

Fisheries Sampling, West Rosebud Creek Drainage, 2021

I. Introduction

Fisheries sampling is completed every year within the West Rosebud Creek drainage through a partnership with Montana Fish, Wildlife & Parks (FWP), NorthWestern Energy (NWE), and the US Forest Service (USFS). The West Rosebud Creek sample area lies within Stillwater and Carbon counties of southcentral Montana, mostly on public land within the Custer-Gallatin National Forest.

Sampling activities include Rainbow and Brown trout spawning and redd surveys on West Rosebud Creek, gillnetting on West Rosebud and Emerald Lakes, electrofishing on the West Rosebud Creek bypass channel between Mystic and West Rosebud lakes (2 sections), electrofishing on a section of lower West Rosebud Creek near the Mackay property, gillnetting on Mystic Lake, and water temperature monitoring. Redd surveys and Mackay electrofishing share the same sample reach (Figure 1). Sampling procedures are conducted on a three-year cycle, with the exception of redd counts which are conducted annually (Table 1).

In 2021, monitoring activities included Rainbow and Brown trout redd counts on West Rosebud Creek and gillnetting on Mystic Lake. FWP staff members conducted the redd counts, and NWE staff conducted the monitoring on Mystic Lake.

Planned sampling for 2022 includes electrofishing the Mackay section of West Rosebud Creek using a drift boat and mobile electrode to conduct a mark/recapture population estimate for trout, annual Rainbow and Brown trout redd counts, and water temperature monitoring.

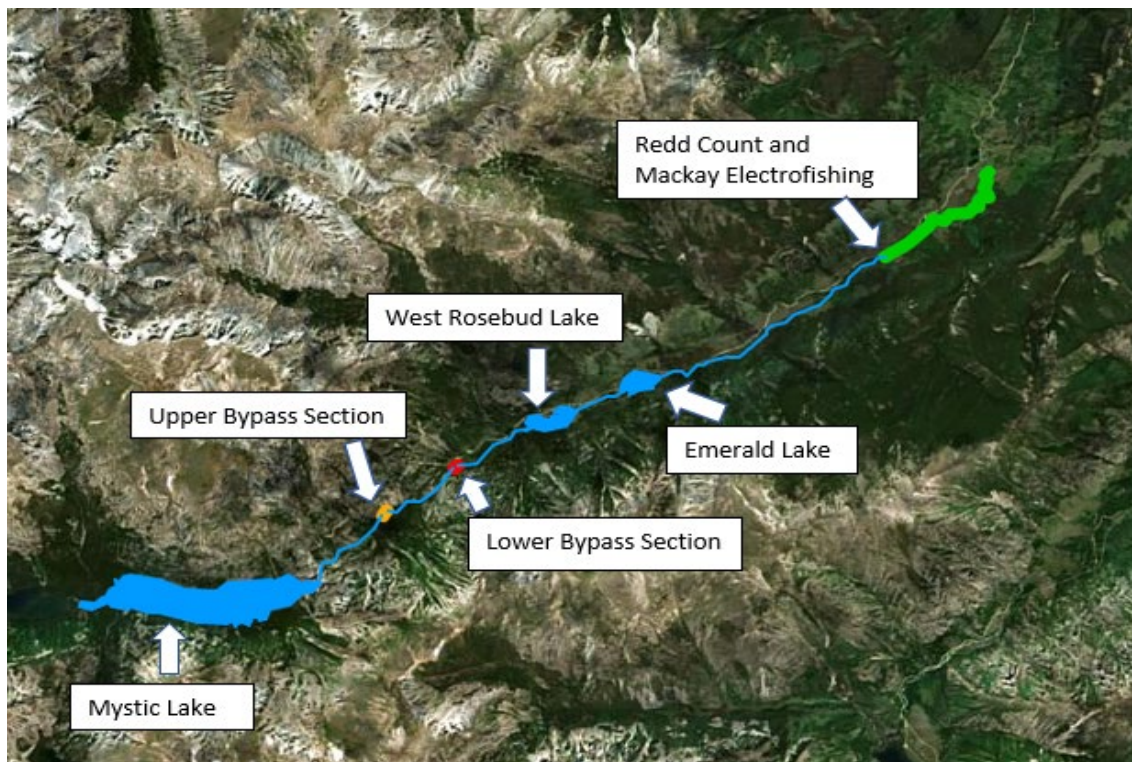


Figure 1: Map of sampling locations in the West Rosebud Creek drainage, Montana.

Table 1: Sampling activities by year in West Rosebud Creek drainage, Montana.

Year	A	B	C	D	E	F
2020		X	X		X	
2021	X				X	

- A: Mystic Lake monitoring
- B: West Rosebud Creek electrofishing, Upper and Lower Bypass sections
- C: West Rosebud and Emerald lakes fish monitoring
- D: West Rosebud Creek electrofishing, Mackay section
- E: West Rosebud Creek Rainbow and Brown trout redd surveys
- F: Water temperature monitoring

II. West Rosebud Creek Redd Surveys

Introduction

Visual Rainbow and Brown trout redd surveys are conducted annually on a 1.6-mile-long section of West Rosebud Creek beginning at the bridge at USFS Pine Grove Campground and ending at the bridge at the boundary of the Mackay property (Figure 2). Surveys are conducted typically by two FWP staff members walking the stream section and recording locations of redds and adult spawning fish via GPS.

Rainbow Trout redd surveys are conducted in early May, and surveys for Brown Trout are conducted in fall, typically late October or early November. Multiple surveys are conducted if it is believed the peak of spawning was not reached during the first survey, and a later survey would yield a higher redd count. Ice conditions on the creek can limit the number of possible Brown Trout surveys, as the high elevation of West Rosebud Creek often results in early winter weather conditions.

Ideal spawning habitat for trout consists of gravel-sized substrate and shallow riffles (Figure 3). Headwater streams such as West Rosebud Creek provide important spawning habitat for migrating trout from the larger Stillwater and Yellowstone rivers.



Figure 2: Rainbow and Brown trout redd survey location on West Rosebud Creek. Survey begins at USFS Pine Grove Campground (45.2756, -109.64542) and ends at the bridge at the Mackay property boundary (45.2856, -109.62406).



Figure 3: Brown Trout redd observed during 2021 survey on West Rosebud Creek. Note the water depth, velocity, and substrate size.

Rainbow Trout

A single spawning survey was conducted for Rainbow Trout on May 19, 2021. Only one redd was recorded, with no adult fish observed.

Rainbow Trout redd surveys have not been conducted as consistently as Brown Trout surveys. Previous surveys yielded very low counts, and have not been regularly conducted since 2014 due to staffing availability on the FWP crew. Only two redds were observed during the 2014 survey. Moving forward, Rainbow Trout redd surveys will be conducted as consistently as Brown Trout surveys.

Brown Trout

A single spawning survey was conducted for Brown Trout on November 3, 2021. Sunny and calm weather made for good visibility. Fifty-one total redds and three adult spawning fish were observed, with locations recorded on GPS (Figure 4). This is the highest number of Brown Trout redds recorded (Table 2). Because so few adult fish were observed during this survey, it is likely the peak of spawning had passed, and an additional survey was not conducted. Redds are often observed in consistent locations from year to year (Figures 4 and 5). Locations were not recorded in the 2020 survey.

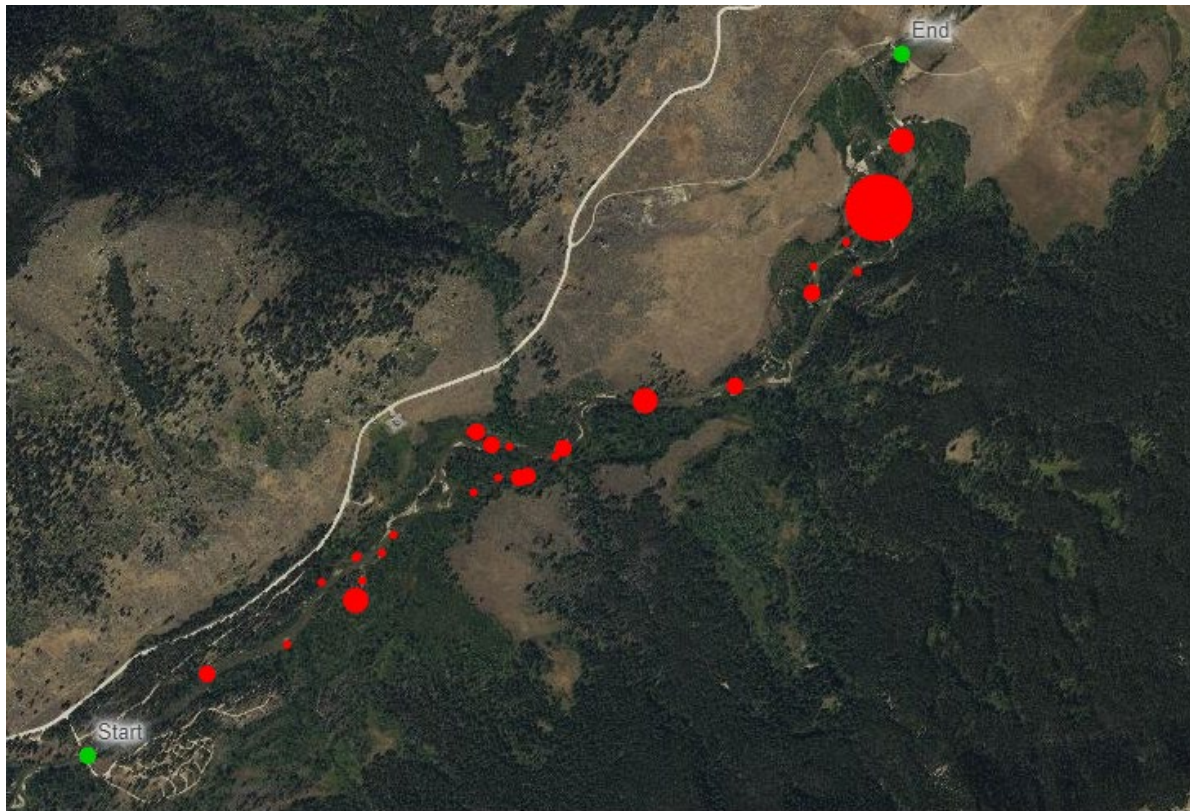


Figure 4: Redd locations from November 3, 2021 Brown Trout spawning survey on West Rosebud Creek. Dot size correlates to number of redds observed in a location.

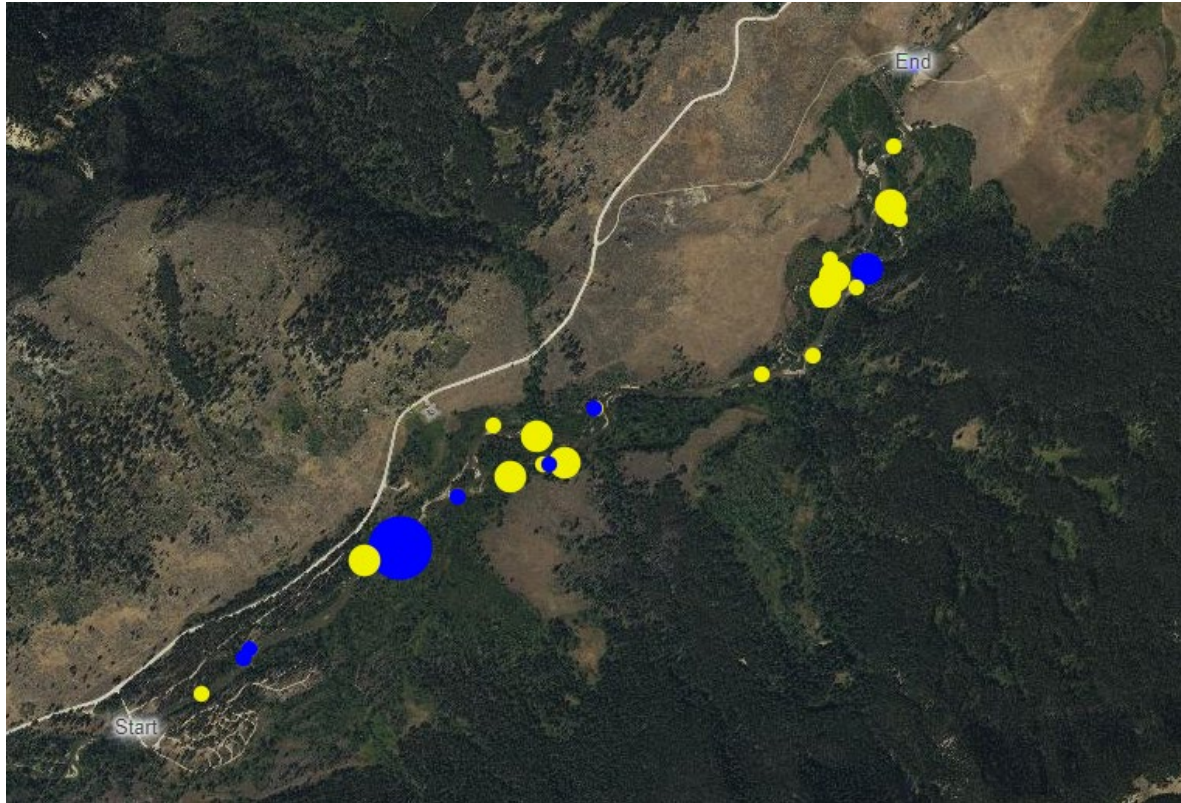


Figure 5: Redd locations from 2018 and 2019 Brown Trout spawning surveys. Yellow indicates 2018 data and blue indicate 2019 data. Dot size correlates to the number of redds observed in a location.

Table 2: Number of redds observed during Brown Trout spawning surveys, 2018-2021.

Year	2018	2019	2020	2021
Brown Trout redds	32	13	24	51

III. Mystic Lake Gillnetting

Introduction

Mystic Lake, the largest lake in the Beartooth Mountains at 435 acres, is located within the West Rosebud Creek drainage. It is a popular hiking destination in the Custer-Gallatin National Forest and is accessed via a well-maintained Forest Service trail, located at the end of West Rosebud Road. Its proximity to Billings, MT and relatively easy access makes Mystic Lake one of the more heavily used lakes for fishing and camping in the Beartooth Mountains.

Mystic Lake was created by a hydroelectric dam built in 1925. The dam is currently operated by NWE. The lake has a maximum depth of 220 feet and sits at an elevation of 7,668 feet.

Rainbow Trout are the most abundant species found in Mystic Lake, with Yellowstone Cutthroat Trout and natural hybrids of the two species present in smaller numbers. Rainbow Trout were stocked annually from 1941-1951, but are now one of the few self-sustaining Rainbow Trout populations in the Beartooth Mountain lakes. Yellowstone Cutthroat Trout were stocked a single time in 1944 and are now

self-sustaining. Hybridization between the two species is common in water bodies where they coexist, resulting in what is often called the “cutbow” trout. Unlike many hybrids, “cutbows” are reproductively viable, leading to continued introgression of the three species. Lake Chub have also been sampled in small numbers in Mystic Lake.

Sampling Procedures

Approximately every three years, gillnets are set on Mystic Lake to conduct fisheries monitoring. Due to the large size of Mystic Lake, sampling is divided into upper and lower sections and conducted over three days. Nets are set using a small boat, owned by NWE, and kept at Mystic Lake for dam maintenance.

Six gillnets—three floating and three sinking—are set overnight in the upper section of the lake (Figure 6). Nets are pulled the following day and fish are identified by species, counted, measured (inches), and weighed (pounds). Following data collection, the same nets are set overnight in the lower section of the lake. Prior to 2021, sampling was conducted in the upper and lower sections in 2018, and the upper section only in 2014.

The gillnets used have experimental mesh sizing, meaning mesh size ranges from 0.75 inches on one end of the net to 2.50 inches on the opposite end.

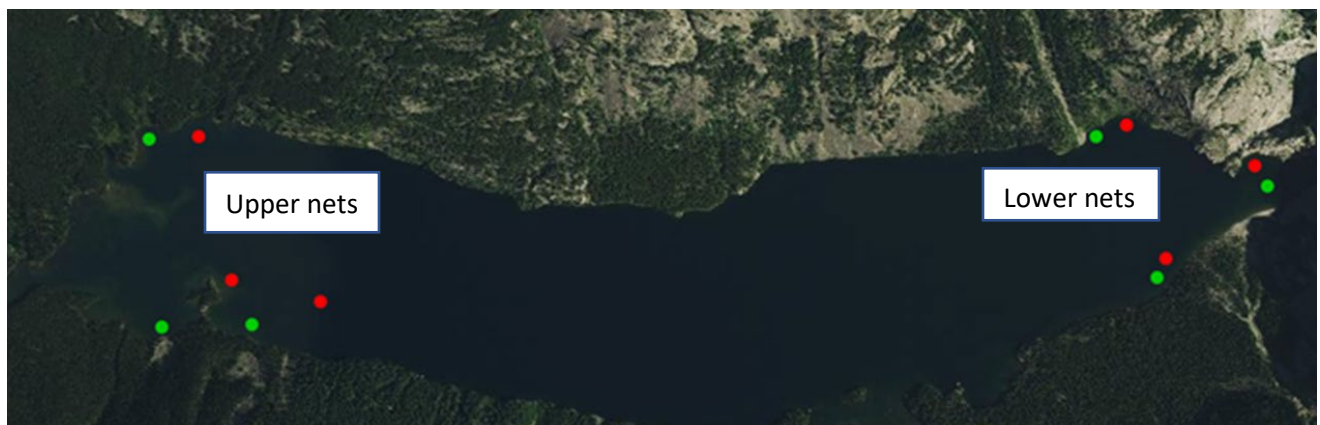


Figure 6: Location of upper and lower nets in Mystic Lake. Red indicates floating gillnet; green indicates sinking gillnet.

Results

Upper Lake

Six gillnets were set overnight on the upper section of Mystic Lake from August 2, 2021 to August 3, 2021, for a combined total of 112.97 net hours.

Rainbow Trout were the most abundant species caught, totaling 98.2% of the total catch in the upper lake nets, while Yellowstone Cutthroat Trout and Lake Chub each accounted for 0.9% of the total catch (Table 3). In every sample year, Rainbow Trout have been the most abundant species caught. Rainbow X Yellowstone Cutthroat trout hybrids were caught in 2014 and 2018, and none were caught in 2021 (Tables 4, 5, and 6). In 2018, hybrids accounted for 30.2% of the total catch. 2021 is the first sample year that a presumed pure Yellowstone Cutthroat Trout was caught in an upper lake net, though visually differentiating between hybrids, Rainbow Trout, and Yellowstone Cutthroat Trout can be difficult. Variances in hybrid trout numbers may have been due to differences in crew members across sample years. Rainbow Trout average length increased by 0.46 inches in 2021 compared to the previous sample from 2018, and was the highest on record for the upper nets (Table 7).

Table 3: Results from upper gillnets in Mystic Lake, 2021.

Species	No. fish caught	Net hours	Fish/net hour	Avg. length (in.)	Length range (in.)	Avg. weight (lb.)	Weight range (lb.)
Lake Chub	1	112.97	0.01	6.0	6.00-6.00	0.10	0.10-0.10
Rainbow Trout	109	112.97	0.97	10.85	6.00-16.50	0.51	0.08-1.46
Yellowstone Cutthroat Trout	1	112.97	0.01	13.20	13.20-13.20	0.90	0.90-0.90

Table 4: Percent of catch by species in upper Mystic Lake gillnets, 2014-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2014	2018	2021
Lake Chub	2.7%	0.0%	0.9%
Rainbow Trout	96.0%	69.8%	98.2%
Hybrid Trout	1.3%	30.2%	0.0%
Yellowstone Cutthroat Trout	0.0%	0.0%	0.9%

Table 5: Total number of individuals caught by species in upper Mystic Lake gillnets, 2014-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2014	2018	2021
Lake Chub	2	0	1
Rainbow Trout	72	125	109
Hybrid Trout	1	54	0
Yellowstone Cutthroat Trout	0	0	1

Table 6: Catch rate per net hour by species in upper Mystic Lake gillnets, 2014-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2014	2018	2021
Lake Chub	0.02	0.00	0.01
Rainbow Trout	0.88	1.38	0.97
Hybrid Trout	0.01	0.60	0.00
Yellowstone Cutthroat Trout	0.00	0.00	0.01

Table 7: Rainbow Trout average lengths (in.) from upper gillnets in Mystic Lake, 2014-2021.

Year	Average length (in.)
2014	10.36
2018	10.39
2021	10.85

Lower Lake

Six gillnets were set overnight on the lower section of Mystic Lake from August 3, 2021 to August 4, 2021, for a combined total of 84.00 net hours.

Rainbow Trout were the only species caught in the lower nets, totaling 107 individuals (Table 8). This percent of catch is significantly higher than the 2018 sample, when Rainbow Trout accounted for 58.8% of the total catch (Tables 9, 10, and 11). In 2018, Yellowstone Cutthroat Trout and Rainbow X Yellowstone Cutthroat hybrids were also caught, accounting for 1.2% and 40.0% of total catch, respectively. Visually differentiating between hybrids, Rainbow Trout, and Yellowstone Cutthroat Trout can be difficult. Variances in hybrid trout numbers may have been due to differences in crew members across sample years. Lake Chub have never been documented in the lower lake nets. Rainbow Trout average length was consistent with the 2018 average length (Table 12).

Table 8: Results from lower gillnets in Mystic Lake, 2021.

Species	No. fish caught	Net hours	Fish/net hour	Avg. Length (in.)	Length range (in.)	Avg. weight (lb.)	Weight range (lb.)
Rainbow Trout	107	84.00	1.27	10.57	6.10-16.70	0.50	0.07-1.59

Table 9: Percent of catch by species in lower Mystic Lake gillnets, 2018-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2018	2021
Rainbow Trout	58.8%	100.0%
Hybrid Trout	40.0%	0.0%
Yellowstone Cutthroat Trout	1.2%	0.0%

Table 10: Total number of individuals caught by species in lower Mystic Lake gillnets, 2018-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2018	2021
Rainbow Trout	50	107
Hybrid Trout	34	0
Yellowstone Cutthroat Trout	1	0

Table 11: Catch rate per net hour by species in lower Mystic Lake gillnets, 2018-2021. Hybrid Trout are crosses between Rainbow Trout and Yellowstone Cutthroat Trout.

Species	2018	2021
Rainbow Trout	0.58	1.27
Hybrid Trout	0.39	0.00
Yellowstone Cutthroat Trout	0.01	0.00

Table 12: Rainbow Trout average lengths (in.) from lower gillnets in Mystic Lake, 2018-2021.

Year	Average length (in.)
2018	10.62
2021	10.57