FWP Fisheries Sampling, West Rosebud Creek Drainage, 2020

I. Introduction

Through a partnership with Montana Fish, Wildlife, & Parks (FWP), US Forest Service (USFS), and NorthWestern Energy (NWE), West Rosebud Creek, West Rosebud Lake, Emerald Lake, and Mystic Lake are sampled on a rotating schedule. The sample area lies in Stillwater and Carbon countries of southcentral Montana, mostly on public land within the Custer-Gallatin National Forest. All sample areas are within the West Rosebud Creek drainage, a tributary to the Stillwater River beginning in the Beartooth Mountain Range. The Stillwater River drainage is highly regarded for its trout angling opportunities.

Sampling activities include Brown Trout spawning and redd surveys on West Rosebud Creek, gillnetting on West Rosebud and Emerald Lakes, gillnetting on Mystic Lake, 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, water quality monitoring (NWE), and habitat surveys on West Rosebud Creek (USFS). 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. In 2020, monitoring activities included Brown Trout redd counts, gillnetting on West Rosebud and Emerald Lakes, and electrofishing two sections on the West Rosebud Creek Bypass Channel.

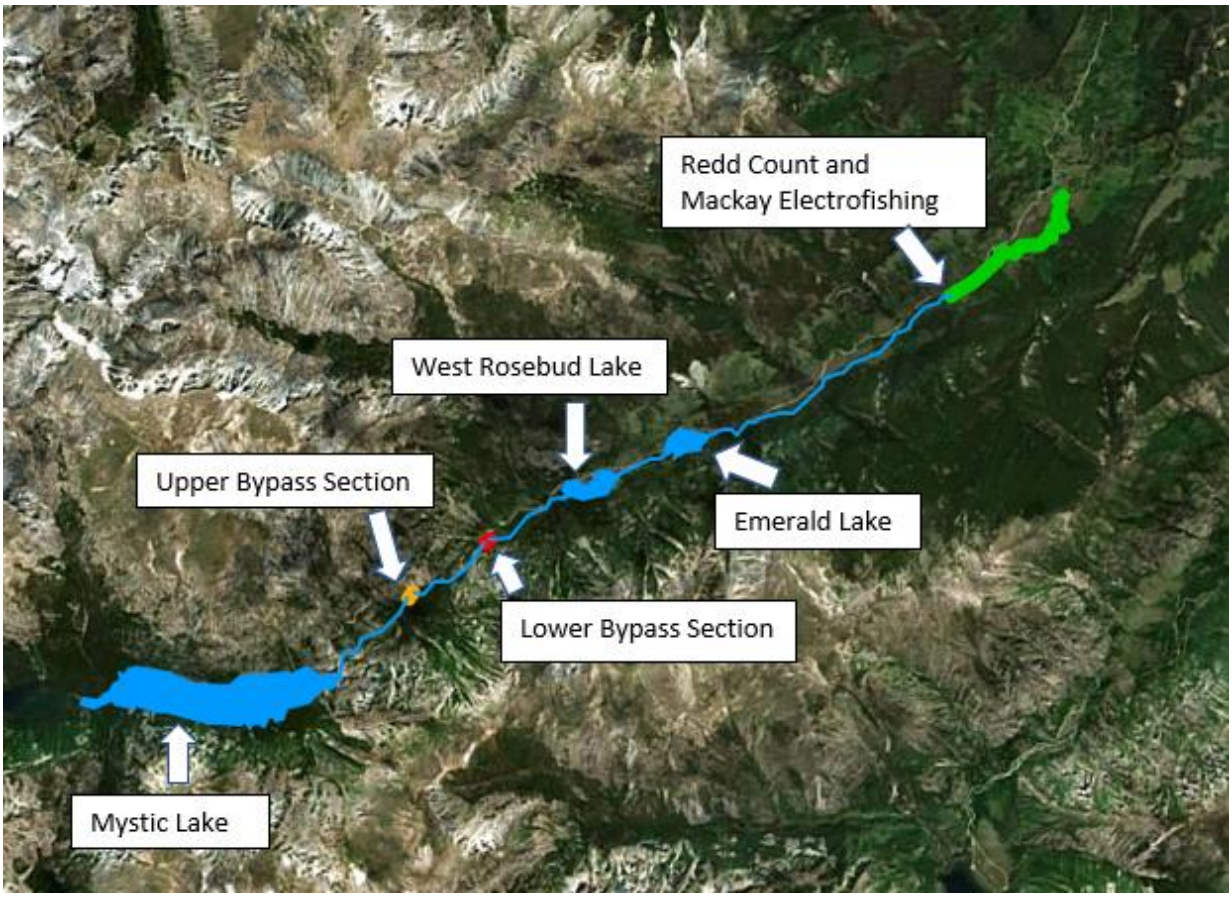

Figure 1: Overview of sample area. Orange line marks Upper Bypass Section, red line marks Lower Bypass Section, green line marks redd count and Mackay section.

II. West Rosebud Creek Brown Trout Redd Surveys

Introduction

Visual Brown Trout redd surveys are conducted annually on a 1.6-mile-long section of West Rosebud Creek beginning at the bridge at Pine Grove Campground and ending at the bridge at the boundary of the Mackay property (Figure 2). Surveys for Brown Trout are conducted in late fall (late Oct-mid Nov). Multiple surveys are often conducted if it is believed the peak of spawning was not reached during the first survey; however, ice conditions on the creek can limit the number of possible surveys to conduct. Resident West Rosebud Creek trout and migrating trout from the Stillwater and Yellowstone rivers use this area to spawn.

Results

Two surveys were conducted in 2018 (Oct. 30 and Nov. 12), with 32 Brown Trout redds observed during both surveys (Figure 2; Table 1). Some redds were found in different locations between surveys, but most were in the same or similar locations across survey dates. A single survey was conducted on Nov. 7 in 2019 and Oct. 29 in 2020 with 13 and 24 redds observed, respectively.

GPS coordinates are typically recorded for redd locations. During the most recent survey in 2020, however, GPS coordinates were not recorded for redd locations, but redds are typically recorded in similar locations every year.

Early ice conditions may also slow down or reduce spawning, as in 2019 when ice conditions were observed during the survey, and the least number of redds were observed in recent survey years. Spring

(late April- mid May) Rainbow Trout redd survey have also been conducted on this section.

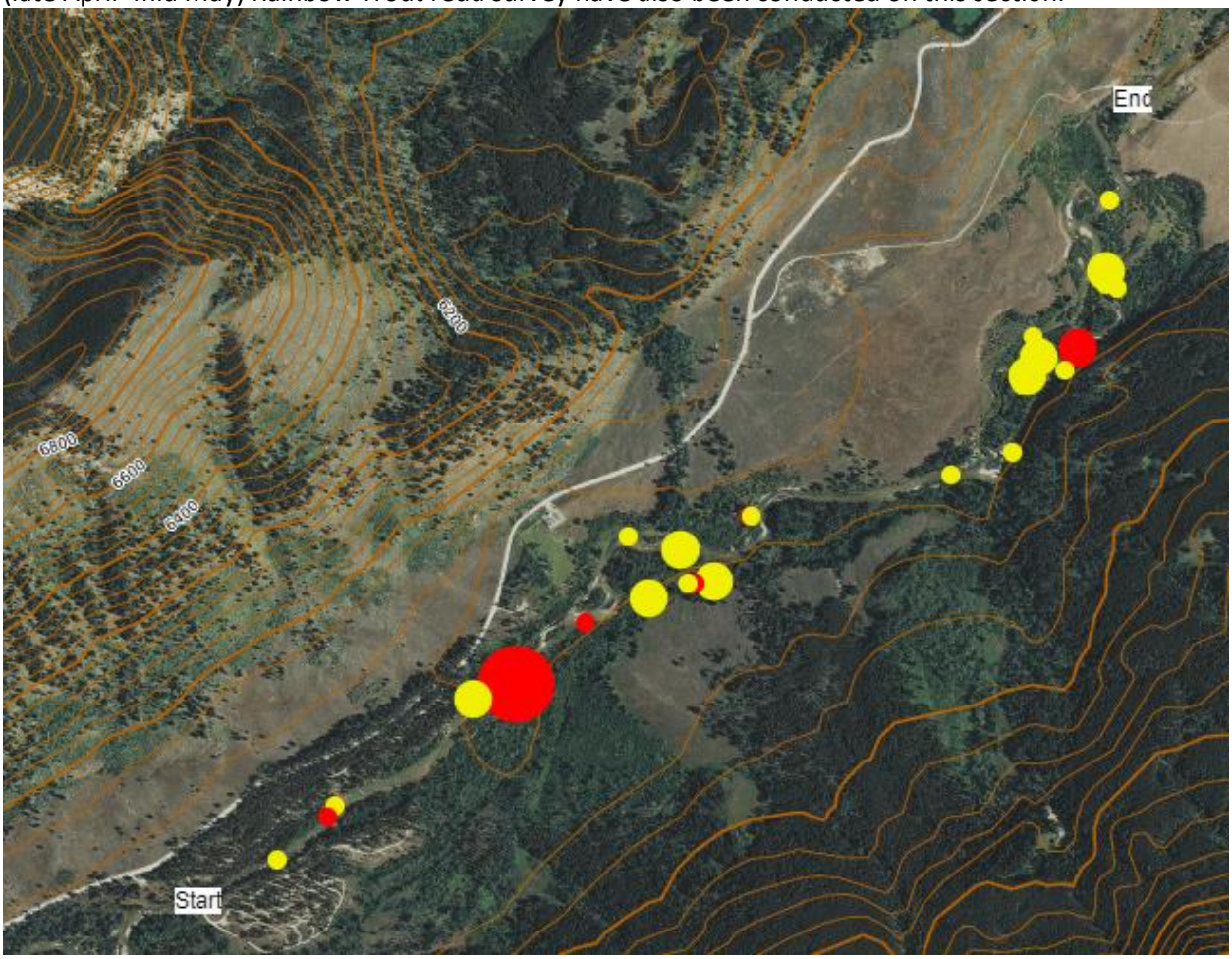

Figure 2: Map of Brown Trout redd locations in West Rosebud Creek. Size of dot reflects number of redds observed in location. Yellow-colored dots represent 2018 data; red-colored dots represent 2019 data. Start (45.2756 N, -109.64542 W); end (45.2856 N, -109.62406 W).

Survey Year	2018	2019	2020
West Rosebud Creek	32	13	24

Table 1: Number of Brown Trout redds observed in 2018, 2019, and 2020, West Rosebud Creek.

III. West Rosebud and Emerald Lakes Gillnetting

Introduction

West Rosebud and Emerald Lakes are located within the West Rosebud Creek drainage. Both lakes are easily accessible by two-wheel drive vehicles in snow-less months. Bordered by Forest Service land and bordering the Absaroka-Beartooth Wilderness, these lakes and surrounding areas are used regularly for fishing, hiking, camping, and other recreational activities. West Rosebud Lake is a 19-acre man-made lake with a maximum depth of 6 feet and sits at an elevation of 6,596 feet. Emerald sits just downstream of West Rosebud and is a 28.5-acre lake with a maximum depth of 4 feet and sits at 6,396 feet.

West Rosebud Lake features a fishing pier, established pathway, and boat launch. Both lakes receive a fair amount of fishing pressure, with an average of 1,992 angler days per year from 2011-2017 for West Rosebud Lake and 1,907 for Emerald Lake.

Stocking

West Rosebud Lake is stocked three times annually with 1,000 6-9-inch Rainbow Trout. Annual stockings take place every month for three months, typically in late spring to mid-summer. Emerald Lake is on the same stocking schedule, receiving 600 Rainbow Trout per stock. Though stocked with RB, both lakes have self-sustained Brown Trout, Mountain Whitefish, and Longnose Sucker populations, and Rainbow Trout are not typically the most abundant species caught in nets. Angling pressure, predation from Brown Trout, and migration downstream are potential causes for the low number of Rainbow Trout observed despite extensive stocking.

Arctic Grayling were stocked a single time in both lakes in 2009, with West Rosebud Lake receiving 270 10-inch fish and Emerald Lake receiving 200 fish of the same size. In 2010, 5 Grayling were caught in West Rosebud Lake nets; this was the only sample year that Grayling were caught.

Every year from 2011-2014, approximately 1,000 5-6-inch Yellowstone Cutthroat Trout were stocked in West Rosebud Lake. Two were caught in West Rosebud Lake nets in 2014.

Sampling Procedures

Gillnets are set approximately every three years on West Rosebud and Emerald Lakes, three nets (two sinking nets and one floating) on West Rosebud Lake and one floating net on Emerald Lake. Nets have been set nine times in West Rosebud between 2001 and 2020 and set eight times in Emerald over the same time period. 2003 was the only sample year when all four nets were set in West Rosebud Lake and none in Emerald Lake. Nets are deployed in consistent locations each year, though net set locations were not recorded every year (Figures 3 and 4; Table 2).

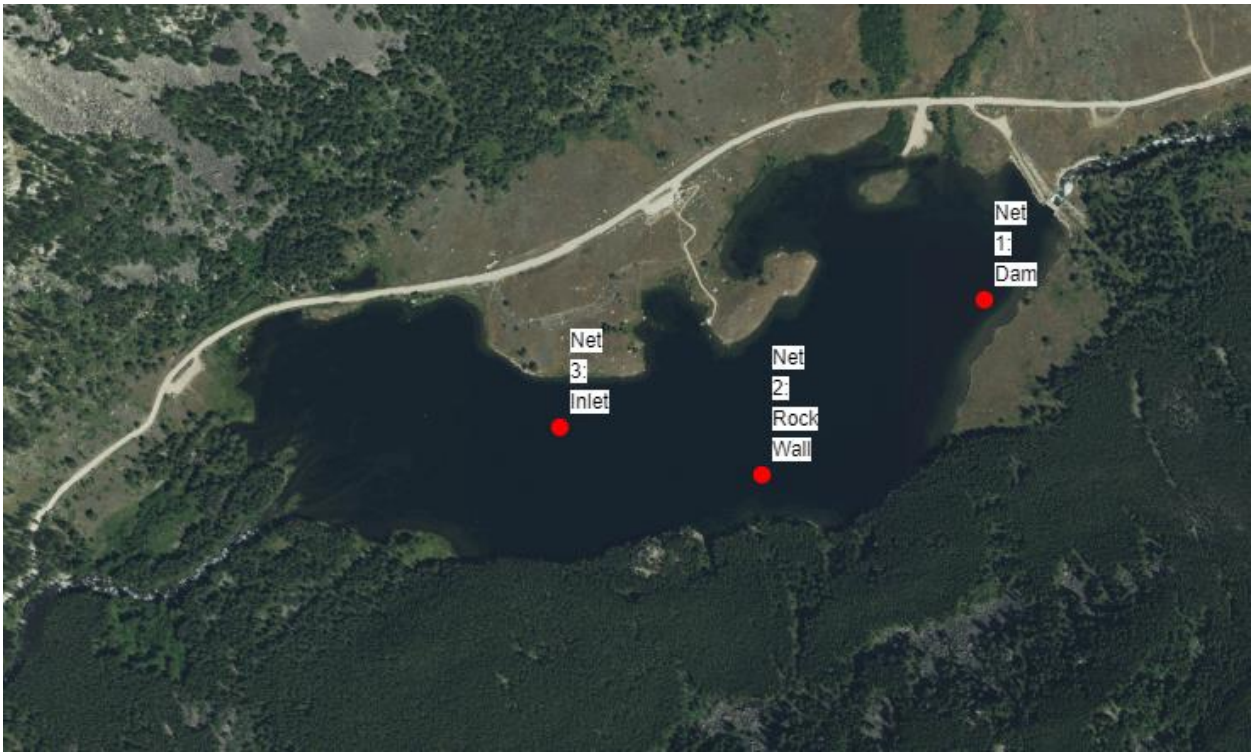

Figure 3: Net locations, West Rosebud Lake.

Figure 4: Net location, Emerald Lake.

Net	Name	Location	Coordinates
Net #1	West Rosebud, sink	SE shore, near dam	45.2512 N -109.70896 W
Net #2	West Rosebud, sink	SE shore, near rock wall	45.24965 N -109.71128 W
Net #3	West Rosebud, float	Near inlet	45.25007 N -109.71382 W
Net #4	Emerald, float	N shore, E end	45.2575 N -109.69237 W

Table 2: Net location and description for West Rosebud and Emerald Lakes.

Results

West Rosebud Lake

Three gillnets were set overnight on West Rosebud Lake from May 19—May 20, 2020, for a combined total of 59.66 net hours. Brook Trout were the most abundant species caught, making up over 50% of the total catch. Other species caught included Brown Trout at 34% of total catch, Longnose Sucker 11% of total catch, and Mountain Whitefish at 4% of total catch (Table 3). The abundance of Brook Trout, Brown Trout, and Longnose Sucker generally reflect the long-term trend, while Mountain Whitefish was significantly lower (Table 4; Figure 5). No Rainbow Trout were caught in the net this year, an anomaly for the long-term trend, though Rainbow Trout are never a significant portion of total catch. Two species were not caught in 2020 that have been sampled in this lake in the past, Arctic Grayling and Yellowstone Cutthroat Trout. These species have only been sampled one year each over the 20-year sampling period, so are very uncommon to catch in the nets.

Lengths of each fish species for 2017 and 2020 followed the 20-year trend closely, with no species showing any major deviations from the long-term average (Figure 6).

SPECIES	NO. FISH CAUGHT	NET HOURS	NO. FISH/ NET HOUR	AVG. LENGTH (IN.)	LENGTH RANGE (IN.)	AVG. WEIGHT (LB.)	WEIGHT RANGE (LB.)
BROOK TROUT	50	59.66	0.82	10.93	7.6-13.1	0.55	0.17-0.88
BROWN TROUT	33	59.66	0.55	12.62	6.9-17.8	0.76	0.21-1.77
LONGNOSE SUCKER	11	59.66	0.18	14.16	11.6-16.2	1.29	0.60-1.89
MOUNTIAN WHITEFISH	4	59.66	0.07	15.25	13.9-16.2	1.30	0.95-1.94

Table 3: 2020 combined net data, West Rosebud Lake.

SPECIES	2001	2003	2006	2008	2010	2012	2014	2017	2020
BROOK TROUT	54	69	35	59	27	29	40	42	50
GRAYLING	0	0	0	0	5	0	0	0	0
BROWN TROUT	90	56	21	67	63	24	37	23	33
LONGNOSE SUCKER	4	9	13	22	16	17	13	9	11
MOUNTAIN WHITEFISH	30	48	33	30	31	13	11	14	4
RAINBOW TROUT	5	8	14	7	7	4	8	1	0
CUTTHROAT TROUT	0	0	0	0	0	0	2	0	0

Table 4: Summary of total number of species caught in each net year, West Rosebud Lake.

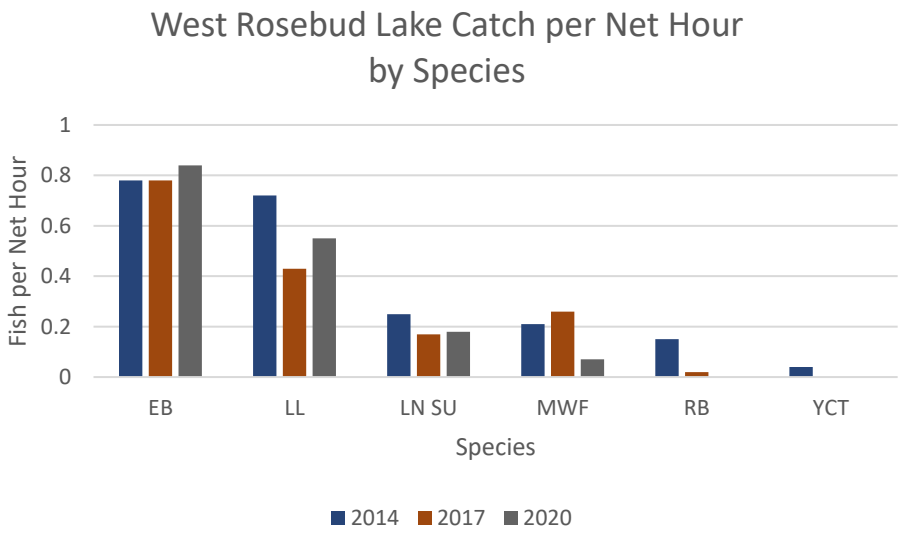

Figure 5: Fish caught per net hour by species, 2014, 2017, and 2020, West Rosebud Lake. Brook Trout (EB); Brown Trout (LL); Longnose Sucker (LN SU); Mountain Whitefish (MWF); Rainbow Trout (RB).

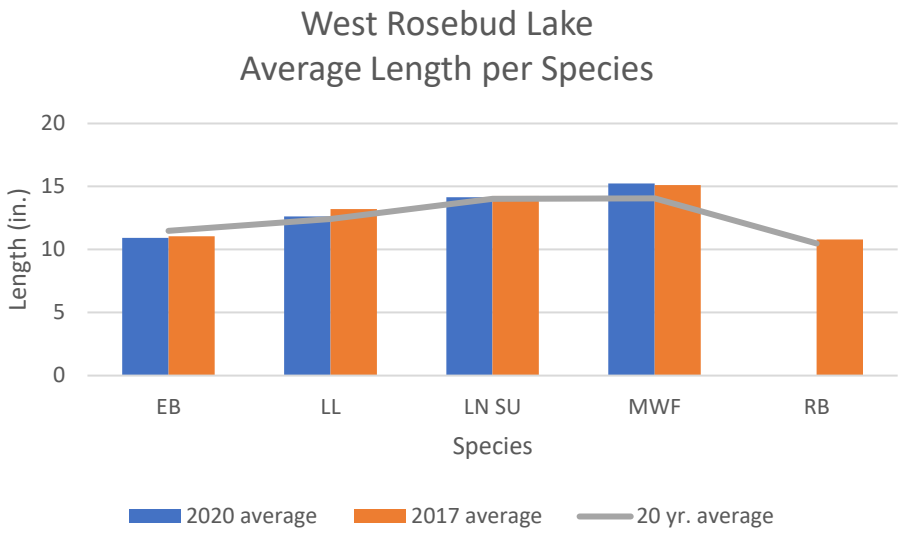

Figure 6: 2020 and 2017 average length per species against 20 yr. average, West Rosebud Lake. Brook Trout (EB); Brown Trout (LL); Longnose Sucker (LN SU); Mountain Whitefish (MWF); Rainbow Trout (RB).

Emerald Lake

One gillnet was set on Emerald Lake overnight from May 19—May 20, 2020, for a total of 20 net hours. Brown Trout were more abundant than the four other species caught, totaling 68% of the catch. Other species caught included Brook Trout at 14% of catch, Longnose Sucker at 9% of catch, Mountain Whitefish at 4.5% of catch, and Rainbow Trout at 4.5% of catch (Table 5). Brook Trout abundance has been decreasing since 2012, with 2020 being the second lowest recorded number. 2020 followed the long-term trend with Brown Trout as the most abundant species, and Rainbow Trout as the least (Table 6; Figure 7).

Rainbow Trout length appears significantly longer in 2020 compared to long-term trend; however, that is due to the one 18-inch individual sampled in 2020, which skewed the average of the more typical 10-12-inch Rainbow Trout found in Emerald. In 2017, Brown Trout averaged longer lengths than the long-term trend. In this year, a 25.5-inch Brown Trout was caught, increasing the overall average length. In recent surveys, Mountain Whitefish average length has been above the long-term average., and Longnose Sucker lengths have followed the long-term average (Figure 8).

SPECIES	NO. FISH CAUGHT	NET HOURS	NO. FISH/ NET HOUR	AVG. LENGTH (IN.)	LENGTH RANGE (IN.)	AVG. WEIGHT (LB.)	WEIGHT RANGE (LB.)
BROOK TROUT	3	20	0.15	12.73	12.5-13.1	0.71	0.68-0.75
BROWN TROUT	15	20	0.75	13.24	8.9-20.8	0.91	0.22-3.35
LONGNOSE SUCKER	2	20	0.10	14.55	11.1-18.0	1.59	0.58-2.61
MOUNTAIN WHITEFISH	1	20	0.05	17.4	17.4-17.4	1.76	1.76-1.76
RAINBOW TROUT	1	20	0.05	18.0	18.0-18.0	2.32	2.32-2.32

Table 5: 2020 net data, Emerald Lake.

SPECIES	2001	2006	2008	2010	2012	2014	2017	2020
BROOK TROUT	23	15	13	21	8	0	8	3
BROWN TROUT	25	30	15	6	18	21	4	15
LONGNOSE SUCKER	1	1	2	11	1	9	3	2
MOUNTAIN WHITEFISH	5	9	20	18	8	3	5	1
RAINBOW TROUT	0	2	0	2	3	4	0	1

Table 6: Summary of total number of species caught in each net year, Emerald Lake.

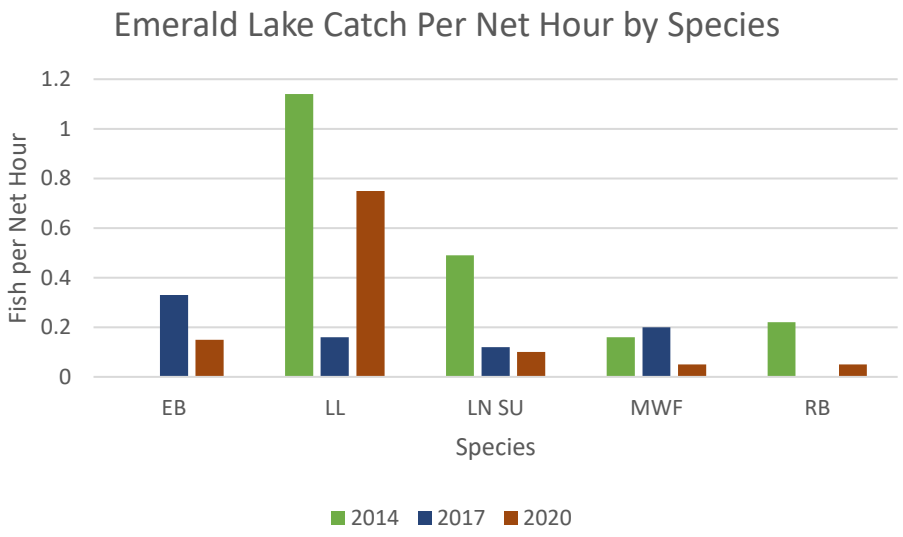

Figure 7: Fish caught per net hour by species, 2014, 2017, and 2020, Emerald Lake. Brook Trout (EB); Brown Trout (LL); Longnose Sucker (LN SU); Mountain Whitefish (MWF); Rainbow Trout (RB).

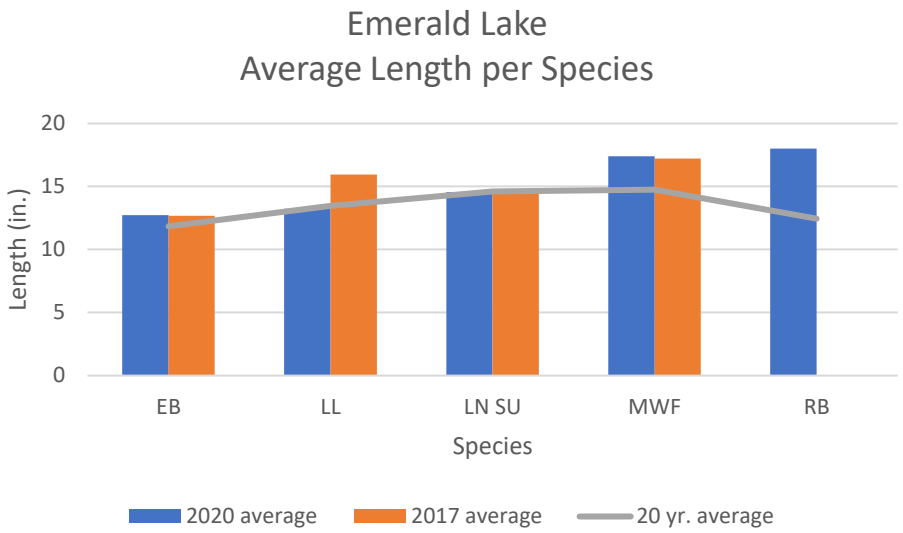

Figure 8: 2020 and 2017 average length per species against 20 yr. average, West Rosebud Lake. Brook Trout (EB); Brown Trout (LL); Longnose Sucker (LN SU); Mountain Whitefish (MWF); Rainbow Trout (RB).

IV. West Rosebud Creek Lower and Upper Bypass Electrofishing Sections

Introduction

The Bypass Channel of West Rosebud Creek flows from Mystic Lake to West Rosebud Lake, while bypassing the hydroelectric dam at Mystic Lake. This allows for fish passage between the lakes. Two reaches of the Bypass Channel are sampled: known as the lower and the upper bypass sections.

The Lower and Upper Bypass sections of West Rosebud Creek are sampled via electrofishing approximately every three years, typically in mid-September. Sampling on the Lower section has been conducted six times since 2004; the Upper section has been sampled seven times since 2004.

The Lower section is 200 feet in length and is located directly behind the NWE Powerhouse between Mystic and West Rosebud Lakes (Figure 9). Sampling begins at a large pool upstream of a weir. The Lower Bypass section of West Rosebud Creek is characterized by large boulders, fast-moving water, and slow pockets where the majority of fish hold. This section begins at an elevation of 6,565 feet.

The Upper Bypass section is 300 feet in length and begins at the boundary of the Absaroka-Beartooth Wilderness (Figure 10). A sign marks this boundary on the nearby Forest Service trail, approximately 1.21 trail miles from the trailhead. This section is lower gradient than the Lower section, and is characterized by slow-moving riffles, with occasional boulder pools. The sampling section begins at an elevation of 6,952 feet.

Figure 9: West Rosebud Creek Lower Bypass Section location. Start coordinates: 45.24345 N, -109.7319 W. End coordinates: 45.24305 N, -109.7325 W.

Figure 10: West Rosebud Creek Upper Bypass Section. Start coordinates: 45.23635 N, -109.74623 W End Coordinates: 45.23578 N, -109.74693 W.

Sampling Procedure

The Lower and Upper Bypass sections are sampled using a depletion estimate, with the exception of the 2004 sample on the Upper section. Backpack electrofishing units and bank shockers with handheld anodes have been used to sample these sections. Crews sample the stream starting downstream and working upstream, moving between both banks to sample as much of the stream as possible. Bank shockers are run from a generator, while backpack electrofishers are run off a small battery. Backpack shockers produce less power and may not be as efficient at capturing fish. This difference in equipment could explain some disparities in results across sample years.

As a depletion estimate, at least two passes of electrofishing are completed on each section. Fish caught in the first pass are held in packable mesh bag live wells in the stream to avoid recapture during the second pass.

The Lower section was sampled with a backpack unit in 20004, 2011, and 2017; samples taken in 2012, 2014, and 2020 were done with a bank shocker. Due to the difficult nature of this section for shocking (large, slippery boulders, fast-flowing water, etc.), two passes of electroshocking were not always completed (2004, 2011, and 2017). Years with at least two passes include 2012, 2014, and 2020, with 2014 having three passes completed.

On the Upper section, sampling was conducted with the use of a bank shocker in the last four sample years (2012, 2014, 2017, and 2020). The earlier years of sampling—2004, 2008, and 2011—were conducted with a backpack unit. Three passes were conducted on this section in both 2008 and 2011. 2004 was sampled as a mark-recapture survey, with two surveys done one month apart. Depletion estimates provide a population estimate within the sampled section, while mark-recapture models provide estimates of fish per mile. Because this section is significantly less than a mile (300 feet, 0.06 mile), sampling procedure was changed after 2004 to more appropriately reflect the length of the section.

Results

<u>Lower Bypass Section</u>

First Pass Catch-

Both Rainbow and Brown Trout are found in this section. Because of the inconsistencies in sampling procedure across sample years, first pass catch numbers are presented for every sample year for each species as a constant to be compared. Sampling was conducted at relatively the same time of year for each sample, with the exception of 2004 when the sampling was done in early August rather than mid-September.

There is a wide range of variability in first pass catch numbers for both species. In the last four sampling years, more consistency was seen in Rainbow Trout catch, while the first two sample years had the widest range (58 caught in 2004 and 4 in 2011). Brown Trout catch has been lower than Rainbow Trout in every sample year except for 2017 (Figures 11 and 12).

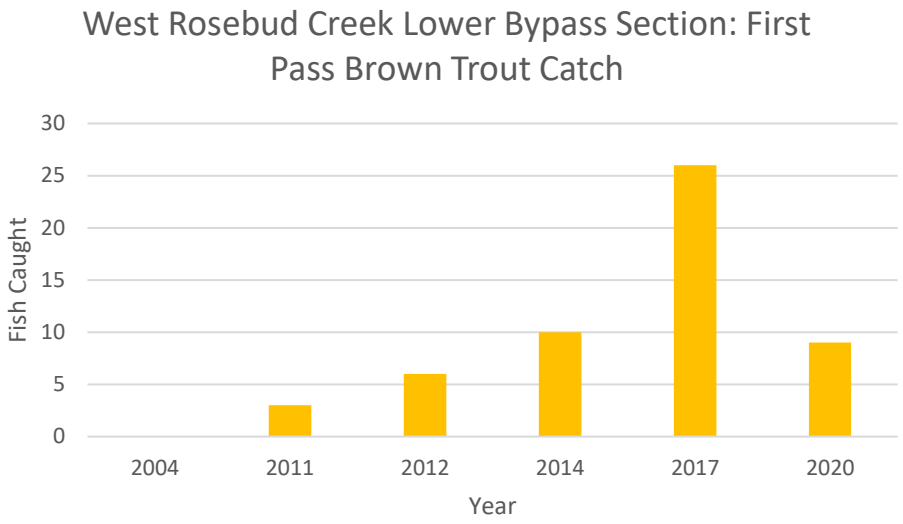

Figure 11: Number of Brown Trout caught on first pass only, West Rosebud Creek Lower Bypass section.

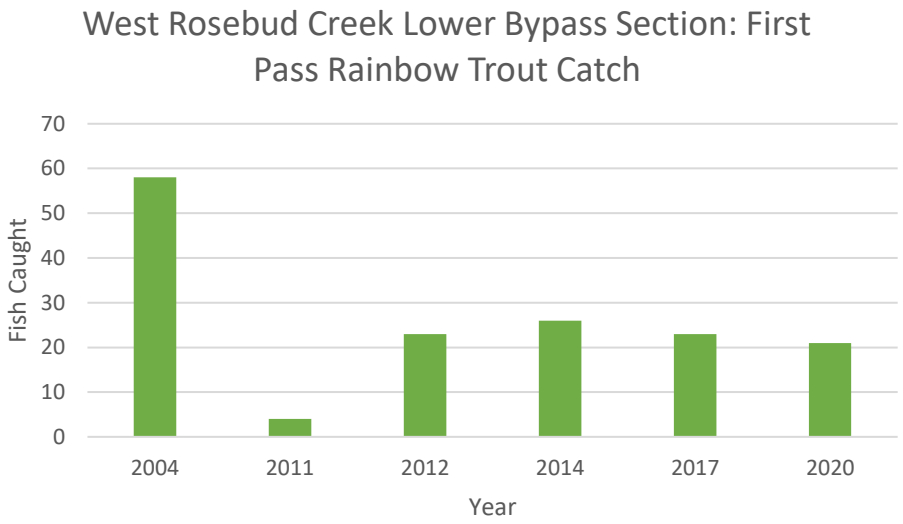

Figure 12: Number of Rainbow Trout caught on first pass only, West Rosebud Creek Lower Bypass section.

Depletion Estimate-
2012, 2014, and 2020 were the only sample years with the appropriate number of passes completed to conduct a population estimate. Depletion estimates were run using Zippin's K-Pass Removal depletion model estimate on FWP's internal Fisheries Information System (FIS). Sampling results for 2020 provided an estimate of 12 Brown Trout in the 200-foot section (Figure 13). Rainbow Trout population was estimated at 27 fish within the section, the lowest of all sample years (Figure 14).

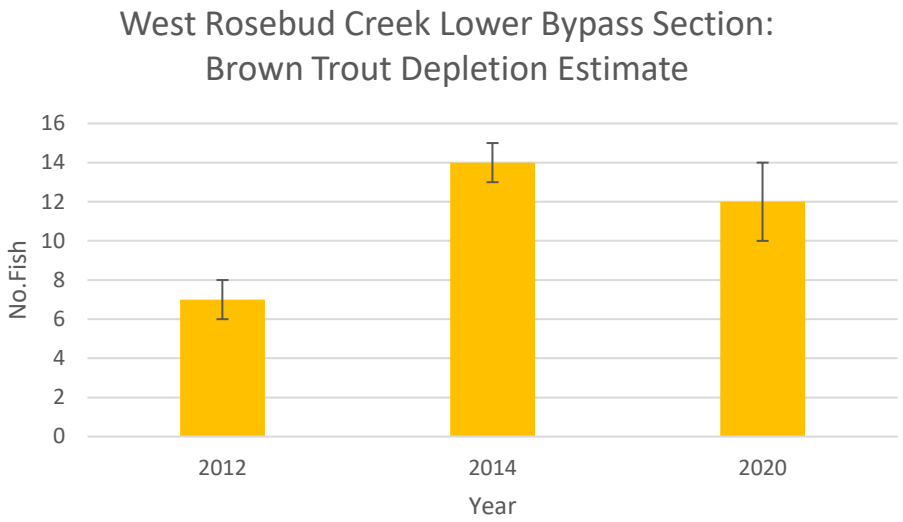

Figure 13: Depletion population estimate for Brown Trout with upper and lower confidence intervals, West Rosebud Creek Lower Bypass section.

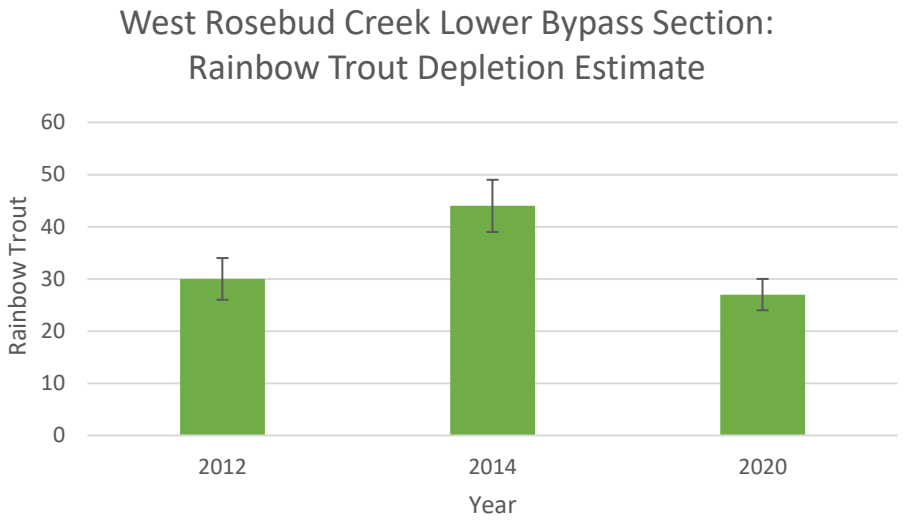

Figure 14: Depletion population estimate for Rainbow Trout with upper and lower confidence intervals, West Rosebud Creek Lower Bypass section.

Length Frequency-
More fish of both species in the 9-inch interval were collected in 2020 compared to the long-term average. This is shorter than the long-term mode for Brown Trout, and longer than the long-term mode for Rainbow Trout.

Brown Trout within the 13-inch length range are the most abundant for the long-term average (Figure 15). The 2020 sample reflected a similar number of fish within this length group, but the most abundant

length group was the 9-inch length group. More Brown Trout in the 11-inch length group were also caught in 2020 compared to the long-term average.

Rainbow Trout length frequencies for 2020 more closely followed the long-term average, with the increase in 9-inch length group fish being the exception (Figure 16). Rainbow Trout in the 7-inch group were still the most abundant, but this number was below the long-term average caught in this length group.

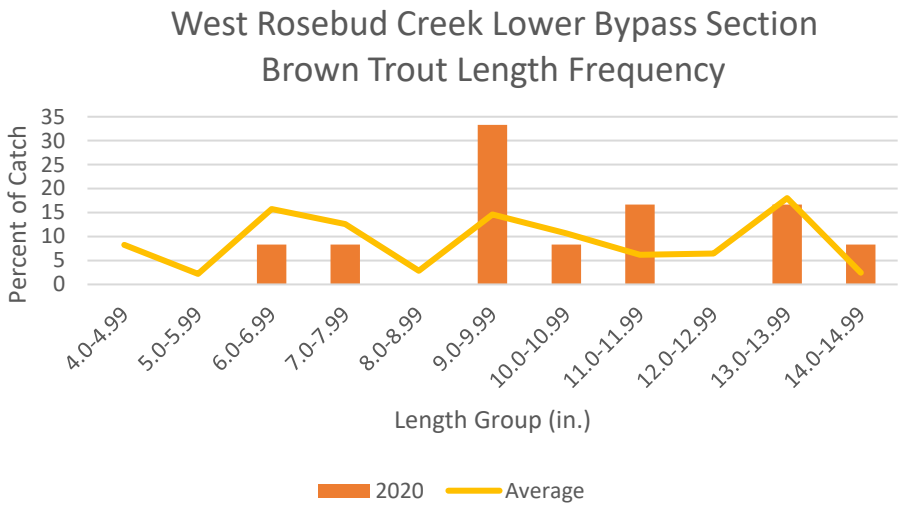

Figure 15: Brown Trout length frequencies for 2020 sample and long-term average, West Rosebud Creek Lower Bypass section.

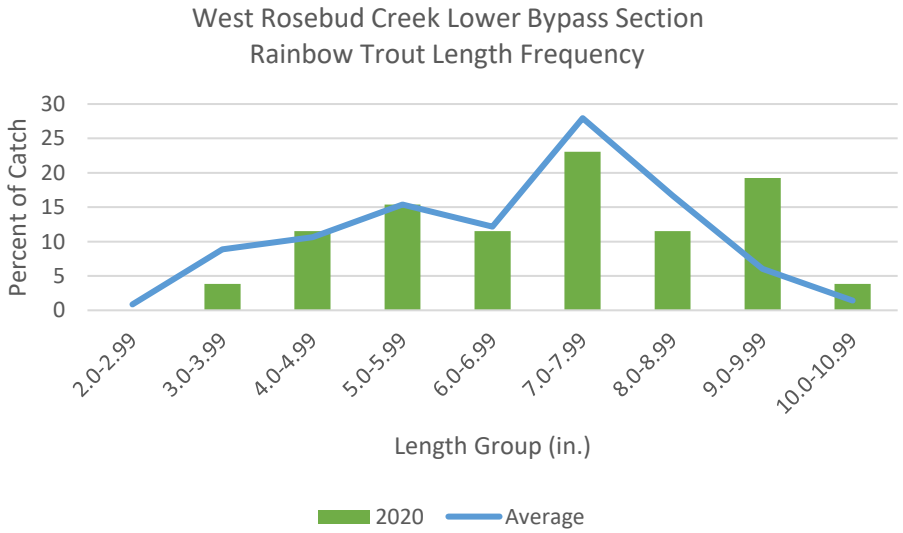

Figure 16: Rainbow Trout length frequencies for 2020 sample and long-term average, West Rosebud Creek Lower Bypass section.

Upper Bypass Section

Depletion Estimate-

Rainbow Trout are the only species sampled in this section. Using Zippin's K-Pass Removal depletion model estimate on FWP's internal Fisheries Information System (FIS), there is estimated to be 169 Rainbow Trout in this section, based on 2020 field data. 2020 has the third highest estimate across sampling years (Figure 17).

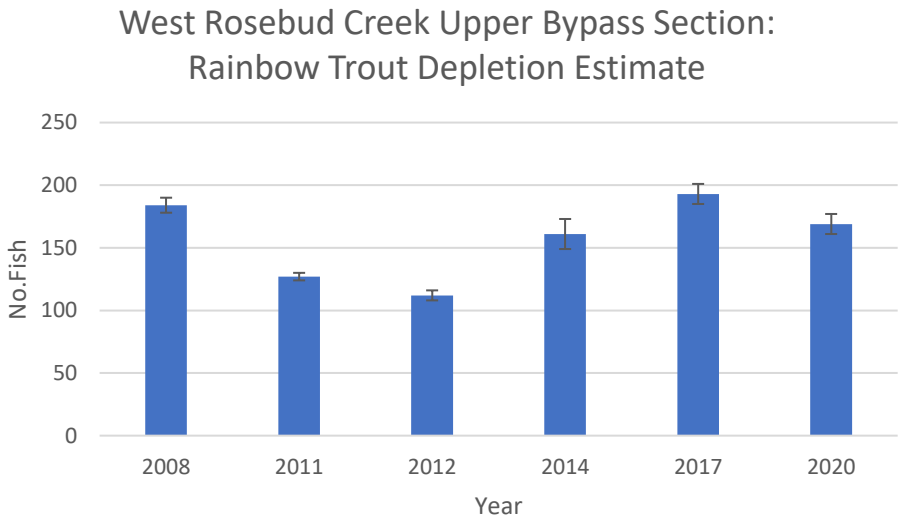

Figure 17: Depletion population estimate for Rainbow Trout with upper and lower confidence intervals, West Rosebud Creek Upper Bypass section.

2004 was sampled using the mark-recapture method. The section was sampled on Aug. 3 where 128 fish were marked with a small fin clip. The section was sampled again on Sept. 1., with 187 total fish caught, 60 of them recaptured marked fish. Using the Ricker's Closed Mark-Recapture model on FIS, the estimate of Rainbow Trout per mile in this section is 6,626. This was excluded from the long-term data set, as this population estimate is not directly comparable to the depletion estimate run for every other sample year.

Length Frequency-

In 2020, the most abundant length group sampled was the 5-inch length group (Figure 18). The long-term average for most abundant length is the 4-inch group. Frequencies of smaller fish (1-4-inch) were below the long-term average, while larger fish (6-10-inch) were slightly above the long-term average.

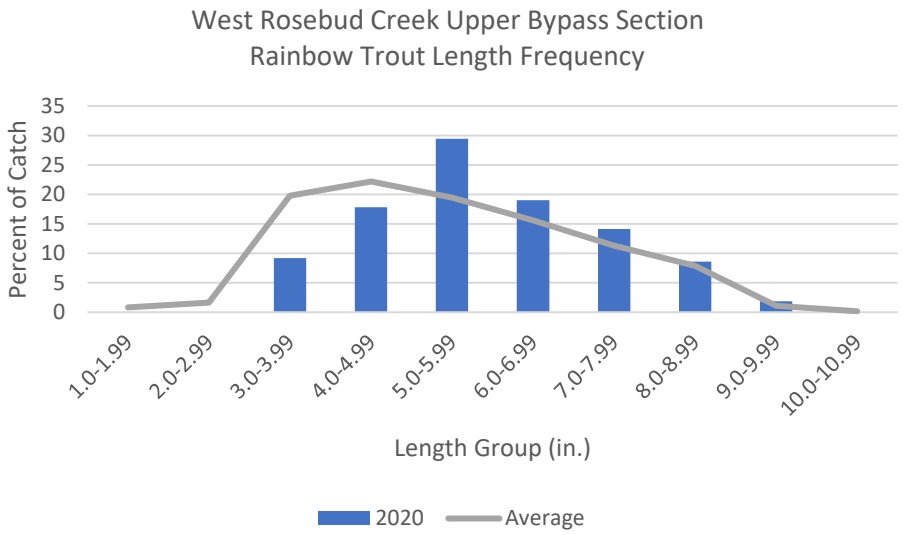

Figure 18: Rainbow Trout length frequencies for 2020 sample and long-term average, West Rosebud Creek Upper Bypass section.

2017 Ages-

Scales were collected from Rainbow Trout in only one sample year (2017). These scales were read under a microscope and annuli were counted to age the fish. Aging scales is a subjective task, especially for older fish. Scales were not collected from every Rainbow Trout caught on this sampling day, only a select number in each length range. Older fish (4-5) had the most variances in lengths, while younger fish were more consistently sized (Figure 19). Fish aged 1 and 4 were the most common, each making up 23.26% of the total sampled (Figure 20).

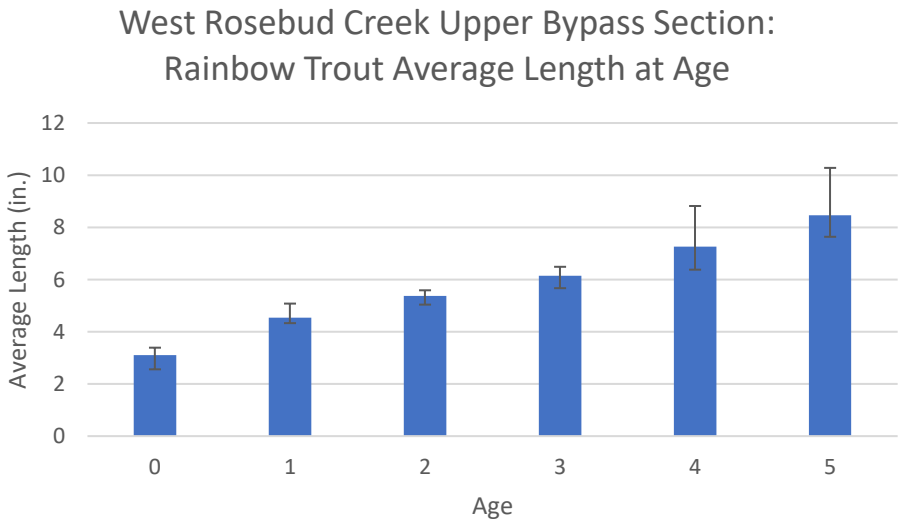

Figure 19: Average lengths for Rainbow Trout at varying ages, West Rosebud Creek Upper Bypass section 2017.

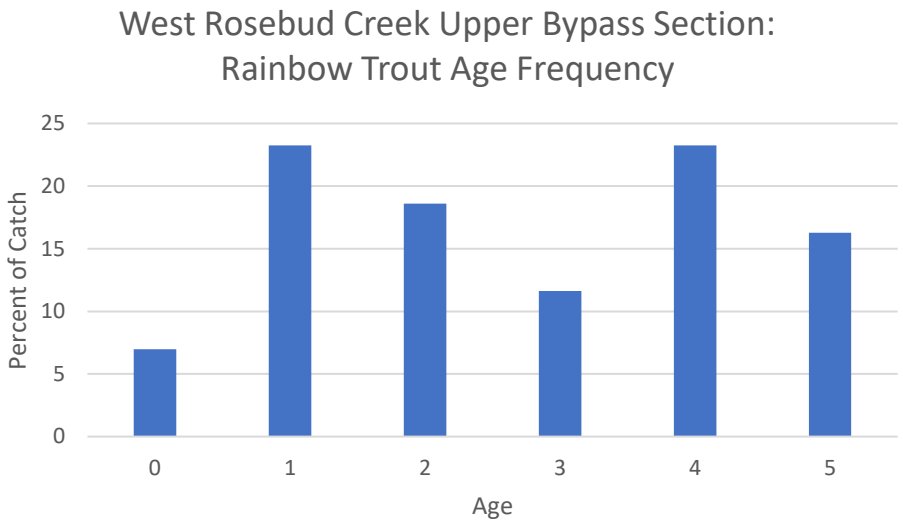

Figure 20: Age frequencies for Rainbow Trout, West Rosebud Creek Upper Bypass section 2017.