Background and Status of Asotin Creek IMW and

Proposed Statement of Work for SRFB 17-1304 Funds

By

Stephen Bennett

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# Introduction

The stream and riparian conditions in Asotin Creek improved after the implementation of the Model Watershed Plan which was developed in 1995. However, Asotin Creek still lacks the geomorphic diversity and is disconnected from much of its floodplain. This is a common problem across the Pacific Northwest (PNW), and a common restoration action to improve stream and riparian conditions is to add large woody debris (LWD). The wood forces hydraulic diversity which can lead to geomorphic diversity, stream bed aggradation, and better floodplain connection. The restoration actions can also lead to flood attenuation, increased groundwater storage, increased summer base flows, and improved water quality. Hundreds of millions of dollars are being spent annual to add LWD to streams because it is thought that the habitat changes LWD can force will increase the production ESA listed salmon and steelhead and improve overall ecological function and productivity of riverscapes.

## Problem Statement

Unfortunately, there has been a lack of evidence that stream restoration using LWD or other methods can increase the production of salmon and steelhead at the watershed scale. What this means is that we have few studies that can demonstrate that a population of fish at the watershed-scale increases after restoration. Therefore, federal and state management agencies developed a group of Intensively Monitored Watersheds throughout the Pacific Northwest to test the effectiveness of restoration actions at increasing salmon and steelhead production at the watershed-scale.

# Asotin Creek Intensively Monitored Watershed

Asotin Creek was chosen as a site for an Intensively Monitored Watershed (IMW) in 2007 because it was an ideal setting to conduct an experiment to test restoration effectiveness. There is a population of wild summer steelhead with limited hatchery influence, local support, and identifiable limiting factors (i.e., lack of LWD). When developing the Asotin Creek IMW we saw an opportunity to maximize the investment in monitoring by developing a method for adding LWD to streams that could be implemented by a broader group of restoration practitioners and over larger areas to address the scope of stream degradation. We call this ***low-tech process-based restoration of riverscapes* (**[lowtechpbr.restoration.usu.edu](http://lowtechpbr.restoration.usu.edu/)) – an approach to adding wood to wadable streams that provides structure for the stream to kick of processes of erosion, deposition, and overbank flow to increase complexity and improve riparian and floodplain conditions. This approach is different than more traditional engineering approaches because it focuses on “letting the system do the work” rather than trying to impose form on the stream.

## IMW Goals

The Asotin Creek IMW has the potential to not only inform restoration actions in Asotin Creek and southeast Washington, but also streams across the PNW and beyond. The goals of the Asotin Creek IMW are to:

* test the effectiveness of large wood additions at increasing juvenile steelhead production productivity in wadable streams
* provide recommendations for wadable and headwater stream restoration using wood treatments throughout the Columbia River Basin,
* provide assessment of low-tech process-based restoration method to improve cost-effectiveness of wood restoration in small streams, and
* provide guidance for buffering climate change impacts on small streams, especially in snow dominated flow regimes.

## IMW Status

So how far have we got at attaining these goals? Well we have implemented a robust experimental design, conducted several years of pre-treatment monitoring, implemented almost 14 km (9 miles) of restoration building over 650 LWD structures we call post-assisted log structures, monitored 8 years of post-treatment response, conducted some restoration maintenance and enhancement, and reported our results in publications and presentations (Figure 1). Few other IMWs have been able to accomplish as much because it is extremely hard to maintain a long-term monitoring program and coordinate restoration actions to fit within an experimental design. We credit this to the great local support, previous work in Asotin Creek, the ideal setting and conditions, and a good amount of luck. We are currently in the adaptive management phase of the project where we propose to add more wood to either maintain a high wood density or enhance the geomorphic responses we are already seeing.

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*Figure 1. Timeline of the Asotin Creek IMW including conclusion of the experiment in 2025.*

### Summary of Results

So far we have seen positive changes in habitat and fish populations in treatment areas compared to control areas. We have been able to demonstrate an increase in:

* wood density by 250-3,000%
* pools and bars by 75-300%
* floodplain connection by 5-10%
* **fish abundance by 12-42% (translates to 128-745 fish/km or 206-1,200/mile)**

## Preliminary Conclusions

Asotin Creek is demonstrating that additions of LWD can improve stream habitat and floodplain conditions and that these changes can lead to increases abundance of juvenile steelhead. Importantly, we are demonstrating that the increases in fish production are coming from mostly increases in instream habitat complexity. In other words, the increases in fish abundance has come from improving the conditions in the current channel, and less from creating more side-channels or connecting the floodplain. This has important implications for restoration actions in places where connecting the entire floodplain is not feasible due to risks to infrastructure.

# Proposed Final Steps (SOW)

We want to make the conclusions of the Asotin Creek IMW as broadly applicable as possible to maximize the benefits and learning from the large investment in the project. To do this we want to continue to conduct our regular annual monitoring to assess the effectiveness of restoration until 2024 or 20025. We also want to maintain and/or enhance the restoration treatment to see if further floodplain connection leads to greater increases in fish abundance and ultimately production. An important part of low-tech process-based restoration is to add wood in phases using an adaptive management plan. We propose to continue implementing our adaptive management plan as described in our Restoration Plan (Wheaton et al. 2012).

Another critical task is to increase our analyses of existing data and to fully investigate other responses to the restoration including other habitat changes (e.g., changes in geomorphic conditions, changes in habitat capacity) and changes in juvenile steelhead survival and production (i.e., seasonal survival, smolt production). These analyses are important to understand what the mechanisms are of the changes we are documenting so that we can help recommend future restoration actions that maximize restoration effectiveness. We are also continuing to refine the low-tech process-based approach to adding wood including how many phases are required, and logistical efficiencies to promote sustainable wood recruitment and healthy streams.

## Scope of Work - 2021

To assist the Asotin Creek IMW in completing it goals we are requesting to use the remaining funds in the Salmon Recovery Funding Board Contract with ACCD 17-1304 to complete the following tasks:

* enumerate the juvenile steelhead emigrants (i.e., smolts) leaving the Asotin Creek IMW tributaries (Charley, North Fork and South Fork Creeks) by analyzing PIT tag array efficiency, tagged to un-tagged ratio in the population, and expanding the number of marked fish leaving by the tagged/un-tagged ratio
* add between 40-60 new structures or maintain existing structures in North Fork (some structures may be added or maintained in Charley Creek and South Fork Creek if funds are available). Structures will include post-assisted log structures (PALS), beaver dam analogs (BDAs), and/or whole trees (Wheaton et al. 2019).

## Budget

The budget request to complete the above tasks is $58,641.02. Below is a breakdown of the costs.



## Deliverables

The CONTRACTOR shall produce the following deliverables by the dates indicated below. All written reports required under this contract must be delivered to the Asotin County Conservation District. The minimum deliverables to be submitted as part of this contract are as follows (see Exhibit A for more detail on specific deliverables :

|  |  |
| --- | --- |
| **Deliverables/Tasks** | **Due Date** |
| Analysis of juvenile steelhead and smolt production | 12/31/2021 |
| Progress Report | 06/30/2021 |
| Installation and/or maintenance of 40-60 PALS | 12/31/2021 |
| Annual Report | 12/31/2021 |

## Period of Performance

The period of performance under this contract will be from January 1, 2021, through December 31, 2021.

# Literature Cited

Wheaton J, Bennett S, Bouwes B, Camp R. 2012. Asotin Creek Intensively Monitored Watershed: Restoration plan for Charley Creek, North Fork Asotin, and South Fork Asotin Creeks. DRAFT: April 7, 2012. Prepared for the State of Washington Recreation and Conservation Office, Olympia, WA. Prepared by Eco Logical Research Ltd. DOI: 10.13140/2.1.4900.8961

Wheaton JM, Bennett SN, Bouwes N, Maestas JD, Shahverdian SM. 2019. Editors. Low-tech process-based restoration of riverscapes: design manual. Utah State University Restoration Consortium. Logan, UT. Available at: <http://lowtechpbr.restoration.usu.edu/manual:>