Marys River Watershed Council
Rock Creek Focused Fish Passage and In-stream Structure, OWEB Grant #208-3089
FINAL Status Report (Year 5 Post-Implementation)

Does the Project continue to meet goals as specified in the grant agreement?

The original intent of the Rock Creek Focused Passage and Instream Structure Project was to address the primary limiting factor for mainstem Rock Creek – elevated summer stream temperatures, often exceeding the DEQ 64°F standard for salmonids rearing waters. Temperatures are elevated on mainstem Rock Creek due to a variety of current and historical factors, including past riparian forest harvest, direct solar exposure, limited floodplain interaction, municipal water withdrawals and reservoir surface spill. Prior to the implementation of this project, approximately eight miles of cold water mainstem and tributary habitat was inaccessible due to water intake structures without functional fish ladders and perched culverts. In addition, lack of gravel in the mainstem forces summer flows to course over solar-exposed bedrock.

This partnership between the Council, City of Corvallis, US Forest Service, Marys Peak Stewardship Group and the ODFW Fish Passage Program addressed four impassable culverts and large wood enrichment. The four culverts installed under this project were on Griffith Creek, Middle Fork Rock Creek, Stillson Creek and Tributary D. Provision of passage at the two City water intake structures was funded by a parallel OWEB grant (208-3013). This project, coupled with two fish ladders installed on Griffith and South Fork Rock creeks, were intended to provide unimpeded access for both juvenile and adult cutthroat to approximately 8 miles of previously inaccessible habitats. Log structures were placed at 23 sites to encourage winter floodplain interaction, to recruit gravels and to create channel complexity. All four culverts are functioning to provide full fish passage to adult and juvenile cutthroat in winter and summer flows as well as natural bedload transport. Photos (February 2014) and brief commentary about culvert status may be found at the end of this report.

<u>Monitoring Results</u>

Post-project snorkel inventories were conducted for three years during the May cutthroat spawning period, to be consistent with May 2006 pre-project surveys (2009-2011). In 2010, we conducted a summer pinch period snorkel inventory in addition to the May survey, to determine the levels of summer usage of Rock Creek by cutthroat trout as a thermal refuge. From 2012 forward, snorkel inventories were conducted during the thermal pinch period, so that Rock Creek data would be comparable to our post-project monitoring data in other subbasins of the Marys River.

Spring surveys, 2009-2011. A comparison of a post-project snorkel inventories (2009, 2010, 2011) to the pre-project inventory (May 2006) demonstrates significant improvements in cutthroat distribution and abundance. Total relative abundance of cutthroat for the basin has increased from the pre-project year in both years 2 and 3 of the post-project inventories (Table 1; 54% and 44% respectively). One of the hypotheses entering into this suite of restoration prescriptions was that the provision of improved access to high quality spawning habitats above each of the diversion dams would result in a basin scale increase in population size beginning in 2010. This increase has occurred and expectations are that the magnitude of this increase should improve as structures mature and begin to trap and sort additional high quality spawning gravels.

Two of the culvert replacements (Stillson Cr and Trib D) also exhibited increases in fish abundance above the repaired crossings in the first post-project inventory in 2009. The increase in Stillson was 125% of pre-project

abundance and the increase in Trib D was 20%. The actual numbers of cutthroat that these increases represent are minor from a basin-scale perspective. Trib D however, has exhibited a decrease in abundance when compared to the pre-project year in both 2010 and 2011. Stillson exhibited a decrease in 2010 and a slight increase in 2011. These two tributaries provide cold water refugia from the mainstem and it is conceivable that increases in abundance could be more significant in summer during pinch period low flows in the mainstem. These snorkel surveys were not able to assess temperature-dependent upstream migration to cool water refugia, as they occurred prior to the annual July-September thermal pinch point. Only one of the passage project sites (MF Rock) failed to exhibit an increase in the abundance of cutthroat above the repaired crossing in the first two post project years (2009, 2010).

Cutthroat trout distribution on mainstem Rock Creek changed significantly before and after project implementation, as measured in cutthroat trout per square meter of pool habitat. Prior to project implementation, there was an abnormal, bi-modal distribution of cutthroat trout, with a large accumulation below major passage barriers (Figure 1). After project completion, most of the cutthroat trout were observed above the barriers addressed in the project, with a small accumulation still remaining below the South Fork Rock Creek water diversion structure (Figure 2).

Habitat complexity was also augmented by helicopter-placement of 23 log structures along mainstem Rock Creek (2008). As these structures mature by capturing additional wood and aggrading the stream bed, we expected associated improvements in channel-floodplain interaction providing winter slack-water habitat and increased accumulations of transient canopy litter increasing the food supply for macroinvertebrates. During the first post-project snorkel inventory (2009), cutthroat trout in mainstem Rock Creek were disproportionately accumulating at log structure sites (71%, whereas treated pools comprised only 33% of the total pool habitat). In contrast, the second post-project inventory (2010) suggested that there was not disproportionate habitat use occurring at log structure sites (31% of cutthroat trout observed at these sites). This is very similar to the 33% distribution of complex structure habitat. This suggests that higher spring flows were likely still providing linkage to edge-oriented or floodplain habitats during the May 2010 inventory. The third post-project inventory (2011) again indicated a higher abundance of cutthroat trout in habitats associated with log structure placements (57%).

The results of the pre-project and the three spawning period post-project snorkel inventories are summarized below.

Stream	**Total 1+ and older Cutthroat**			
	Spring	**Spring**	**Spring**	**Spring**
	2006 (Pre)	2009	2010	2011
Griffith (below dam)	60	120	190	115
Griffith (above dam)	170	330	255	370
MF Rock	135	115	130	195
Stillson	20	45	15	25
Trib D	25	30	5	10
Rock (below dam)	720	385	1035	925
Rock (above dam)	275	370	530	390
Total	**1,405**	**1,395**	**2,160**	**2,030**

Table 1. Pre- and post-project spring (May) snorkel inventory results.

FIGURE 1

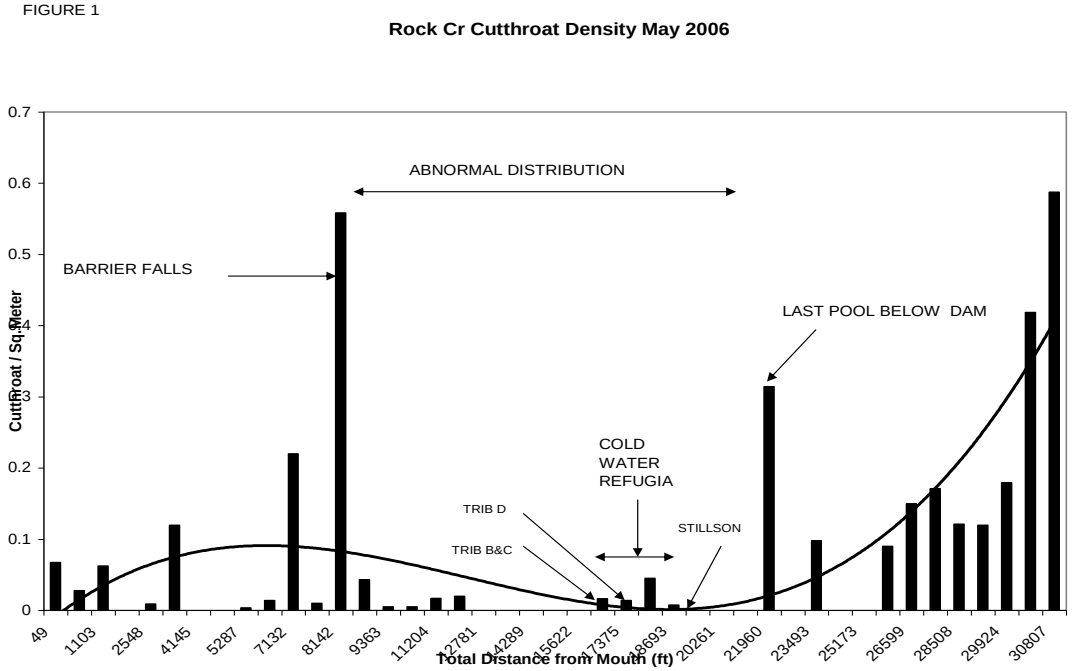
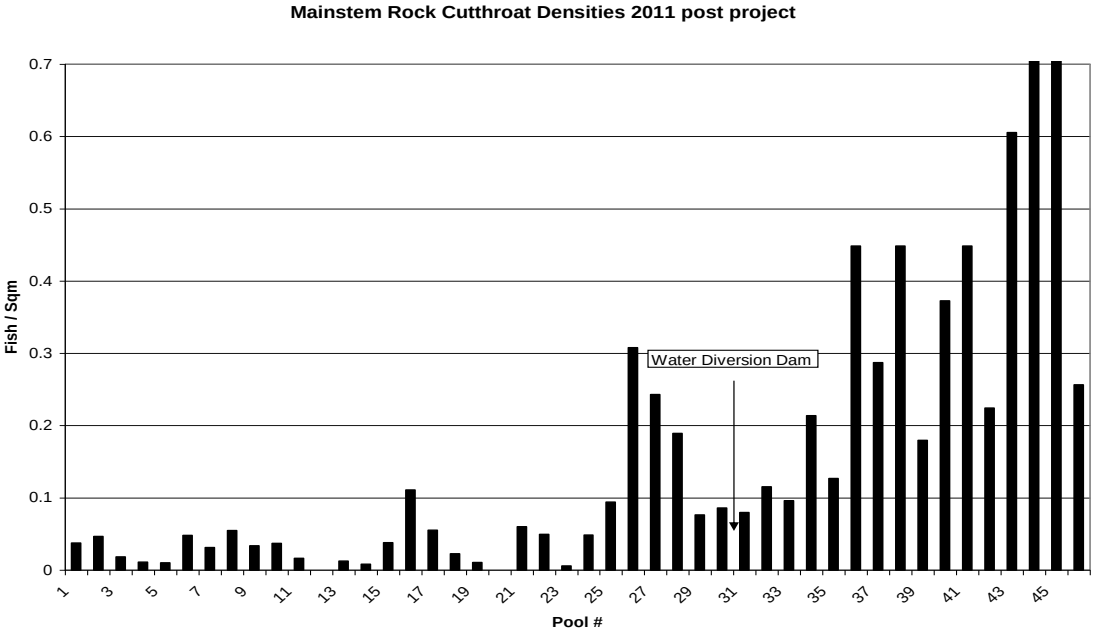


Figure 2. Mainstem Rock Creek cutthroat densities, post-project (2011 data).



Summer Surveys, 2010 and 2012-13. The summer surveys initiated in 2010 used the same RBA methodology as the spring surveys, and surveyed the same 11.2 miles of contiguous stream habitat. Start and finish points for each stream segment were maintained across years. In the summary table below, all data for the dam pools below water intake structures at South Fork Rock Creek and at Griffith Creek were removed, because they were not consistently encountered in the every 5th pool sample across years and these man-made pools tended to accumulate high numbers of fish. The dam pools were dropped to eliminate interannual bias in the expansion calculations of total cutthroat abundance.

The focal monitoring question for the summer surveys is to describe whether and how the abundance and distribution of cutthroat trout in Rock Creek will change over time relative to efforts to address the most significant limitation to system function, elevated summer stream temperatures in Rock Creek and the receiving stream, Greasy Creek. Our hypothesis is that improvements in summer stream temperature resulting from restoration actions designed to capture bedload, aggrade the active summer channel and recharge floodplain terraces through hyporheic linkage would result in changes in the abundance of cutthroat during pinch period summer flows regimes.

When compared to the post project summer inventory conducted in 2010, there is a 31.6% and 32.7% decrease in abundance on the basin scale (all 3 stream reaches combined) for the subsequent sample years 2012 and 2013. These are significant declines in abundance that suggest that the probability of actual decline is very high. Griffith Creek is the coolest tributary to Rock Creek, and we hypothesized that it plays a more significant role as a summer temperature refuge when stream temperatures in greater Greasy Creek are elevated. The decline in total summer pinch point cutthroat abundance in Griffith Creek in 2012 (69.5%) and 2013 (71.7%) relative to 2010 despite high summer stream temperature profiles for mainstem Greasy Creek in 2012 and 2013 appears counter to our initial hypothesis.

Rock Creek	**1+**	**2+ or older**	**Total cutthroat**	**Total steelhead**	**Summer weather**
2010	1,340	605	1,945	0	Cool
2012	985	525	1,510	0	Warm
2013	1,045	415	1,460	0	Warmest
Griffith Creek					
2010	405	55	460	0	Cool
2012	115	25	140	0	Warm
2013	115	15	130	0	Warmest
Mid Fork Rock Creek					
2010	145	0	145	0	Cool
2012	80	15	95	0	Warm
2013	115	10	125	0	Warmest

Table 2. Summer pinchpoint stream survey results, 2010 & 2012-13.

Temperature records for mainstem Greasy Creek in 2013 demonstrate the longest sustained period above 64°F that we have observed to date, with 80 days above 64°F (7-day maximum average) at the confluence of Greasy Creek and Marys River and 38 days above 64°F at the confluence of Rock and Greasy creeks. In contrast, there were only 38 days at or above the 64°F threshold in 2012 at the confluence of Greasy Creek and Marys River and none in 2010. Contrary to our expectations, cutthroat abundance was highest in Griffith Creek in the year when mainstem Greasy Creek temperatures

were lowest. It is likely that there are other environmental factors at play in the large variation in abundance observed in Griffith Creek, which are not captured in our monitoring efforts. This realization leads us to consider the possible role of variable summer flow volumes emanating from Griffith Creek as a result of variation in base flow and potential differences in withdrawals at the water intake facility on Griffith Creek. Griffith Creek summer flow volumes have not historically been monitored, but this additional information could be valuable for determining the presence or absence of a correlation to the observed changes in cutthroat abundance between years.

Given that the mainstem of Greasy Creek frequently appears to exceed DEQ water quality standards for salmonid rearing temperature (<64°F) and that the temperature exceedance can be sustained for long periods between July and September, maintaining or creating a temperature differential in Rock Creek at the Greasy confluence is still a critical restoration objective. Maintaining Rock Creek as a functional temperature refuge has survival implications for the Greasy Creek cutthroat trout deme. Prolonged, elevated stream temperatures are known to impose stress on salmonids, reducing survival rates directly and indirectly. The City of Corvallis' management objective is not to exceed the DEQ water quality standards (64°F or 17.8° C) on City ownership in mainstem Rock Creek. To ensure the long-term persistence and resilience of Greasy Creek cutthroat trout, we may want to take a hard look at the role Rock Creek plays within Greasy Creek and in the greater Marys River basin. What are the 5th field (Marys River) limitations to system function and what important seasonal functions might individual 6th field watersheds (e.g., Rock Creek) need to contribute so that the basin (Marys) functions as a system? Because Rock Creek is the premier source of high water quality for the Marys (in terms of volume and temperature), it also represents the greatest opportunity for restoration and aquatic conservation in the Marys River basin. There has already been significant public investment in planning and restoration actions. Maximizing the conservation potential of Rock Creek to improve aquatic habitat in Greasy Creek through timed contributions of cool water is a challenging, but potentially worthy conservation objective.

Describe any maintenance or modifications made since project completion/most recent report?
The high flow events of 2012 mobilized two logs from the uppermost large wood structure, which floated to the first bridge crossing. City staff cut the logs down, and they subsequently have lodged firmly in the next log structure downstream.

Woody debris has accumulated at the outlet of the Middle Fork Rock Cr culvert (see February 2014 photos, attached). Annual monitoring and maintenance are recommended to prevent plugging and scour of bank.

Account for any expenses associated with project maintenance and reporting to the Board.

Photo reconnaissance	4.5 hours
Assembly of report	2.5 hours
Snorkel inventory & report	64 hours (Yr 2 and 3 supported by City of Corvallis; Year 4 & 5 covered by City of Corvallis and Meyer Memorial Trust Model Watershed Program)

Summary of public awareness and/or educational activities related to the project, undertaken since project completion/the most recent report:

- Leadership Corvallis Natural Resource Day tour included a visit to the Rock Creek projects, May 2012;
- Tour for Dan Whelan, Senator Merkley's Field Representative & Natural Resources Liaison, hosted by USFS, Cascade Pacific RC&D, City of Corvallis and Marys River Watershed Council, May 2013;
- City of Corvallis Watershed Tour visited a subset of these sites, May 2013.

Lessons learned from the project:

Marys River Watershed Council and City of Corvallis Public Works expect to continue to monitor fish abundance and distribution through snorkel surveys, as part of Corvallis' long-term management strategy for Rock Creek and MRWC's restoration strategy for the greater Greasy Creek subbasin. In 2013, snorkel survey timing was shifted from late May/early June (spawning run) to the late July/early August stream temperature "pinch period". Future surveys are intended to detect changes in distribution and abundance of cutthroat trout as they relate to past and future restoration actions that address temperature limitations occurring during summer flow regimes.

Photopoint monitoring

Photos documenting Karen Fleck Harding's February 2014 monitoring visit are attached.

Inlet to Griffith Creek culvert (upstream).

Outlet of Griffith Creek Culvert (downstream).

Inlet to Middle Fork Rock Creek culvert (upstream).

Outlet of Middle Fork Rock Creek culvert (downstream) – accumulating debris may require removal to prevent clogging outlet.

Scour caused by previous Middle Fork Rock Creek culvert. No additional scour observed this year to date (February 2014).

Inlet of Tributary D culvert (upstream).

Outlet of Tribuary D culvert (downstream).

Simulated streambed, Tributary D culvert.

Stillson Creek culvert inlet (upstream).

Stillson Creek culvert outlet (downstream).

Stillson Creek simulated streambed.

Helicopter placed large wood structures accumulated significant mobile debris and gravels during 2012 and 2014 high flow events.

First structure above Griffith Cr.

Structure above Stillson Cr

Structure below Trib D