Cedar Creek Monitoring Report

Yellowstone River Basin

2015

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Montana Fish, Wildlife & Parks
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Background

Cedar Creek is located approximately 10 miles north of Gardiner Montana. The stream originates in the Absaroka Mountains and flows westerly for 8 miles to its confluence with the Yellowstone River. Cedar Creek is an important spawning tributary for Yellowstone cutthroat trout (YCT), a Species of Special Concern for the State of Montana, in the Upper Yellowstone River basin (Berg 1975, Clancy 1988, Byorth 1990, and Roulson 2002).

Since 1969, Side-by-side culverts located under HWY 89 South have limited access and movement of YCT for spawing in Cedar Creek (Berg 1975;Figure 1). The culverts were 148-feet long, 6.2-feet in diameter, and were on a 4.4% slope. Clancy (1988) determined that limited access to the tributary for Yellowstone cutthroat trout was affecting the Yellowstone River population. In an attempt to improve access for fish, a fish ladder was placed in the north culvert in 1981 (Clancy and Reichmuth 1990; Figure 2). Initially, fish were able to use the new ladder and move upstream of the culverts to spawn and only used the culvert with the fish ladder to do so (Belford and Gould 1989). Over time the ladder and culverts themselves began to fail. In addition to the failing infrastructure the culverts had become perched on the downstream end as the result of down cutting and further limited passage of YCT.

- Figure 1: Upstream entrance of the two culverts under HWY 89 South that were replaced. Photo courtesy of Montana Dept. of Transportation.

• Figure 2: Downstream end of the two culverts under HWY 89 South. You can see part of the historic fish ladder frame in the culvert on the right. Photo courtesy of Montana Dept. of Transportation.

Fish, Wildlife & Parks (FWP) initiated water leases in Cedar Creek as an additional measure to protect and ensure adequate water for YCT spawning, incubation of eggs, and recruitment of fry. The first water lease began in 2003 and secured 3.25 to 3.76 cfs of water from April1 to November 4 for a period of 30 years (Table 1). As second lease was negotiated with the US Forest Service in 2005 and secured 6.3 to 9.6 cfs from May 1 to October 15 for a period of 10 years. This lease is currently in the process of being renewed for another 10 years.

• Table 1: FWP water leasing and purchase information for Cedar Creek by year.

Year	Term	Quantity	Use	Cost
2003	30 Years	3.25-3.76	Apr.1-Nov.4	$40K one-time payment
2005	10 Years	6.3-9.6	May1-Oct.15	$1.00 per year
2008	Purchase	3.25-3.76	April.1-Nov.4	$75K

In 2014, after 10 years of planning and negotiations with adjacent landowners the culverts were replaced by the Montana Department of Transportation (MDT) with a structure that will allow

for adequate fish passage. The structure is a 162-foot long concrete box culvert that is 12-feet wide and 16-feet tall. The structure is countersunk two feet into the stream bed to ensure long-term fish passage and more natural movement of bed load through the structure (Figure 3).

• Figure 3: View from inside the new box culvert following construction, looking upstream.

Procedures

Fish Passage

In an effort to verify fish passage, FWP conducted a fish passage study in summer 2015. YCT, rainbow trout, and hybrid trout 11.8 inches and larger were captured immediately up and downstream of the mouth of Cedar Creek in the Yellowstone River and tagged with a Passive Integrated Transponder (PIT) tag. The PIT tags, 30 mm half-duplex, were placed intramuscularly near the dorsal fin. The tag size did not allow for fish smaller than 11.8 inches in total length to be tagged.

On April 2, 2015, a total of 26 YCT, 20 rainbow trout, and 8 hybrid trout were implanted with PIT tags (Table 2). On April 22, 2015 an additional 49 YCT, 35 rainbow trout, and 7 hybrid fish were implanted with tags.

• Table 2: Numbers of fish that were implanted with a pit tag in the Yellowstone River in spring 2015.

Date	YCT	Rainbow	Hybrid
4/2/15	26	20	8
4/22/15	49	35	7
Total	**75**	**55**	**15**

An antenna system was set up on the upstream end of the new structure to ensure that only fish that had passed through the entire structure were detected. It consisted of two antennas approximately 20 feet apart that were connected to a PIT tag reader that recorded the detection of PIT tags as fish passed through the antennas (Figure 4). The downstream antenna was located just inside the mouth of the box culvert. The use of two antennas allowed for the determination of direction of fish movement, either up or downstream from the structure. The reader was powered by two 6 volt, deep cell batteries that were charged through the use of a solar panel.

• Figure 4: View of the PIT tag station looking upstream from the top of the new structure.

Fish movement was monitored from April 13, 2015 through August 6, 2015. Initially, antenna tuning issues resulted in uncertainty of detection; however this was addressed within the first few

weeks. Therefore, some fish may have moved up or downstream of the antennas and not been detected during the first few weeks of operation.

Redd Counts

Redd counts for YCT were completed in Cedar Creek on June 24, July 2, and July 13, 2015. The reach of Cedar Creek that was examined for redds extended, approximately 800 meters, from downstream of the new structure to an upstream irrigation diversion. This reach included the area where YCT spawning was documented in the late 1980s (Byorth 1990).

Cedar Creek is a high gradient, boulder dominated system with limited gravel. Spawning was confirmed where fish were observed actively spawning or where the gravel had been recently disturbed and was loose when probed. In order to avoid counting the same redd multiple times, individual redds were marked with a fluorescent green rock (Carol Endicott, FWP, personal communication).

Results

Fish Passage

A total of 16 individual fish passed upstream through the new box culvert and were detected by the antenna system. This included 9 YCT, 3 rainbow trout, and 3 hybrid trout. The first fish detected was a rainbow trout that moved upstream on April 21, 2015 and the last fish was YCT moving downstream on July 7, 2015.

The length of fish that passed through the structure ranged from 11.8 to 15.2 inches in total length (Table 3). It should be noted that fish less that 11.8 inches in total length were not implanted with PIT tags.

- Table 3: Total lengths of trout, by species, that were tagged with a PIT tag and were able pass through the new box culvert.

YCT	Rainbow	Hybrid
11.8	14.3	12.2
12.2	14.6	15.1
12.4	15.2	15.1
12.5		
12.5		
12.8		
13.2		
13.8		
14.5		

Redd Counts

YCT were observed staging both upstream and downstream of the new box culvert during all redd counts. As would be expected, numbers of staging fish declined over time. Redds and fish were not observable in a large reach of the known spawning area as a result of turbulence created by relatively high flows in a high gradient reach that began about 400 meters upstream from the confluence with the Yellowstone River.

A total of 36 redds were observed and most, 27, were located inside the box culvert in small patches of gravel (Figure 5). As a result acquiring GPS coordinates for these redds was not possible. The majority of redds observed outside of the box culvert were located in a large deposit of gravel at the outlet of the box concrete culvert. The number of redds counted in this area are likely an underestimate, as the degree of which the gravel was disturbed suggested superimposition of redds. Only three redds were observed upstream of the box culvert, although YCT were present upstream of the structure. One factor that may have contributed to this limited number of redds was that during all sampling events, flows were high enough to obscure the streambed and potentially, spawning fish (Carol Endicott, FWP, personal communication).

- Figure 5: Arial view of Cedar Creek with the location of observed redd indicated by green dots. The majority of the observed redds were inside the new box culvert as indicated on the photo.

The number of observed redds was considerably less than the 72 counted in 1988 and 138 counted in1989 (Table 4). Although the 2015 sampling period coincided with redd counts conducted in the 1980s, the number of sampling events in the 1980s was not reported. Relatively high flows in 2015 may also have contributed to missing existing redds. A substantial proportion

of YCT redds were present in cascades, which accounted for 58% of the available habitat, and this habitat was obscured by relatively high flows and turbulence (Carol Endicott, FWP, personal communication).

- Table 4: Number of observed YCT redds in Cedar Creek by year.

Year	Redds
1988	72 (All Season)
1989	138 (All Season)
1992	34 (1 Day)
1997	19 (1 Day)
2004	54 (1Day)
2005	74 (Near Peak)
2015	36 (June 24-July 13)

Discussion

As a result of the fish passage study and redd counts, it is apparent that fish, including YCT, rainbow, and hybrid trout, are able to pass through the new structure. Redd count data indicates that YCT were able to successfully spawn upstream of the structure. The new structure should provide improved access upstream of HWY 89 for trout over a wide range of flows. Future monitoring of both Cedar Creek and the main stem Yellowstone will provide an indication if increased spawing access has resulted in an increase in abundance of mainstem Yellowstone River fish.

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