Asotin Creek Intensively Monitored Watershed:
Summary of Monitoring January 1, 2017 – June 30th, 2017
Progress Report: Contract 15-1443C and 16-2101
Stephen Bennett, Eco Logical Research Inc., Providence, Utah

Introduction

The Asotin Creek Intensively Monitored Watershed (IMW) is located in southeast Washington and began in 2008. The Asotin Creek IMW is determining the effectiveness of large woody debris treatments at increasing the productivity and capacity of Snake River Evolutionary Significant Unit (ESU) naturally reproducing steelhead. Asotin Creek is a tributary of the Snake River within the Columbia Plateau and Blue Mountains level III ecoregions. The area is dominated by deep narrow canyons cut into underlying basalt lithology and surrounded by semi-arid sagebrush steppe and grasslands at lower elevations and open conifer dominated forests at higher elevations (Figure 1). Monitoring and restoration is taking place in the lower 12 km of three study streams (Charley, North Fork, and South Fork Creeks) – total study area length 36 km (Figure 2). Pre-treatment monitoring was conducted from 2008 to 2012. Post-treatment monitoring is ongoing and expected to run until at least 2022. Restoration treatments began in 2012 and were finalized in September 2016. One 4 km long treatment section was restored in each study stream from 2012-2014 and an extra 2 km treatment section was restored in 2016. Large wood was added mostly by hand using a method called high density large woody debris ($_{HD}$LWD) whereby many small wood structures are built using woody debris held in place by wooden posts driven into the stream bottom. These wood structures are called post-assisted log structures (PALS). We have built over 650 PALS as part of the IMW over 14 km (39%) of the study area. Ongoing monitoring and analyses is continuing to determine the effectiveness of the restoration. The following is a progress report for the period January 1, 2017 to June 30, 2017.

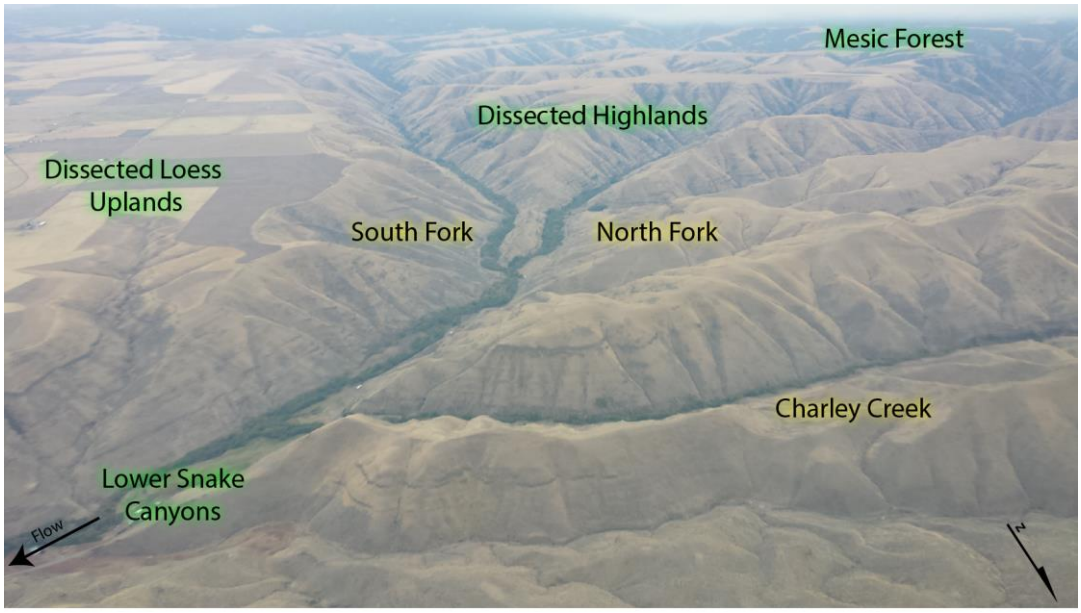

Figure 1. Aerial photo of the IMW study area showing Charley, North Fork and South Fork Asotin Creek.

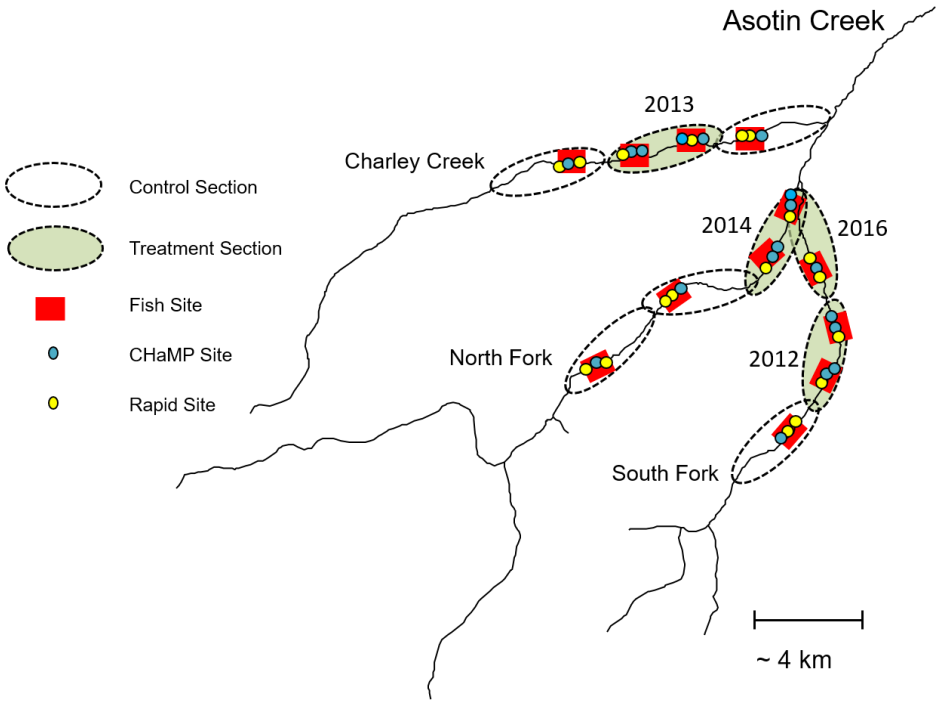

Figure 2. Location of Asotin Creek Intensively Monitored Watershed study creeks, treatment and control sections, restoration locations, and fish and habitat monitoring sites.

- **Monitoring**
  - We conducted mobile PIT tag surveys at all 12 fish sites in the winter (January) and spring (April) to allow the calculation on seasonal survival at each fish site.
  - We maintained and downloaded two IMW water height gages and 25 temperature probes and loaded these data into an IMW databases for use in analysis of habitat use and movement of both adult and juvenile steelhead.
  - PIT tag interrogation sites at the town of Asotin, Cloverland Bridge, the confluence of North Fork and South Fork Asotin Creeks, and Charley Creek were maintained with the assistance of WDFW under a separate contract with RCO but supported by IMW funds.
  - We uploaded all PIT tag detections to PIT Tag Information System (PTAGIS).
  - We began our annual effectiveness monitoring of large woody debris (LWD) structures using customized IPad applications; assessed all South Fork Asotin Creek PALS built in 2012
  - All scale samples from juvenile steelhead captured in 2016 were aged by WDFW and data entered into ELR fish database; custom R code was run to age all juvenile steelhead based on known ages and length relationship from scales
  - Visited restoration sites repeatedly in Feb-June 2017 to document large spring flows and assess restoration structures (Figure 3-5).

Figure 3. North Fork Asotin Creek, mid-channel PALS during high flows: spring 2017

Figure 4. South Fork Asotin Creek, bank-deflector PALS during high flows: spring 2017.

Figure 5. South Fork Asotin Creek aerial view of restoration area: spring 2017.

- **Coordination, Planning, and Analysis**
    - We coordinated with WDFW and Snake River Salmon Recovery Board (SRSRB) on all aspects of the IMW
    - Presented Asotin IMW status at the Wenatchee Salmon Recovery Conference April 25-27.
    - We maintained and managed databases for stream discharge, water temperature, fish capture and detection, and habitat surveys throughout the reporting period.
    - Applied for and received fish capture and restoration maintenance permits
    - Ran the Net Rate of Energy Intake model (NREI) using updated hydraulic models that included the restoration structures on pre, 1-year post, and current (2016) year's data.
    - Worked to further develop the Staircase statistical model to analyze the IMW data
    - Began to populate life cycle modeling based on ISEMP model (McHugh et al. 2017) to assess Asotin effectiveness and develop restoration scenarios to expand results to other watersheds
    - Summarized Asotin monitoring, restoration, funding, and reports/publications in Timeline reporting
    - Assisted in the creation of the GIS Story Map for Asotin IMW
    - Developed and coordinated training, equipment purchases, and schedules for summer and fall fish and habitat surveys

- **Current Issues**
    - Large spring flows caused damage to the IMW's PIT tag interrogation sites; the damage has not been fully assessed due to high water conditions but is appears that several antennas are broken
    - Funding has been applied for to replace PIT tag interrogation sites with new equipment

- **Recent findings**

We have seen a 28.8% increase in juvenile steelhead abundance in treatment compared to controls sections across all streams (Figure 6). Using the net rate of energy approach (NREI) we have documented a 50% increase in predicted carrying capacity in treatment sections compared to control sections four years after restoration (Figure 7). We have begun to determine the production of each brood year relative to the number of spawning females in each brood year using our PIT tag data, redd surveys, and juvenile abundance data (Figure 8). However, measuring production will take several more years due to age life history diversity of steelhead (0-4 years in freshwater and 1-2 years in ocean).

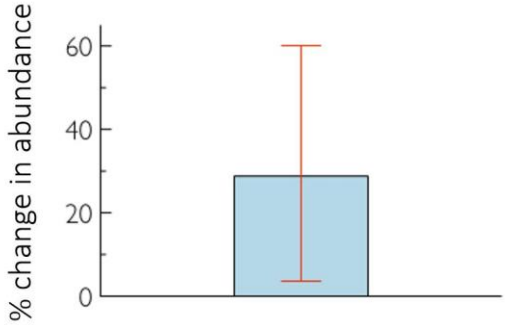

Figure 6. Effect of restoration on juvenile steelhead abundance at all treatment sites relative to control sites: 2008-2016. Error bars = 95% confidence intervals.

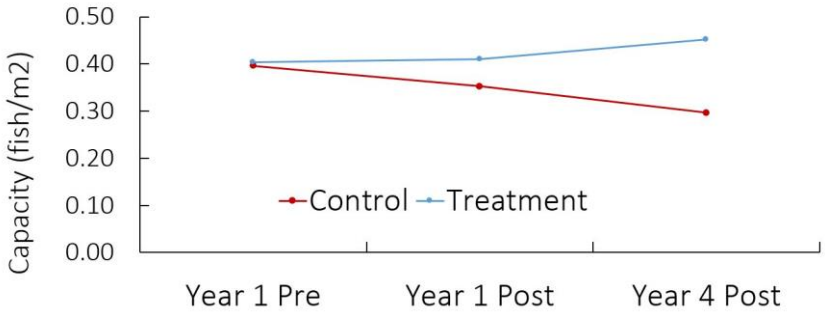

Figure 7. Mean modeled carrying capacity (fish/m^2) for control (n=2) and treatment (n=4) reaches in South Fork: 2012 (Pre-restoration), 2013 (1 Year Post-restoration), and 2016 (4 Years Post-restoration). See Weber et al. (Weber and Bouwes 2013, Weber et al. 2014, Weber et al. 2017) and Wall et al. (Wall et al. 2016, Wall et al. 2017) for details.

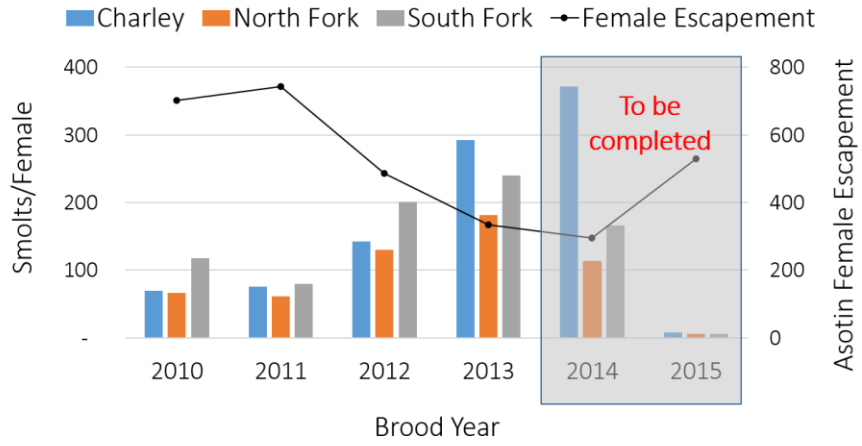

Figure 8. Asotin Creek female steelhead escapement (black line) and smolts/female (colored bars) by stream and brood year. Grey section is not complete because smolts from 2014 and 2015 brood years have not been fully assessed yet.

- **Upcoming Work (July 1 – December 31, 2017)**
    - Conduct the Columbia Habitat Monitoring Protocol (CHaMP) at 18 sites this summer. These sites are within the fish sites mentioned above to allow us to determine the effect of various habitat variables on fish abundance, growth, movement, survival, and production. All the habitat data will be QAQC'd and loaded to champmonitoring.org.
    - Summer and Fall PIT tag surveys at 12 permanent fish sites to assess abundance, growth, movement, survival, and production
    - 10 year summary report to PSMFC on progress of Asotin IMW

- **References**

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