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**Memorandum**

**To:** Robin Knox – Western Native Trout Initiative

**From:** Scott Christy – Trout Unlimited

**Re:** Invoice and Final Report – Telemetry Study Support for Meeteetse, WY Adopt A Trout Program

**Date:** April 1, 2014

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The Greybull Adopt A Trout Program is complete. The **\$3,000** awarded from WNTI purchased materials and services to implement the Adopt a Trout program and the associated fish movement study on the Greybull River. This study documents Yellowstone cutthroat trout (YCT) movement in the Greybull River drainage before and after the replacement of the Upper Sunshine Diversion and installation of a fish ladder. In addition, the study identified other potential barriers to YCT movement and diversions that may entrain large numbers of YCT. This project directly dovetails with previous Trout Unlimited and Wyoming Game and Fish Department (WGFD) efforts in the drainage.

The study and program required multiple project partners including the WGFD, the East Yellowstone Trout Unlimited Chapter, private landowners, and the Meeteetse School District.

TU will implement projects based on the results of the movement study throughout the Greybull River and Wood River systems to benefit native trout.

A copy of the WGFD report summarizing results of the movement study is also attached.

**Tasks Completed**

This program was initiated in September 2012 and concluded in the spring of 2014.

- Movement study to measure the success of fish passage projects.
- Fisheries education program associated with movement study

**Associated project costs:**

Telemetry Tags	\$5,000
Volunteer Hours	\$5,000

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Buses, Teachers, Classroom Aids	\$5,000
Fish Tracking Flight Time	\$2,057.50
Program Administration and Classroom Visits	\$1,250
PIT Tags	\$690
Educational Materials and Supplies	\$252.50
<b>TOTAL</b>	<b>\$20,500.00</b>

**Other contributing project partners:**

Wyoming Game and Fish	\$5,000
East Yellowstone TU	\$5,000
Meeteetse School District	\$5,000
Trout Unlimited	\$1,250
<b>TOTAL</b>	<b>\$17,500.00</b>

**The financial support of the WNTI is greatly appreciated. We look forward to more opportunities in the future to partner on projects to improve native fish populations and habitats.**

**Photos**



**Photo 1: telemetry tag insertion on the Adopt a Trout field day start with Meeteetse students.**



**Photo 2: fish released back into the Greybull under the Sunshine Diversion.**



**Photo 3: looking upstream at the fish passage ladder on the new Sunshine Diversion.**



**Photo 4: looking upstream at the ladder when operational during spring flows.**

### **Appendix 1: WGFD Greybull Telemetry 2011-2013 Report**

The Greybull River drainage has one of the largest conservation populations of non-introgressed YCT in the Wind-Bighorn Geographic Management Unit. Extensive water development has occurred within the drainage which has fragmented the YCT population. Diversions within the drainage may also entrain YCT. Resident YCT populations exist in many of the tributaries. However it is unknown to what extent fluvial dispersion occurs within the drainage and the overall movement patterns of YCT within the drainage are not well understood. The Greybull River watershed was identified by WGFD as a crucial and enhancement Aquatic Habitat priority for Yellowstone cutthroat trout habitat (WGFD 2009). Opportunities for habitat enhancement may include the removal of fish passage barriers and the reduction of entrainment at irrigation diversions. Restoring connectivity to the Greybull River has been identified as a priority by several entities. In 2012 the Upper Sunshine Diversion on the Greybull River was replaced with a new structure that has an integrated fishway (fish ladder) that should allow for the upstream passage of YCT and other fish species.

A radio telemetry study was initiated in 2011 in an effort to document YCT movements in the Greybull River drainage prior to and following the replacement of the Upper Sunshine Diversion and associated fishway, to identify other barriers to YCT movement, and to identify diversions that may be entraining large numbers of YCT. Twenty-eight additional YCT were implanted with radio transmitters (Advanced Telemetry Systems F1820) in 2013 for a total of 90 YCT radio tagged in the

study (Table 1). These radio transmitters weigh eight grams; have mortality sensors, and a battery life of 534 days. The radio-tagged YCT were tracked weekly through June and July, biweekly through September and monthly through the rest of the year. All YCT tagged in 2013 were in the Greybull River downstream from the Upper Sunshine Diversion. All YCT were at least 450 g (one pound) so that transmitters did not exceed two percent of the fish's body mass (Winter 1983) and were sexually mature individuals.

Table 1. Number captured, mean length in inches (n; stdev) with ranges, and mean weight in pounds (n; stdev) with ranges of YCT captured in the Greybull River and implanted with radio transmitters, 2011-2013.

Species	Number	Mean Length (n; stdev)	Range	Mean Weight (n; stdev)	Range
YCT	90	15 (90; 1.67)	13.4 - 20.7	1.50 (90; 0.49)	0.99 - 3.34

In addition to those YCT implanted with radio tags, Passive Integrated Transponder (PIT) tags were implanted in 243 YCT, 34 MWF, and 2 LNS to document their passage of the Upper Sunshine Diversion fishway (**Error! Reference source not found.**). The benefit of these tags are: (1) they are smaller and therefore can be implanted in smaller juvenile fish, (2) they are much less expensive (<\$3.00 apiece) than radio tags, and (3) movement past a given antennae array can be documented without the active tracking of the individual fish.

Through the course of this study the all radio tagged YCT have been relocated from one to 37 times for a total of 839 unique locations (Figure ). Distances traveled by individual YCT ranged from less than 200 m to over 30 km. There was a large diversity in the distances traveled by individual YCT. Approximately half of the tagged fish moved less than 5 km. Ten percent of the fish moved more than 15 km. Movements were seasonal and primarily associated with spawning (Figure 1).

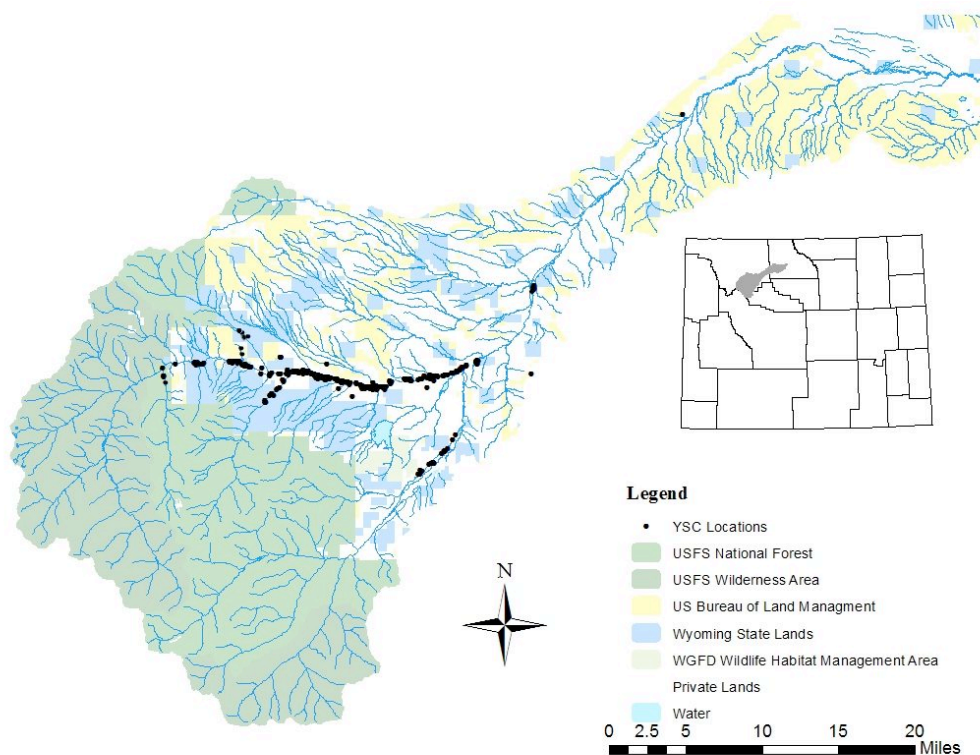


Figure 1. Greybull River drainage with land ownership and locations of radio tagged Yellowstone cutthroat trout 2011-2013.

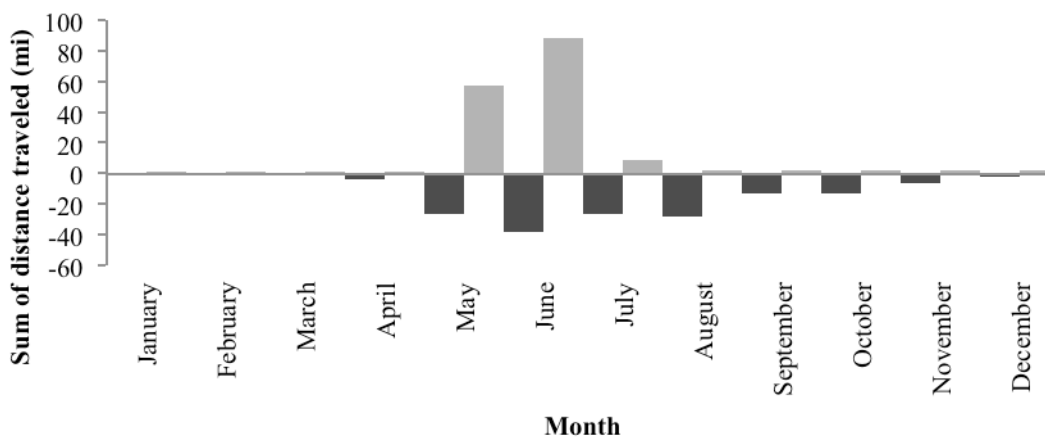


Figure 2. Sum of the distances traveled by the nine individual YCS that moved the farthest during the Greybull River Telemetry Study. Bars above the x-axis indicate distances moved upstream, distances below the x-axis indicate downstream movement.

Of the 90 radio-tagged YCT tagged in 2011 and 2012, 39 died before the battery life expired on the radio tags.

We evaluated fish passage of the Upper Sunshine Diversion by assuming that any of the tagged fish located within 1 mi downstream of the diversion had encountered the diversion in an attempt to pass. Prior to construction in 2011, nine YCT encountered the old Upper Sunshine diversion structure, only one of which (11%) was able to pass upstream.

The low snowpack in the winter of 2011-2012 resulted in Greybull River under regulation throughout the summer of 2012. The Greybull Valley Irrigation District did not use the Upper Sunshine Diversion to add water to Upper Sunshine Reservoir during the irrigation season. The diversion structure was maintained with the radial arm gates in the full open position. Eight YCT encountered the Upper Sunshine Diversion in 2012, two of which (25%) were able to pass upstream. Overall, upstream movements of YCT were less notable in 2012, likely due to the lower flow conditions experienced.

The year of 2013 was the first in which the fishway on the Upper Sunshine Diversion was operational. In 2013, 14 YCT encountered the Upper sunshine Diversion, three of which (21%) were able to pass upstream. The timing of the upstream passage indicates that those YCT were able to navigate upstream through the fishway, as the gates on the Upper Sunshine Diversion were closed during that period.

A multiplexer PIT tag reader array was installed on the Upper Sunshine fishway in 2013. Three antennae were attached to the entrance (downstream) of the fishway, halfway up the fishway and at the upstream extent of the fishway. Tagged YCT were only detected at the fishway entrance but not through the fishway itself. However, these data are inconclusive as the two upstream antenna arrays may have not functioned properly in 2013.

The YCT migration study will be concluded in the summer of 2014, as all tags will have deleted batteries. Future plans are to develop habitat suitability criteria for YCT in the Greybull River based on attributes of occupied habitat documented in 2013 and 2014. These criteria may be utilized in a 2-D model of depth and velocity at a variety of flow regimes in an effort to determine the relationship between discharge and available habitat. This study is being done in relation to hydropower proposals by the Greybull Valley Irrigation District. Continue to, implant as many YCT as possible with passive integrated transponder (PIT) tags and ensure the PIT multiplexer is properly functioning in 2014.