**Columbia Basin Water Transaction Program**

**FY13 RM&E Habitat Monitoring Report**

**BPA Project # 2002-013-01**

Report covers work performed under BPA contract #58768

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# 1. Executive Summary

The Columbia Basin Water Transactions Program has developed and implemented a Monitoring and Accounting program to track outcomes from transactions for the two Fish and Wildlife Program Strategies that guide CBWTP actions:

1. Project Implementation and Compliance Monitoring
   F&W Program Strategy: Develop a project compliance monitoring program for independent post-project auditing of project performance to assess ongoing performance of habitat based mitigation projects in support of adaptive management planning.

2. Tributary Habitat
   F&W Program Strategy: Monitor and evaluate tributary habitat conditions that may be limiting achievement of biological performance objectives.

This report summarizes biological monitoring data and results from the following transaction sites in priority streams:

| State | River | Biological Results |
|---|---|---|
| Washington | Upper Salmon Creek, Okanogan Basin | 429 juvenile steelhead, 120 adult steelhead observed via snorkel survey |
| | Teanaway River, Yakima Basin | PHABSIM observations of habitat gains in native salmonid productivity |
| | Loup Loup Creek, Okanogan Basin | 653 juvenile steelhead observed via snorkel survey |
| Idaho | Fourth of July Creek, Upper Salmon Basin | 21 fluvial bull trout redds observed |
| | Patterson Big Springs Creek, Pahsimeroi | 14 Chinook salmon redds observed |
| | Kenney Creek, Lemhi Basin | 183 steelhead/rainbow trout, 11 bull trout, 6 westslope cutthroat trout observed |
| | Canyon Creek, Lemhi Basin | 11 Chinook salmon, 93 steelhead/rainbow trout, 1 cutthroat trout |
| | Big Timber Creek, Lemhi Basin | 2 Chinook salmon, 55 steelhead/rainbow trout, 1 bull trout |
| | Pole Creek, Salmon River Basin | 1,600 juvenile rearing Chinook salmon |
| Oregon | Catherine Creek, Grande Ronde Basin | Spring Chinook Redds are increasing in number, up to 20 observed in recent years |
| | Whychus Creek, Deschutes Basin | One adult steelhead observed, Three spring Chinook |

## 2. Introduction

*For each Fish and Wildlife Program Strategy briefly discuss how your project informs/supports the program sub strategies and associated management questions. The content may be reorganized into any format of your choosing.*

This report outlines the RM&E work within the Columbia Basin Water Transactions Program (CBWTP) for Fiscal Year 2013. Two Fish and Wildlife Program Strategies guide CBWTP actions:

3. Project Implementation and Compliance Monitoring
   F&W Program Strategy: Develop a project compliance monitoring program for independent post-project auditing of project performance to assess ongoing performance of habitat based mitigation projects in support of adaptive management planning.

4. Tributary Habitat
   F&W Program Strategy: Monitor and evaluate tributary habitat conditions that may be limiting achievement of biological performance objectives.

A separate report was prepared that summarized the results of Contractual Compliance monitoring for FY13. This report focuses on results from habitat monitoring.

## 3. Methods: Protocols, Study Designs, and Study Area

### *3.1 Protocol Title*

CBWTP - Water Transaction Monitoring v1.0

### *3.2 Protocol Link*

a. http://www.monitoringmethods.org/Protocol/Details/437

### *3.3 Protocol Summary*

This Accounting Framework emerges from an evolving foundation of reporting mechanisms developed since the inception of the Columbia Basin Water Transaction Program in 2002 to demonstrate the effectiveness of water transactions. With a focus specifically on water transactions, the Accounting Framework is designed around a discrete logic path that tracks the four sequential components of a flow transaction. These steps comprise the four nested tiers of monitoring investments: Project Compliance: Ensure compliance with the terms of the transaction. Flow Accounting: Account for the flow added to the protected stream reach at the point of diversion (POD) before, during, and after the time period of the water transaction. Flow Impact: Account for changes in flow-related aquatic habitat metrics along a specified section of the protected reach during the time period of the water transaction. Data Integration: Evaluate changes in flow-related habitat characteristics that may track with changes to broader-scale biological conditions and fish population dynamics. This Accounting Framework is designed to meet the current needs of the program in FY 2014 and the immediate future. The Framework has an adaptive management component and will be re-visited on a regular basis as the CBWTP develops.

# 4. Results

## *4.1 Washington – Upper Salmon Creek, Okanogan Basin*[1]

In 2006, CBWTP, in collaboration with the Confederated Colville Tribes (CCT), Okanogan Irrigation District (OID) and Washington Water Trust, funded a 20-year lease resulting in up to 20 cfs of flow and 1,700 af/year into lower Salmon Creek. This project addresses flow as a limiting factor according to recommended actions for recovery of the Upper Columbia Steelhead Endangered Species Unit, particularly in providing passage to pristine habitat above the OID diversion at River Mile 4.3. This project aims to fulfill Strategy 1-1A Creek in the NPCC Sub-basin Management Plan:

> "Strategy 1-1A. Provide water for adult fish passage, over-winter rearing, and juvenile out-migration (below OID).This is combined with additional habitat efforts completed by the Colville Tribes, including replacement of culverts that have been a barrier to steelhead passage in this system."

Daily flow measurements from March – July confirmed that OID was maintaining the minimum amount of flow contracted for 2013. CCT snorkel data in 2013 confirmed 429 juvenile steelhead at a density of 1,119 fish/hectare. 2013 pit tag arrays confirmed 120 adult steelhead returning to spawn Salmon Creek. In addition CCT has continued to improve habitat via channel passage and reconstruction projects at the bottom of Salmon Creek. CCT and WWT are continuing to work with OID, the only diverter on Salmon Creek, to devise permanent flow solutions to meet year-round objectives for the Upper Columbia Steelhead ESU Recovery Plan.

## *4.2. Washington – Teanaway River – Yakima Basin*[2]

### *4.2.1 Summary*

Washington Water Trust (WWT) has implemented transactions with over 20 landowners in the Teanaway Basin. Since 2011, WWT has either completed or is in the process of completing five permanent transactions in the Teanaway Basin. In 2013, WWT had 20 active projects with 11.7 cfs of aggregate instream flow.

Based on CBWTP Strategic Planning discussions in 2013, WWT's instream flow goal for the Teanaway River is between 12 and 20 cfs. WWT continues to build upon its instream portfolio through conversion of existing long-term leases to permanent transactions and seeking permanent transactions whenever possible. WWT's instream flow contribution to the Teanaway River has increased significantly over the last decade and continues to grow with additional long-term leasing, conversion to permanent transactions, and permanent transactions.

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[1] Provided by: 2013 Monitoring Update – Salmon Creek – Okanogan Basin, submitted by Greg McLaughlin, Washington Water Trust (March 2014)

[2] Provided by: 2013 Monitoring Update – Teanaway River – Yakima Basin, submitted by Jason McCormick, Washington Water Trust and Jon Kohr, Washington State Department of Fish and Wildlife (March 2014)

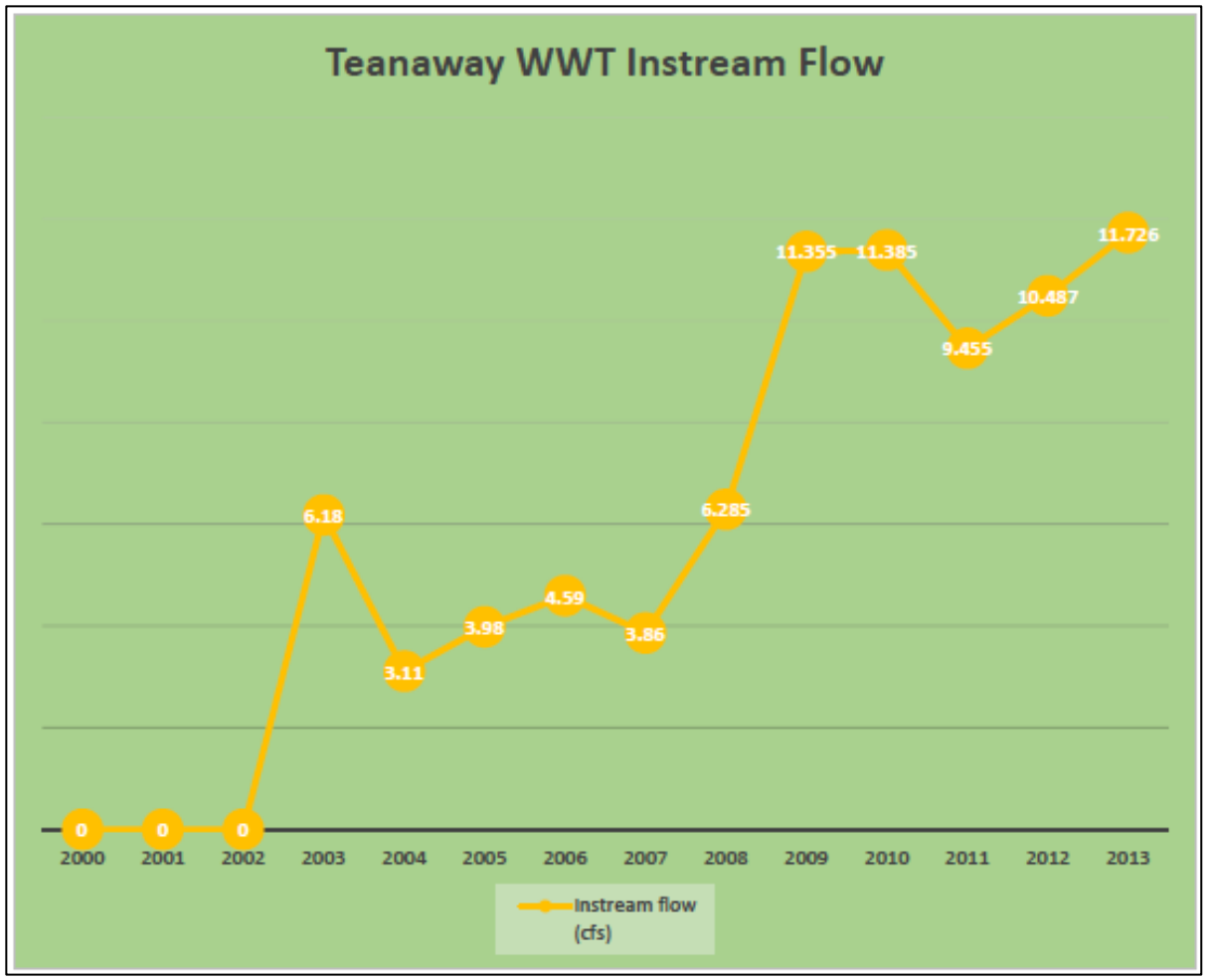


**Figure 1.** WWT Instream Water Rights Protected by Year

*4.2.2 Habitat Assessment*

*Life Stages and Species Affected During Period of Ecological Significance*

WWT focuses its flow restoration activities on several species and life stages during periods of low flow that impact the following life stages and species of priority fish: juvenile rainbow trout (steelhead); juvenile spring Chinook; juvenile coho; adult migrant spring Chinook; and adult migrant bull trout. The affected species and life stages range from small to large-bodied salmonids.

*Physical HABitat SIMulation*

In 2010, the Washington Department of Fish and Wildlife (WDFW) staff conducted a Physical HABitat SIMulation (PHABSIM) study to assess fish habitat at varying flows. The study site location is downstream of the numerous CBWTP water transactions. The purpose of the study was (in part) to quantitatively review habitat increases with increased stream flow from the water acquisitions. The study produces a habitat value indicator called weighted usable area (WUA). The transaction water is then assessed using WUA comparing before-and-after transaction results.

WUA curves are almost always a bell-shaped curve, meaning too little water is considered low

habitat value rising to a "maximized" point, then falling due to high velocities and low value depths for fish to thrive. This bell-shaped curve result was found in the Teanaway River for the species assessed (steelhead, coho, spring Chinook, and rainbow trout). Therefore, transaction water at lower flows result in higher proportions of increased habitat. Conversely, at higher flows WUA increase may be minimal, even slightly negative if flow is higher than the maximized habitat value.

PHABSIM results are considered part of the Tier 3 habitat monitoring within the Accounting Framework (AF). The final results for the Teanaway River PHABSIM study show that there are substantial habitat gains to spawning and rearing conditions with transaction water when flows are low. These flows are typically low during transaction periods, or irrigation seasons. In conclusion, initial findings are that the habitat gains (in WUA) from water transactions in the lower-middle reach of Teanaway River increased and are aiding in native salmonid productivity, which includes ESA-listed mid-Columbia steelhead populations.

*Critical Riffle*

Critical Riffle (CR) depth measurements to evaluate passage of native salmonids are also considered Tier 3 habitat monitoring efforts. WDFW and WWT staff gathered data for a Critical Riffle study to assess passage of salmonids at varying flows in the lower Teanaway River. During the Strategic Planning process the participants determined after review of the CR results that an initial instream flow goal between 12 and 20 cfs would provide 100% passage for small-bodied salmonids. The upper goal of 20 cfs approaches high passability for medium-bodied salmonids, but is less than optimal passage for large-bodied salmonids.

That initial target flow of 12 to 20 cfs for salmonid passage was achieved through the 2013 irrigation season as observed at the Teanaway River gage at Lambert Road. Figure 2 shows that the flow at the Forks gage (indicated by the blue line) located at RM 10.3 and at the Lambert gage (green line) near RM 0.7 Previous years field sampling and gage data (post-2005 drought) also indicate that flows above 12 cfs have been reached. This is clearly an indication that transaction water since 2003 has been beneficial in increasing instream flows during late summer to fall low flow periods and has been beneficial to native salmonid species in the lower to middle Teanaway River.

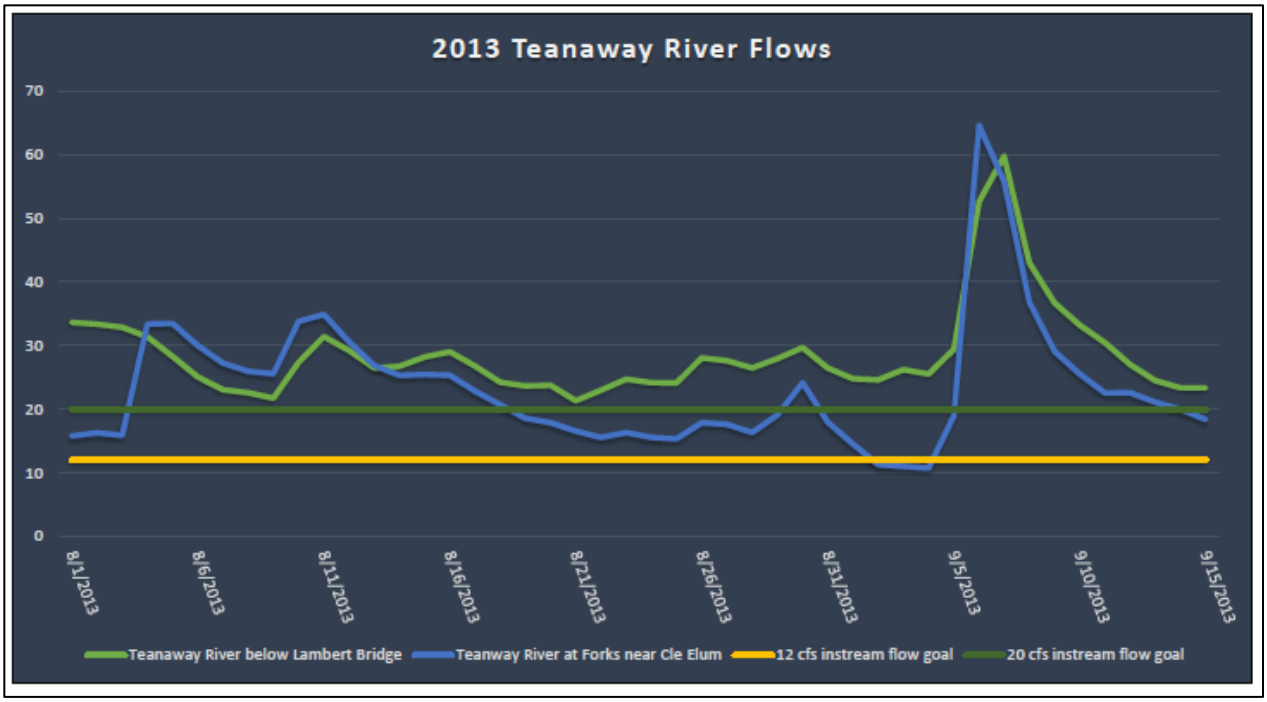


**Figure 2.** 2013 Teanaway River Flow from 08/01 to 09/15

### *4.3. Washington – Loup Loup Creek – Okanogan Basin*[3]

In 2011, CBWTP, in collaboration with the Confederated Colville Tribes, Helensdale Reclamation District (HRD) and Washington Water Trust, funded a 20-year lease resulting in 3.21 cfs of flow into lower Loup Loup Creek. This project addresses flow as a limiting factor according to recommended actions for recovery of the Upper Columbia Steelhead Endangered Species Unit, particularly in the first 1.8 stream miles below a natural barrier falls above the HRD diversion. This project aims to fulfill Objective 1-1 for Loup Loup Creek in the NPCC Subbasin Management Plan:

> "Monitor, protect and increase stream discharge during April and May to a minimum of 14 cfs for the migration and spawning of adult fish and to protect and increase flows all months other than April and May to a minimum of 1-2 cfs for juvenile rearing."

This is combined with additional habitat efforts completed by CCT, including replacement of culverts that have been a barrier to steelhead passage in this system.
Site visits during August and September of 2013 confirmed that the HRD diversion was completely closed and blocked in with dirt fill and that legally protected flows were present

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[3] Provided by: 2013 Monitoring Update – Salmon Creek – Okanogan Basin, submitted by Greg McLaughlin, Washington Water Trust (March 2014)

throughout the irrigation season. CCT snorkel data in 2013 confirmed 653 juvenile steelhead at a density of 6,819 fish/hectare in Loup Loup Creek. Of all tributaries sampled in the Okanogan basin, only Omak Creek had a higher count of fish, and only Tunk Creek had a higher density, indicating that these streams are already functioning at a high level for rearing objectives.

CCT and WWT are continuing to work with other diverters on Loup Loup Creek to meet the flow target of 14 cfs for the migration and spawning season.

### *4.4 Idaho – Lemhi and Salmon River Basins*

#### *4.4.1 Fourth of July Creek, Upper Salmon Basin*

A 20-year lease in Fourth of July Creek, tributary to the Salmon River in the Sawtooth Valley, protects 2.9 cfs from the Fourth of July Creek 2 diversion down to the Salmon River. IDFG conducted a fluvial bull trout redd survey in late summer/early fall and observed 21 redds (Figure 3). Flows in Fourth of July Creek dropped below 2.9 cfs due to a combination of natural low flow and administration issues for the first time in the 10 years of the lease, which may have prevented full passage into the basin through the primary reach. A higher degree of monitoring will occur in 2014. While it may be tempting to attribute the reduced number of fluvial bull trout redds in 2013 to decreased flows, without rigorous, repeatable monitoring with controlled variables, that attribution is impossible.

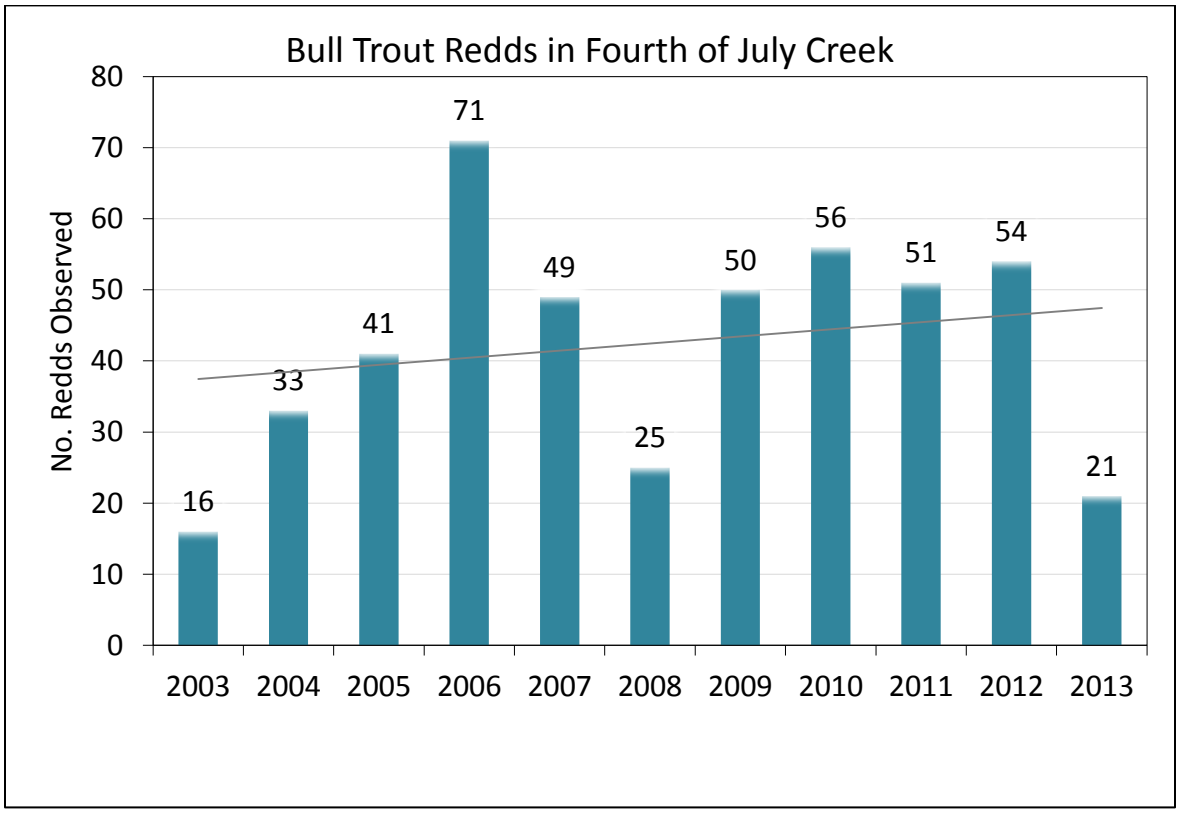


**Figure 3.** Bull Trout Redd trends in Fourth of July Creek

*4.4.2 Patterson Big Springs Creek, Pahsimeroi Basin*

The removal of the Patterson Big Springs Creek cross ditch in 2008 and the 2011 source switch from the Patterson Big Springs Creek 9 diversion to Mayrick Creek has resulted in over 8.5 cfs in water rights protected instream, but in actuality over 20 cfs was typically diverted out of the Patterson Big Springs Creek cross ditch. IDFG conducted Chinook salmon redd surveys and observed 14 redds in Patterson Big Springs Creek, 15% of the Pahsimeroi Basin redds (Figure 4). Trend analysis of Chinook salmon redd numbers is difficult due to the long life history of the species. Adult escapement is affected by numerous in-basin and out-of-basin variables. Active spawning in Patterson Big Springs Creek shows sufficient flow to allow passage and spawning, but attributing changes in total redd counts to changes in flow is impossible without rigorous, repeatable monitoring with controlled variables.

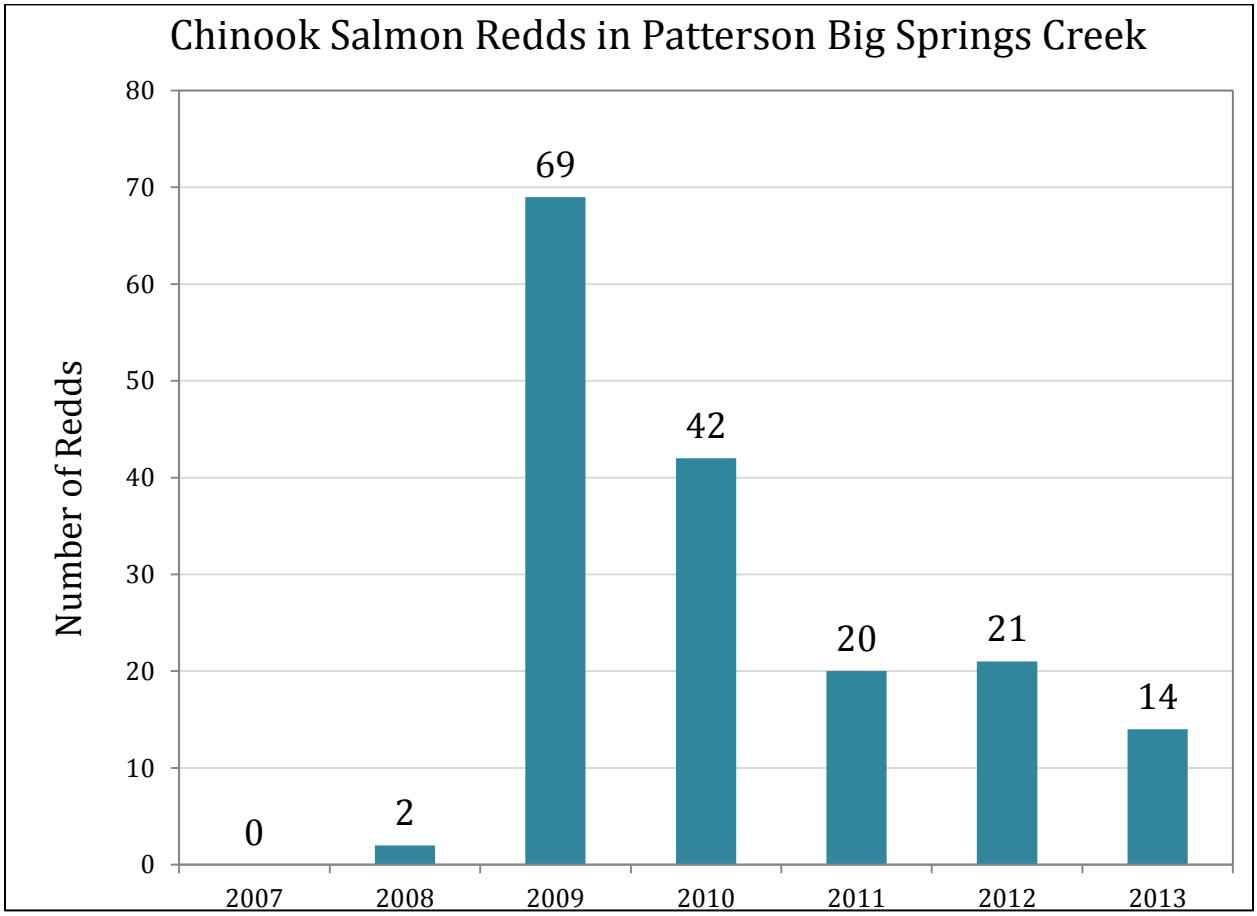


**Figure 4.** Annual Chinook Salmon Redd counts in Patterson Big Springs Creek

*4.4.3 Kenney Creek, Lemhi Basin*

The 2013 source switch from Kenney Creek to a wastewater ditch resulted in a flow improvement of 0.14 cfs, which adds to a 2011 conservation easement (Lemhi Regional Land Trust) protecting approximately 4 cfs in lower Kenney Creek. A PIT tag array has been operational near the mouth of Kenney Creek since 2010. In 2013, the array detected 183 steelhead/rainbow trout, 11 bull trout, and 6 westslope cutthroat trout (Figure 5).

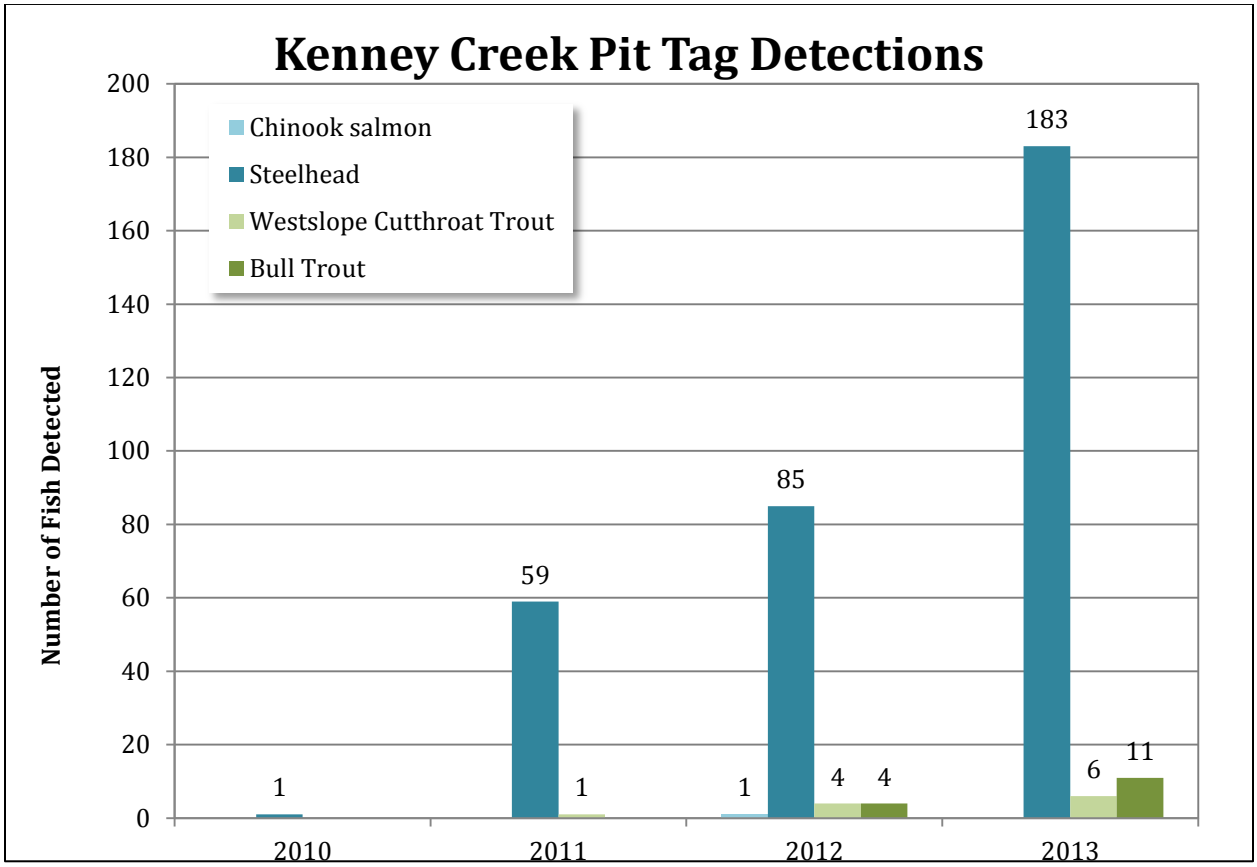


**Figure 5.** Annual Pit Tag Detections on Kenney Creek

*4.4.4 Canyon Creek, Lemhi Basin*

The 20-year source switch from Canyon Creek to the Lemhi River resulted in an increase in flows of up to 4 cfs in lower Canyon Creek. A PIT tag array has been operational near the mouth of Canyon Creek since 2010. In 2013, the array detected 11 Chinook salmon, 93 steelhead/rainbow trout, and one westslope cutthroat trout (Figure 6).

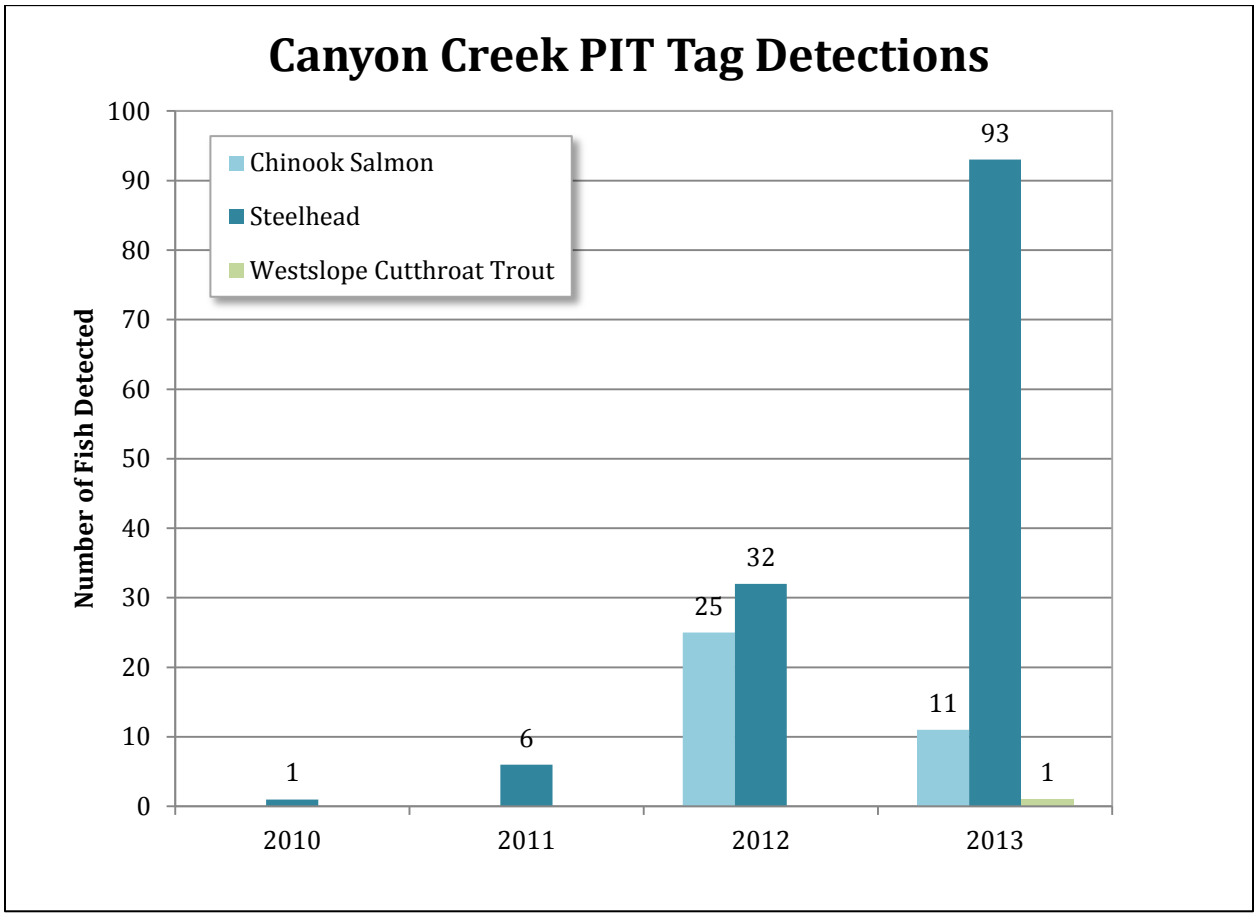


**Figure 6.** Annual PIT Tag Detections on Canyon Creek

*4.4.5 Little Springs Creek, Lemhi Basin*

The 20-year source switch from Little Springs Creek to the Lemhi River resulted in an increase of up to 5.69 cfs in Little Springs Creek. A PIT tag array has been operational near the mouth of Little Springs Creek since 2010. In 2013, the array detected 11 Chinook salmon, 198 steelhead/rainbow trout, 3 bull trout and one westslope cutthroat trout (Figure 7).

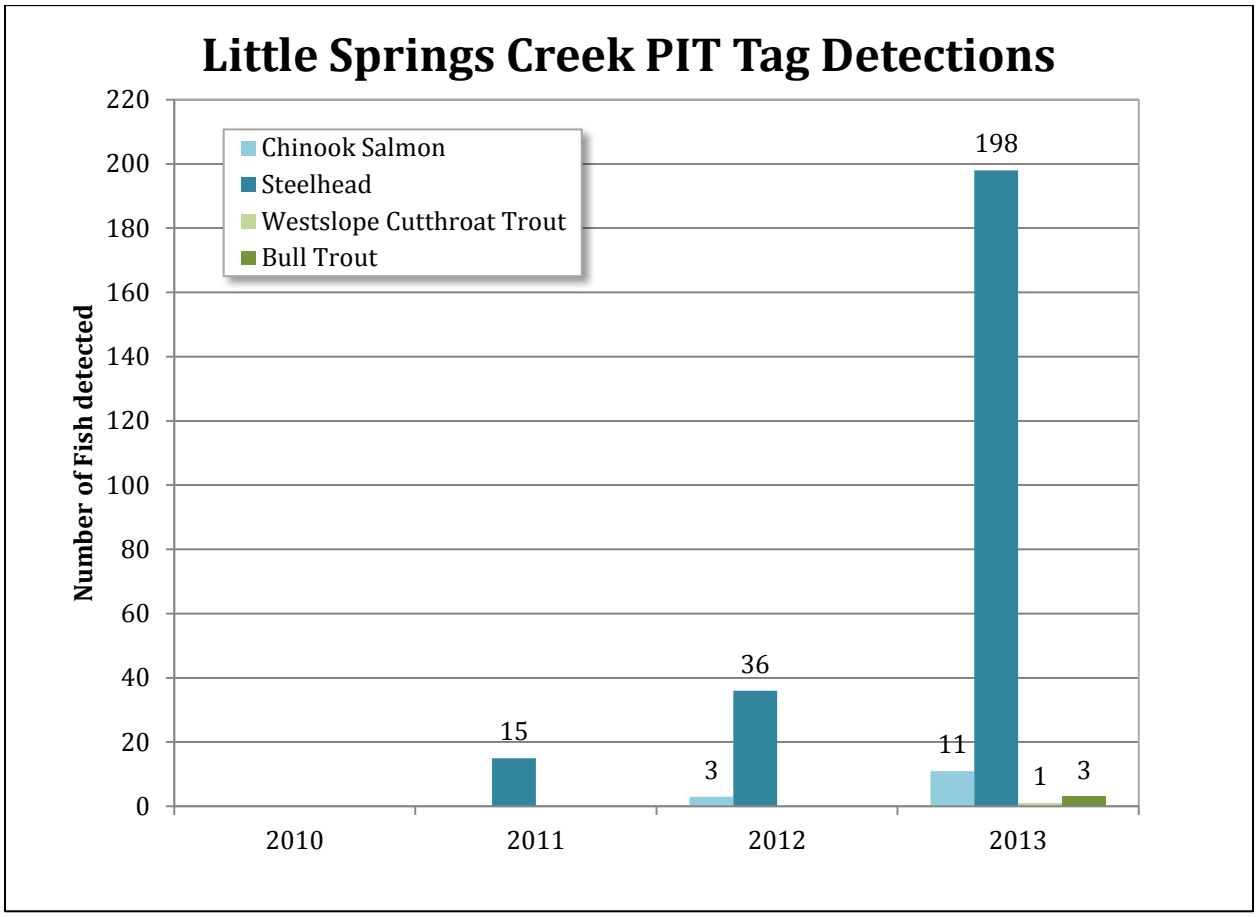


**Figure 7.** Annual PIT Tag Detections on Little Springs Creek

*4.4.6 Big Timber Creek, Lemhi Basin*

Two 20-year source switches from Big Timber Creek to the Lemhi River have resulted in an increase of up to 5.4 cfs in lower Big Timber Creek. A PIT tag array has been operational in lower Big Timber Creek since 2010 (It was moved downstream in 2013). In 2013, the array detected 2 Chinook salmon, 55 steelhead/rainbow trout, and one bull trout (Figure 8).

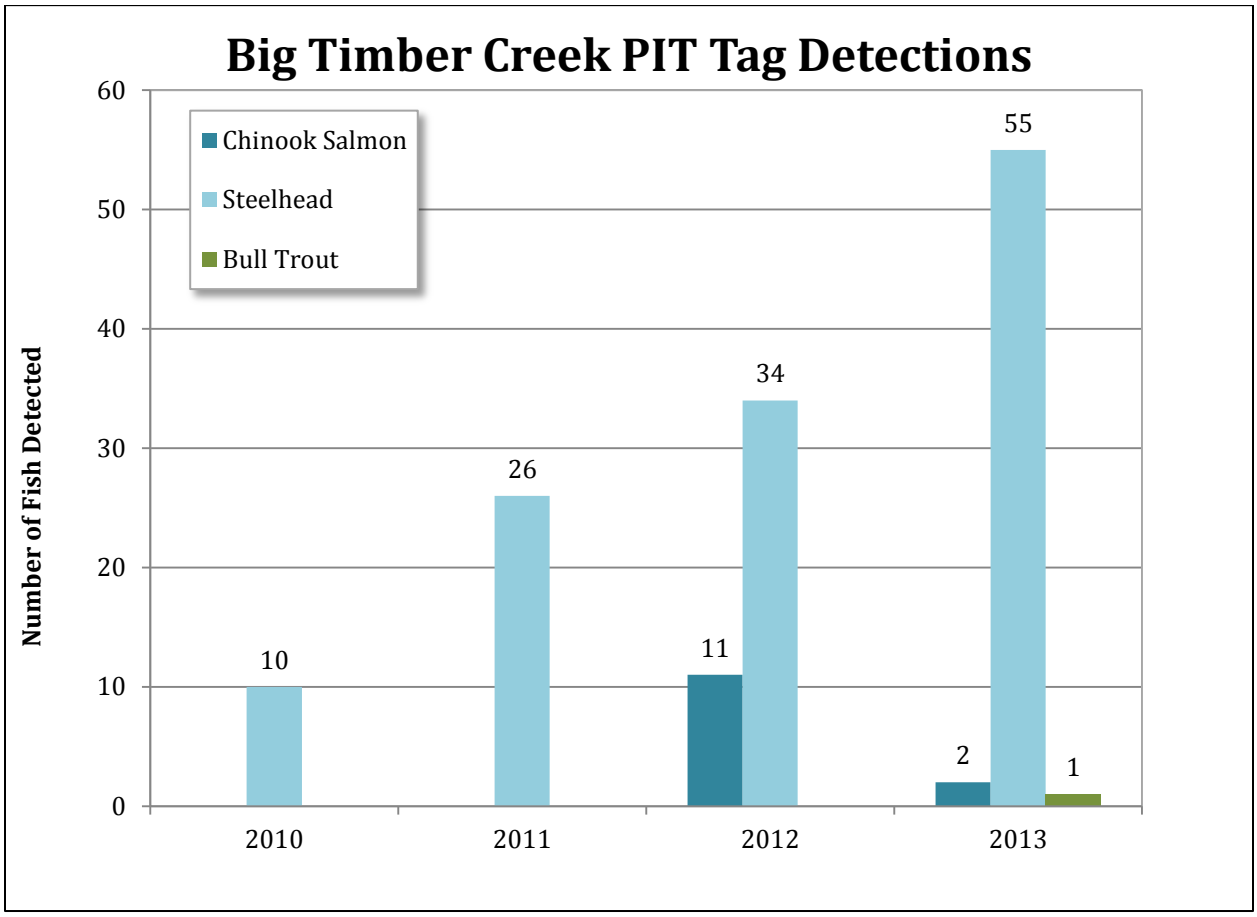


**Figure 8.** Annual PIT Tag Detections on Big Timber Creek

*4.4.7 Pole Creek, Salmon River Basin*

A minimum flow agreement on Pole Creek, tributary to the Salmon River near its headwaters, protects at least 6 cfs instream between the only active diversion to the location of the hydropower return flow, approximately 2 miles downstream. On August 21, 2013, field technicians from the Idaho Department of Fish and Game (IDFG) conducted a snorkel survey of Pole Creek. They observed several hundred juvenile Chinook salmon in every pool sampled below the diversion. They estimated approximately 1600 juvenile rearing Chinook salmon in the reach below the diversion. The technicians did not observe Chinook upstream of the diversion. IDFG did not observe Chinook salmon redds or adults in Pole Creek during the annual redd survey.

### *4.5 Oregon - Catherine Creek, Grande Ronde Basin*

The Freshwater Trust began flow restoration on Catherine Creek in 2011, which coincides with an increase in Spring Chinook Redds per mile along Catherine Creek. However, there is a lack of data that can positively link increases in redd counts with an increase in flow along Catherine Creek. So with the assumption that fish do require a flowing stream to make a redd, these trends are noted as connected but not verifiably causal (Figure 9).

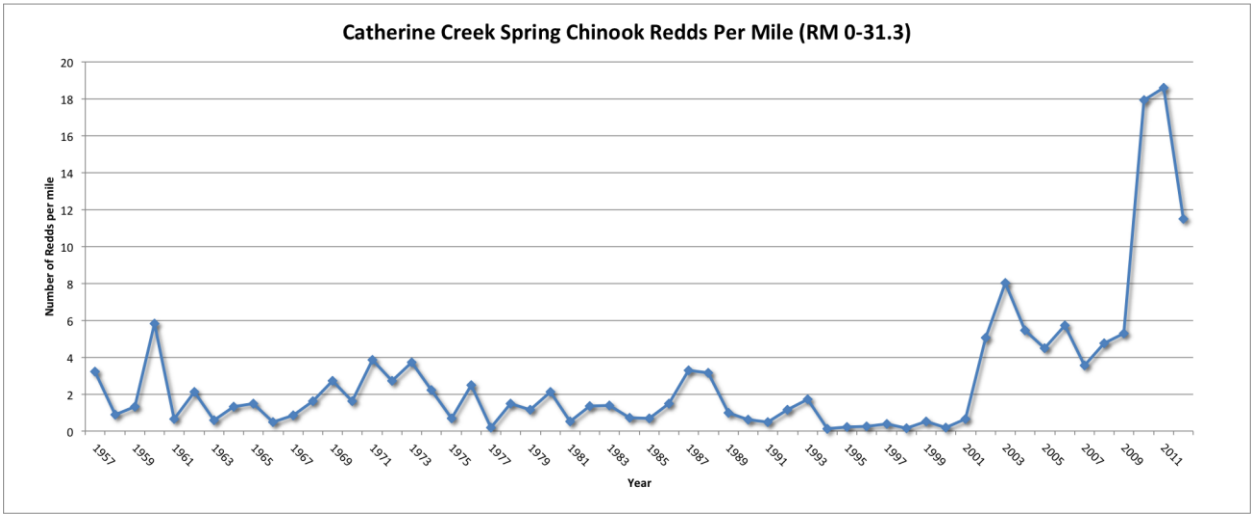


**Figure 9.** Redd counts per mile and year in Catherine Creek (www.streamnet.org, data for "Adult Return Redd Counts" in Catherine Creek)

### *4.6. Oregon – Whychus Creek, Deschutes Basin*

#### *4.6.1 Water Quality Status and Temperature Trends*

The following paragraph and summary information was taken verbatim from a report written by Lauren Monk with the Upper Deschutes Watershed Council entitled: *Whychus Creek Water Quality Status, Temperature Trends, and Stream Flow Restoration Targets* (2014).

> Diversion of almost 90% of summer streamflow and channelization of over 50% of the length of Whychus Creek have degraded water quality, leading to an ODEQ listing of water quality limited in 2002, 2004, and 2010. The Upper Deschutes Watershed Council monitored temperature from 1995 through 2013 at eleven sites representing diverse flow conditions in Whychus Creek. This report incorporates 2013 data to 1) evaluate the current status of temperature in Whychus Creek in relation to state standards for salmonid spawning, rearing and migration; and 2) refine target flows projected to produce temperatures that meet state standards. Temperatures exceeded the state rearing and migration temperature standard of 18˚C at six monitoring sites in 2013 for a total of 81 days, at more and farther upstream sites than in the previous three years, and for more days than in any year since 2007. Temperatures approached, but never exceeded, the 24˚C lethal threshold for salmon

and steelhead in 2013, for the fourth year in a row. Regression of 1995-2013 temperature and flow data identified 56-65 cfs as the range of minimum flows necessary to meet the 18° temperature standard at FS Road 6360, slightly lower than the 66-78 cfs range predicted by 2008 and 2010-2012 models. Temperature results from 2013 suggest that despite significant gains made in streamflow restoration and temperature reductions over the past ten years, at current flow protection levels temperatures may continue to exceed fish and state requirements for rearing and migration in years characterized by lower flows. Continued development of creative solutions to allocation of Whychus Creek streamflow in low-water years is needed to guarantee conditions that will support the recovery of re-introduced native fish populations. These results contribute to an improved understanding of temperature and flow on Whychus Creek that will allow restoration partners to better plan future watershed restoration efforts.

### *4.6.2 Benthic Macroinvertebrate Communities*

The following paragraph and summary information was taken verbatim from a report written by Celeste Mazzacano with the Xerces Society for Invertebrate Conservation entitled: *Effectiveness Monitoring in Whychus Creek; Benthic Macroinvertebrate Communities in 2005, 2009, and 2011-2013.*

Aquatic macroinvertebrates were sampled in 2005, 2009, 2011, 2012, and 2013 at 10-13 sites in Whychus Creek (RM 30.25 to RM 0.5) to determine biological conditions and assess the effects of restoration on stream biota. The benthic macroinvertebrate community in Whychus Creek underwent the greatest changes from 2005 to 2009, after which it showed increasing stabilization. PREDATOR model and multi-metric Index of Biological Integrity (IBI) scores indicated parallel trends in biotic condition in downstream reaches but presented differing portrayals of conditions in mid-reach and upstream sites. PREDATOR scores for downstream reaches indicated significant improvement in biotic conditions from 2005 to 2009 followed by little change through 2013. IBI scores for downstream reaches increased significantly from 2005 to 2011 with a corresponding improvement from moderately to slightly impaired condition, and maintained the improved biological condition through 2013 despite lower mean scores in 2012 and 2013. PREDATOR scores for mid-reach sites fluctuated, with significantly lower scores indicating poor conditions in 2011-2013 compared to good conditions in 2005 and 2009. IBI scores for mid-reach sites tracked PREDATOR scores, but suggested biological conditions remaining slightly impaired in contrast to the marked decrease in conditions indicated by the PREDATOR model. PREDATOR and IBI scores at mid-reach sites are likely to continue to change as the stream responds to the channel relocation at Camp Polk in 2012. PREDATOR scores indicating poor biotic conditions in upstream sites did not differ significantly among years, while mean IBI scores for upstream sites increased significantly from 2005 to 2012, indicating an improvement in biotic condition from slightly to minimally impaired, but fell in 2013 to suggest a return to a slightly impaired biological condition. Increased mean IBI scores among upstream reaches may have been driven by an increase in richness, relative diversity, and abundance of sensitive EPT taxa (Ephemeroptera, Plecoptera, Trichoptera) at upstream sites from 2005 to 2012. Mean

optima values indicating tolerance for temperature and fine sediments were consistently highest for downstream sites and decreased through mid-reach and upstream sites. Although mean temperature optima for replacement v. missing taxa were significantly different in only a single year, mean temperature optima for the entire macroinvertebrate assemblage decreased steadily and significantly in all reaches from 2005 to 2011, and fell again from 2012 to 2013 at the downstream and mid-reach sites expected to be most affected by streamflow restoration. The latter trend was also observed for fine sediment optima although less pronounced. Fine sediment optima of replacement taxa were significantly lower than optima of missing taxa in all years, suggesting the stream may be sediment-deprived or that replacement taxa are responding to aspects of microhabitat that aren't being measured. Five years of data suggest that following an initial shift in composition the macroinvertebrate community may be stabilizing in an assemblage that reflects slightly to moderately impaired or fair to poor conditions. The persistence of a macroinvertebrate assemblage indicating degraded biological conditions may be an artifact of historic habitat alterations that have yet to be Effectiveness Monitoring in Whychus Creek: Benthic Macroinvertebrate Communities 2 remediated by restoration, or it may suggest that additional stressors continue to influence biological conditions and the resulting macroinvertebrate communities.

### *4.6.3 Fish Counts*

In May 2014, the Confederated Tribes of the Warm Springs Reservation of Oregon and Portland General Electric Company released an Annual Report on 2013 Adult Migration, Survival, and Spawning, which includes data for the Crooked River system and Whychus Creek. The information provided below originates in this report.[4]

For steelhead populations in 2013, one adult steelhead was observed near Rimrock Ranch in Whychus Creek.

In the Crooked River, 18 adult steelhead were noted, with the following additional observations:

- with nine mortalities below Opal Springs, the lowest fish passage barrier on the Crooked River.
- nine fish passed above Opal Springs.
- anecdotal reports of steelhead spawning below Opal Springs.

For Chinook populations, 9 Chinook were located in the Crooked River system, and four of those fish passed above Opal Springs. One of those four fish made it all the way to Ochoco Creek. Three Chinook were located in Whychus Creek.

[4] Hill, M., R. Burchell, M. Bennett, B. Wymore and C. Quesada. 2014. 2013 Adult Migration, Survival, and Spawning Test and Verification Study. Portland General Electric Company. Portland, Oregon.

## 5. Discussion/Conclusions

Habitat and biological monitoring under the Accounting Framework offers an opportunity to partner with other RM&E efforts in the Columbia Basin to evaluate the impacts of flow restoration within a greater context of habitat improvements for listed fish species. While this potential for collaboration is a boost to flow restoration efforts, it is also a challenge that is reflected in the FY13 data. Funding for RM&E activities is limited and therefore many of the CBWTP's efforts are voluntary and rely heavily on leveraging the efforts of partner organizations to collect and analyze data. Furthermore, QLEs develop monitoring plans at the start of the monitoring season to work with partners on monitoring habitat data, however actually acquiring that data within the timeframe needed for CBWTP reporting is a challenge. Agency partners often have a longer timeframe for reviewing data and officially releasing it to the public, which makes it difficult for QLEs to process and submit the information to CBWTP by the spring reporting deadlines. Future RM&E reports from CBWTP will not attempt to utilize data from the current year but rather will delay reporting this data to the following year. For instance, the CBWTP's 2014 RM&E report (to be submitted to BPA in February of 2015) will contain data through the 2013 monitoring season. This will allow CBWTP to receive more complete data from its partner organizations and produce better analyses of the data to better determine the effectiveness of CBWTP's flow restoration activities in key watersheds.