Worksite Description: Asotin Creek is a tributary of the Snake River, flowing through the town of Asotin in SE Washington. The IMW is located in the upper Asotin watershed, including Charlie Creek, North Fork Asotin Creek, and South Fork Asotin Creek.

Driving Directions: From Lewiston, drive south on SR 129 to Asotin Creek

Coordinates for Worksite Directions - Latitude: 0.00 **Longitude:** 0.00

Sponsor Clarifications:

Sponsor verified the above information is correct and complete.

WORKSITE #1 COSTS

Worksite Billed Cost:	Estimated	Expended	Non-Reimbursable	Total Billed
Equipment				
Non-Capital Costs	$165,214.00	$187,888.25		$187,888.25
Worksite Total	$165,214.00	$187,888.25		$187,888.25

Worksite Costs by Category:	Original Agreement	Final
Planning/Coordination funding:	$53,269.00	$62,943.00
Habitat Assessment Funding:	$111,945.00	$124,945.00

WORKSITE #1 METRICS

	Original Agreement	Final
Targeted salmonid ESU/DPS:	Steelhead-Snake River Basin DPS	Steelhead-Snake River Basin DPS
Targeted species (non-ESU species):	None	None
Area Encompassed (acres):	58.0	58.0
Miles of Stream Affected:		20.00
Restoration Planning And Coordination Project		
Conducting habitat restoration scoping and feasibility studies		
Description of the Plan:	This project is a continuation of the Asotin Creek multi-year IMW project. This phase includes: 1) Refine experimental plan 2) Continue baseline monitoring 3) Develop restoration treatment plan	his project is a continuation of the Asotin Creek multi-year IMW project. This phase includes: 1) Refine experimental plan 2) Continue baseline monitoring 3) Develop restoration treatment plan
Name of the Plan:	Asotin Creek IMW	Asotin Creek IMW
Total cost for Conducting habitat restoration scoping and feasibility studies:		
Salmonid Habitat Assessment / Inventory		
Instream survey		
Total cost for Stream survey:		
Type of stream assessment:	Instream Habitat Condition Assessment, Salmonid Presence/Absence Survey	Instream Habitat Condition Assessment
Stream Miles Assessed:	20.00	20.00
Stream miles assessed that contained salmonids:	20.00	20.00
Stream Miles Assessed That Needed Restoration:	20.00	20.00
Stream Miles Assessed For Regulatory Actions:	0.00	0.00
Number of fish passage impediments identified:	0	0

SPONSOR CERTIFICATION

[X] I certify that this project has been completed in accordance with the project agreement.

[X] I certify that, to the best of my knowledge, the information in the Final Report is true and correct.

Submitted by Steve Martin on 05/29/2013