7-8-09

Post Restoration Monitoring Summary
Rock Creek Project (Marys River Basin)

Project Sponsors include:

The City of Corvallis
Oregon Watershed Enhancement Board (OWEB)
Marys River Watershed Council
Oregon Department of Fish and Wildlife (ODFW) Fish Passage Program
United States Forest Service (USFS)

Introduction

This summary focuses on the response of native Cutthroat in the Rock Cr subbasin of the Marys River following an intensive restoration project conducted in 2008 that centered on providing unimpeded access for both juvenile and adult Cutthroat to approximately 8 miles of previously inaccessible habitats. These headwater habitats exhibited the potential for providing additional capacity for spawning, rearing and thermal refugia. By necessity, the entire hydrologic unit described as Rock Creek and its tributaries has been analyzed as a single functional unit that extends below and above the boundaries of the City of Corvallis ownership where all of the project activities occurred. This was imperative because the distribution of Cutthroat is dynamic and always responding to the basin scale influences of temperature and the variable locations of key spawning and rearing habitats.

The post project monitoring consisted of a 20 percent snorkel inventory of the distribution and abundance of Cutthroat conducted on May 19-21, 2009. The baseline inventory of Cutthroat distribution conducted prior to project implementation was conducted May 19-21, 2006. The primary objective of this review was to compare these pre and post abundances and distributions of Cutthroat as a method for assessing the efficacy of the multiple fish passage improvements.

Methodology

Protocols involved the Rapid Bio-Assessment (RBA) methodology developed by Bio-Surveys, LLC for snorkel inventory. This is a random sampling strategy that is designed to gather a 20 percent sample of all pool habitats within the current distribution of Cutthroat for the Rock Cr subbasin. The method collects pool metrics and classifies variations in habitat complexity.

The survey was initiated at the mouth of Rock Cr (confluence of Greasy Cr) and continued up the mainstem of Rock and it's tributaries until increases in gradient diminished the potential of the aquatic habitat for providing significant Cutthroat production. The survey included 11.2 miles of contiguous stream habitat.

Both the pre and post snorkel surveys were conducted at identical times (May19-21) 3 years apart. In addition, the start and finish points of the inventory were also maintained for consistency.

Pre project conditions

Basin scale aquatic issues effecting Cutthroat trout distribution and abundance

Extremely high water quality (temperature) was identified in the headwaters of the Rock Creek subbasin. All headwater streams originate from high coastal elevations and flow through largely intact Late Successional Reserves (LSR) on USFS property. Canyons are narrow, steep, heavily canopied and exhibit limited solar exposure on the aquatic habitats of Rock Creek tributaries. Wood densities are high, resulting in deep accumulations of transient bedload material (sand, gravel and cobble). These deep bedloads of migratory substrate store and buffer summer flows from the impacts of direct sunlight and air.

Each of the major headwater tributaries (North Fork, South Fork, Middle Fork and Griffith Creek) eventually transitions onto the City of Corvallis ownership, which is positioned lower in the watershed. The natural geomorphology of the City's ownership is described by wider floodplains and flatter channel gradients. These two natural features predispose the stream corridor to increased impacts from air and solar exposure. Lower stream gradients (<2%) lengthen the window of solar exposure which is exacerbated by the east / west aspect of significant portions of the Rock Creek mainstem. Add the decrease in stored bed load from low instream wood densities on City property and the stream begins to exhibit exposed bedrock functioning as summer heat sinks. Pool turnover rates (the time water is retained in a single pool) are higher with reduced gradient, resulting in prolonged exposure to warming bedrock and sunlight.

Because increases in mainstem water temperatures are known to trigger upstream temperature dependant migrations during late spring and summer and because of the known abundance of high quality spawning gravel in the upper reaches of Rock Cr and its tributaries, the provision of access to these habitats was identified as a high priority aquatic restoration prescription in the City of Corvallis Forest Stewardship Plan. The perceived high priority fish passage issues were identified and prioritized as follows:

1) Water intake diversion dam on SF Rock without a functional fish ladder
2) MF Rock culvert w/ 3ft vertical perch
3) Water intake diversion dam on Griffith Cr. without a functional fish ladder
4) 4 ft natural bedrock intrusion at RM 1.5 (Rock Cr mainstem) with right angle water delivery into jump pool.
5) Griffith Cr culvert w/ 0.5ft perch with juvenile velocity issues.
6) Stillson Cr culvert w/ 2ft vertical perch
7) Trib D culvert w/ 1ft vertical perch

Project Activities

1) Design and construct a fish ladder with 6 inch lifts to meet current NMFS fish passage criteria for passing both adult and juvenile age classes of Cutthroat.

2) Design and install a 14 ft wide culvert with an internal simulated stream channel.

3) Design and construct a fish ladder with 6 inch lifts to meet current NMFS fish passage criteria for passing both adult and juvenile age classes of Cutthroat.

4) Design and construct an instream log structure to divert current side channel flow into historic channel that provides direct delivery of the thalweg into the existing jump pool below.

5) Design and install a 14 ft wide culvert with an internal simulated stream channel.

6) Design and install a 14 ft wide culvert with an internal simulated stream channel.

7) Design and install an 11 ft wide culvert with an internal simulated stream channel.

Monitoring Results

The results of both the pre and post project inventory have been summarized below. (Table 1)

Rock Cr Comparative Analysis / Results of 20% snorkel Inventory

Stream	Total 1+ and older Cutthroat				% change in abundance		
	2006 (Pre)	2009	2010	2011	2009	2010	2011
Griffith (below dam)	**60**	**120**			**100%**		
Griffith (above dam)	**170**	**330**			**94%**		
MF Rock	135	115			-15%		
NF Rock	265	235			-11%		
Stillson	**20**	**45**			**125%**		
Trib D	**25**	**30**			**20%**		
Rock (below dam)	720	385			-47%		
Rock (above dam)	**285**	**490**			**72%**		
Total	**1,680**	**1,750**			4%		

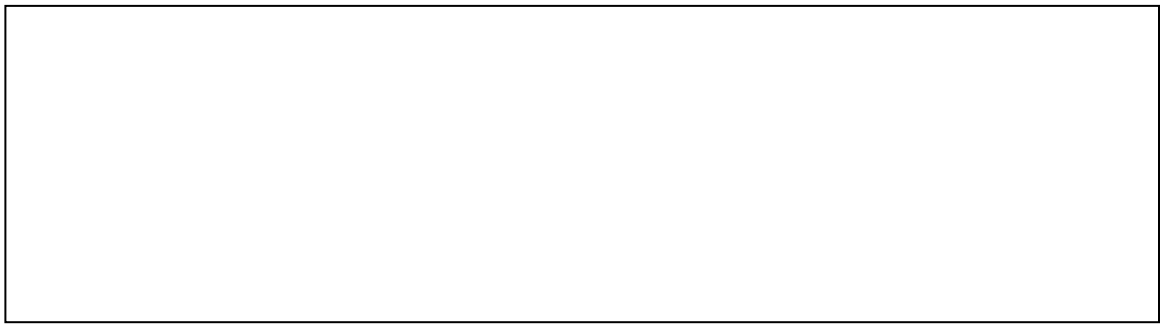

Table 1 suggests that insignificant changes in the basin scale abundance of Cutthroat were observed between the pre and post project inventories (4%). This implies that the observed changes in distribution were likely not an artifact of density dependant pressures on the existing population. This was a fortunate condition for this first year of monitoring that assisted in witnessing a clear response to improved access to headwater tributaries.

NF Rock is a stream segment included in this inventory as a control for possible changes in population structure, distribution or abundance not influenced by migrants from anywhere else in the basin. This is made possible by the impassable dam on the outfall of the NF Reservoir. This stream segment exhibited a minor decrease in abundance (-11%) and no change in distribution between pre and post inventories.

The dramatic changes observed were the large decreases in the abundance of Cutthroat rearing in the mainstem of Rock Cr and the complimentary large increases of Cutthroat in the headwater stream segments above the SF Rock water intake structure (see figures 1 & 2) and above the Griffith Cr water intake structure (see figures 3 & 4). The shift in distributions from the mainstem of Rock Cr to stream segments above the diversion dams is a sound and clear indicator of successful upstream passage through the newly constructed fish ladders as well as the new Griffith Cr culvert installed below the water intake dam. Regardless of the biological driver of this migration (spawning or elevated mainstem temperatures) it is clear that a significant component of the standing population succeeded in passing these known historical barriers.

Additional support for this conclusion was observed at RM 1.5 where a large concentration of older age class Cutthroat (28 individuals) was observed pre project (2006) attempting to jump a 4ft vertical bedrock falls. Only 1 Cutthroat was observed in the pool below this falls in the post project inventory conducted on the same date. The log structure placed above this falls to realign the thalweg appeared to be very effective in providing unencumbered passage.

Additional habitat complexity was provided to the mainstem of Rock Cr by placing 23 log structure complexes by helicopter. As a result of these structures it was observed during the inventory that approximately 71% of the Cutthroat remaining in the treated reach of the mainstem of Rock Cr by May 20 were disproportionately accumulating at log structure sites. The structure sites comprised approximately 33% of the available pool habitats. Additional habitat complexity in the form of improved floodplain interaction, channel braiding from bedload aggradation and the accumulation of transient canopy litter are expected to also improve over time as these sites mature.

Two of the other culvert replacements (Stillson Cr and Trib D) also exhibited increases in fish abundance above the repaired crossing. The increase in Stillson was 125% of pre project abundance and the increase in Trib D was 20%. These two tributaries provide cold water refugia from the mainstem and it is conceivable that

increases in abundance could be more significant later during pinch period low flows in the mainstem. The actual numbers of Cutthroat that these increases represent however are minor from a basin scale perspective.

Only one of the passage project sites (MF Rock) failed to exhibit an increase in the abundance of Cutthroat above the repaired crossing. No obvious issues were observed upon inspection of the repaired crossing indicating that it would not have the capacity for passing all age classes of migrant Cutthroat. An additional late summer inventory could be informative for understanding how refugia in the MF Rock may be functioning for upstream temperature dependant migrants.

Conclusion

These are the results of the first of three scheduled years of monitoring. Obvious and significant alterations in Cutthroat distribution were observed that suggest that the improvements in fish passage infrastructure conducted by the consortium of partners has been immediately effective in providing access to high quality headwater habitats. It is expected that the continued monitoring (2010, 2011) will in addition, be able to quantify an increase in basin scale Cutthroat abundance associated with increases in survival and production. These increases will come as a result of providing unimpeded access to high quality spawning beds and summer thermal refugia.

FIGURE 1

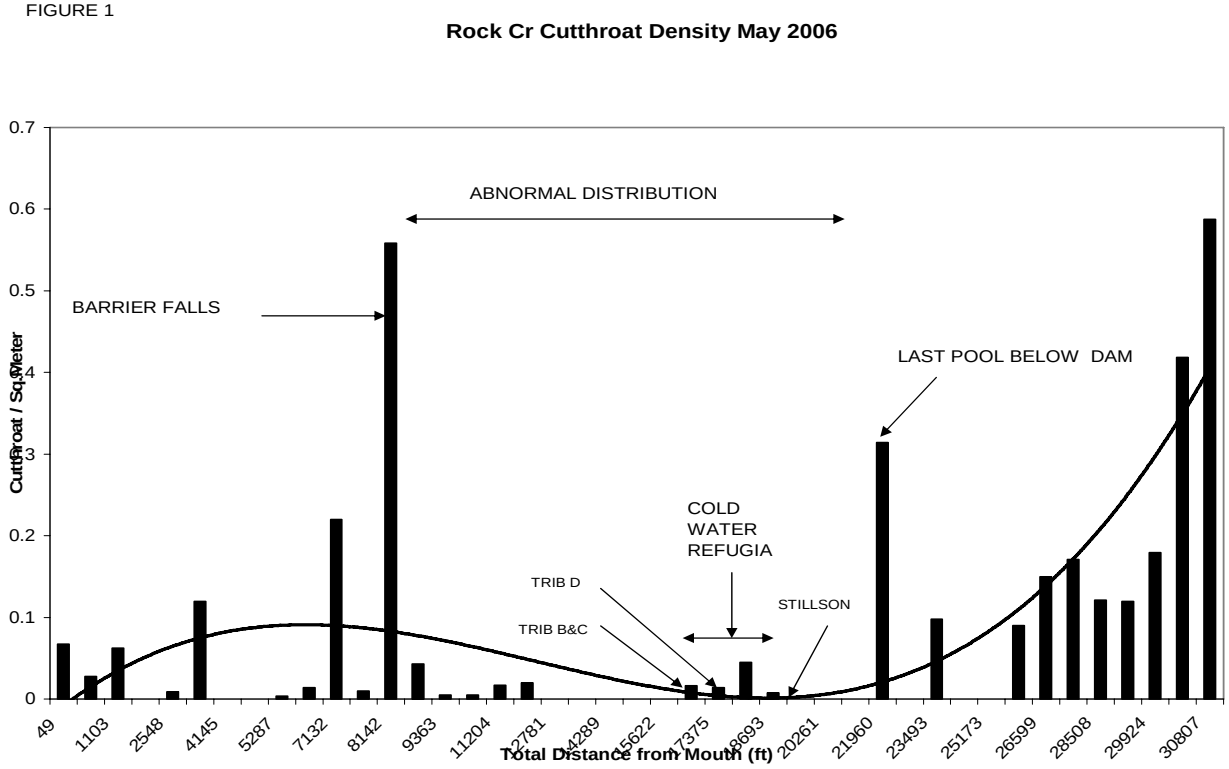

FIGURE 2

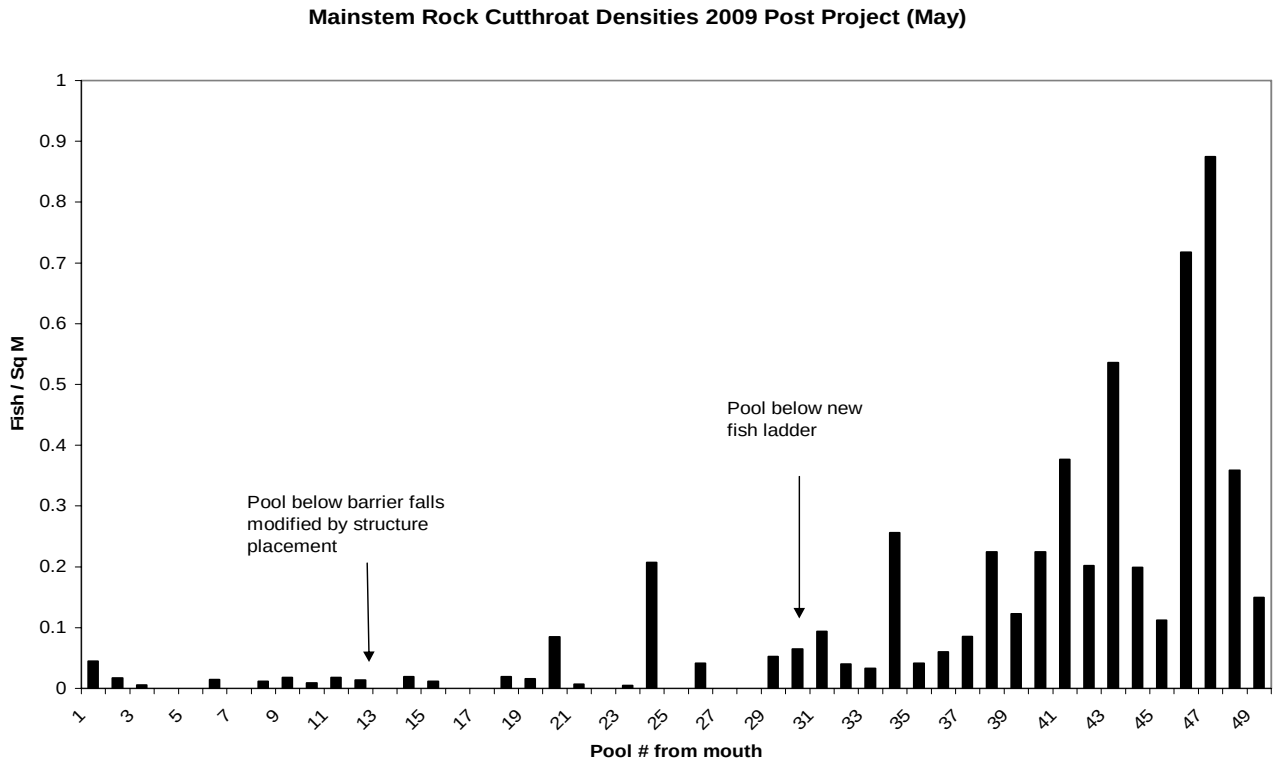

FIGURE 3

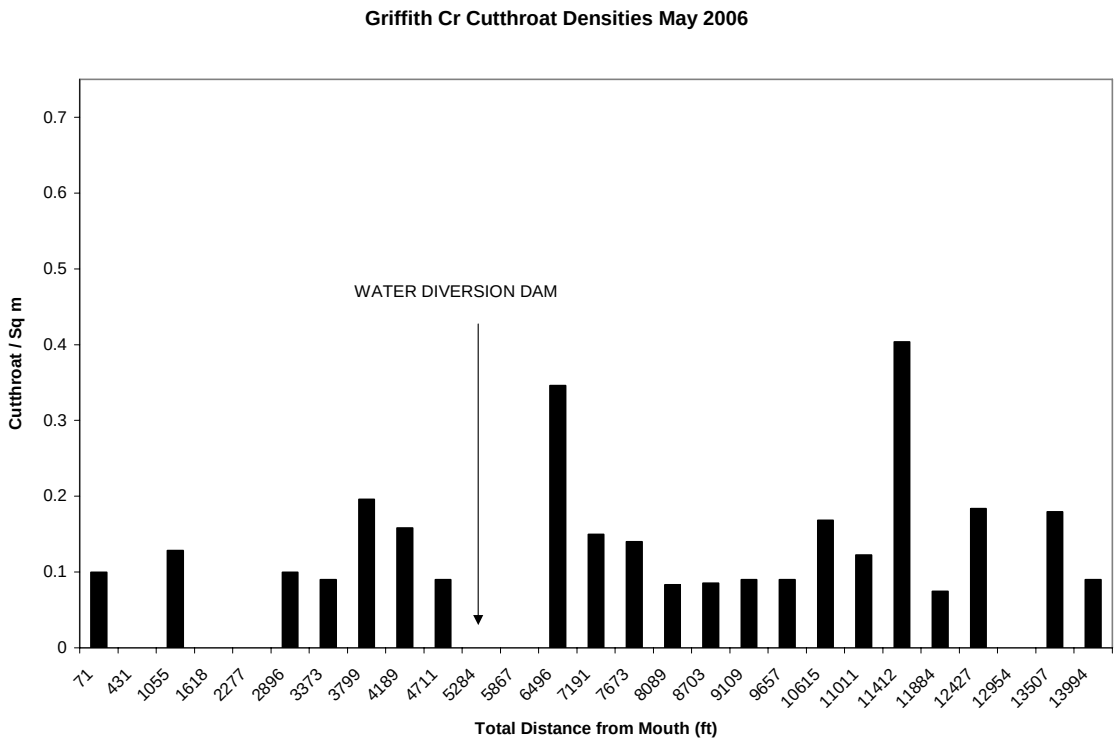

FIGURE 4