



2017 Annual Fisheries Monitoring Report

Mystic Lake Hydroelectric Project FERC Project Number 2301

**June 2018
Public**



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Acronyms

%	Percentage
Commission	Federal Energy Regulatory Commission
EB	Brook trout
FERC	Federal Energy Regulatory Commission
GR	Arctic Grayling
Licensee	NorthWestern Energy Corporation
LL	Brown trout
LN SU	Longnose sucker
MDEQ	Montana Department of Environmental Quality
MWF	Mountain whitefish
MFWP	Montana Fish, Wildlife and Parks
No.	Number
NorthWestern	NorthWestern Energy Corporation
Project	Mystic Lake Hydroelectric Project
RB	Rainbow trout
TAC	Technical Advisory Committee
USFS	U.S. Forest Service
YCT	Yellowstone Cutthroat Trout

1. Introduction

Mystic Lake Hydroelectric Project No. 2301 (Project) is operated and owned by NorthWestern Energy Corporation (NorthWestern or Licensee). The Project is situated in south-central Montana, primarily located in Stillwater County with a very small portion within Carbon County. The Project is located in the Beartooth Mountain Range and surrounded on three sides by the Absaroka-Beartooth Wilderness Area. Mystic Lake is located at the head of a high mountain canyon at an elevation of 7,673.5 feet above mean sea level in the upper reaches of West Rosebud Creek. Within West Rosebud Creek drainage (213.4 square miles), Mystic Lake is the fourth and largest lake in a chain of six hydraulically connected lakes (listed in order going downstream: Star, Silver, Island, Mystic, West Rosebud, and Emerald). The Beartooth Ranger District of the Custer Gallatin National Forest manages approximately 124.7 square miles of the West Rosebud Creek drainage while the remaining 88.7 square miles is privately-owned land.

On December 17, 2007, the Federal Energy Regulatory Commission (FERC or Commission) issued a new License for the Project, effective January 1, 2010 (121 FERC ¶62, 198). The new License includes the U.S. Forest Services (USFS) Section 4(e) Terms and Conditions filed on May 3, 2007. Section 4(e) Condition 16 requires the Licensee (now NorthWestern) to prepare and implement a Fisheries Monitoring Plan that must be approved by the USFS, Montana Department of Environmental Quality (MDEQ), and Montana Fish, Wildlife and Parks (MFWP).

NorthWestern revised the 6-year Fisheries Monitoring Plan, in consultation with USFS, MDEQ and MFWP, for implementation between 2016 and 2021. The *2016-2021 Fisheries Monitoring Plan* (NorthWestern, 2016a) was approved by FERC in a letter dated, June 17, 2016. The schedule for fisheries monitoring activities between 2016 and 2021 is outlined in Table 1-1; the sampling locations are identified in Figure 1-1

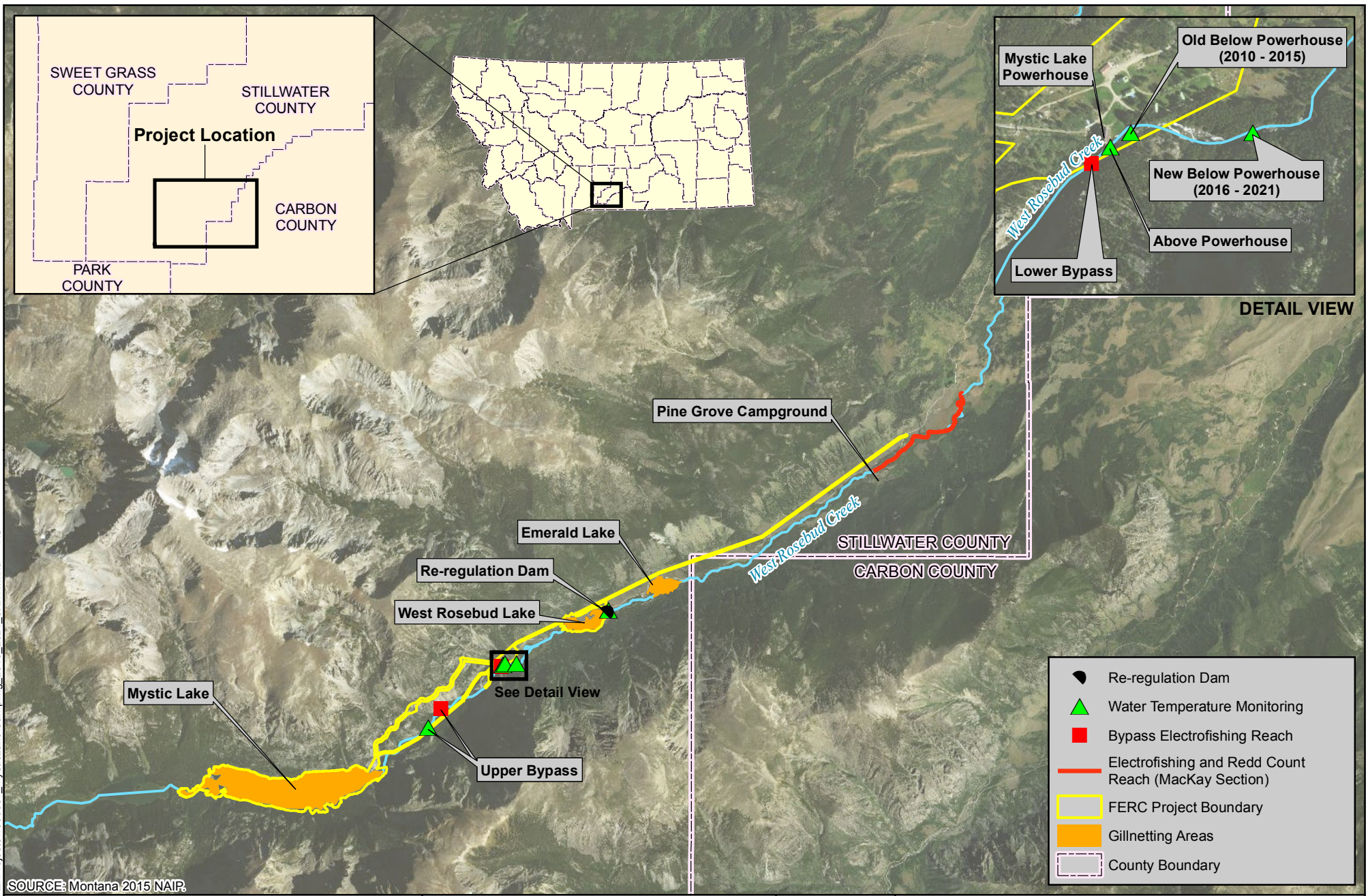
Table 1-1. Mystic Lake Hydroelectric Project 6-Year (2016-2021) Fisheries Monitoring Schedule (NorthWestern, 2016a).

Year	A	B	C	D	E	F
2016				X		X
2017		X	X		X	
2018	X					X
2019				X	X	
2020		X	X			
2021	X				X	

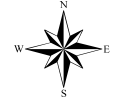
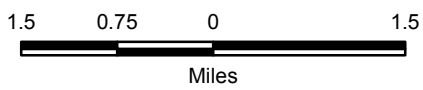
- A = Mystic Lake monitoring
- B = West Rosebud Creek between the dam and powerhouse
- C = West Rosebud and Emerald lakes fish monitoring
- D = West Rosebud Creek below Emerald Lake electrofishing
- E = West Rosebud Creek fall redd counts
- F = Water temperature monitoring

This report summarizes fisheries monitoring efforts completed by the Mystic Fisheries, Aquatic Habitats, and Water Quality Technical Advisory Committee (TAC), made up of NorthWestern, USFS, MDEQ and MFWP members in 2017 to comply with the fisheries monitoring plan and schedule (Table 1-1). Fisheries surveys completed in 2017 included West Rosebud Creek sampling between Mystic Lake Dam and the powerhouse and gillnet sampling in West Rosebud and Emerald lakes. Due to an accidental scheduling error, the redd count in West Rosebud Creek was completed in fall 2016 instead of fall 2017.

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SOURCE: Montana 2015 NAIP.



Mystic Lake Hydroelectric Project
 FERC No. 2301
 Stillwater and Carbon Counties, Montana
 Northwestern Energy Corporation



2016-2021 FISHERIES MONITORING PLAN
 SAMPLING LOCATIONS
 MAY 2018
 FIGURE 1-1

- Re-regulation Dam
- Water Temperature Monitoring
- Bypass Electrofishing Reach
- Electrofishing and Redd Count Reach (MacKay Section)
- FERC Project Boundary
- Gillnetting Areas
- County Boundary

2. West Rosebud Creek Bypass Fisheries

As part of the FERC relicensing (Integrated Licensing Process, or ILP) effort for the Mystic Hydroelectric Project, studies were completed in 2004 to determine the status of the fisheries in the bypass reach of West Rosebud Creek, which extends downstream of Mystic Lake Dam to the powerhouse, and to evaluate the impacts of power production on the fishery. The fisheries data collected in 2004 indicated that current alterations in the hydrograph of West Rosebud Creek in the bypass reach did not cause substantial negative effects on the fish population (PPL Montana, 2004). Overall, in all four sections sampled in the bypass reach in 2004, the fishery appeared to be in excellent condition despite high gradient, very large substrate and low winter flows, and there appeared to be suitable habitat for spawning, rearing, and over-wintering.

Between 2010 and 2015, the Mystic Project Fisheries Monitoring Plan included monitoring activities in the lower bypass reach (first reach surveyed in 2004) and upper bypass reach (third reach surveyed in 2004) once every 3 years (PPL Montana, 2010 and NorthWestern, 2016a). A summary of data collected between 2010 and 2015 is provided in the *6-year Fisheries Monitoring Report, 2010-2015* (NorthWestern, 2016), filed with FERC May 12, 2016.

The current 6-year Fisheries Monitoring Plan (2016 through 2021) includes electrofishing in the bypass reach of West Rosebud Creek every third year with the first survey completed in 2017. Bypass monitoring efforts were implemented in September in two established locations (upper and lower bypass reach shown in Figure 1-1). The upper bypass is a 350-foot section below the falls and the lower bypass is a 200-foot section.

In 2017, two sampling or electrofishing passes were completed in the upper section and only one pass was completed in the lower section. MFWP used standardized analysis program to estimate and report fish populations and compared 2017 results to previous years of data collection. This sampling is the best trend indicator of relative change in the fish community.

2.1 Results - Upper Bypass

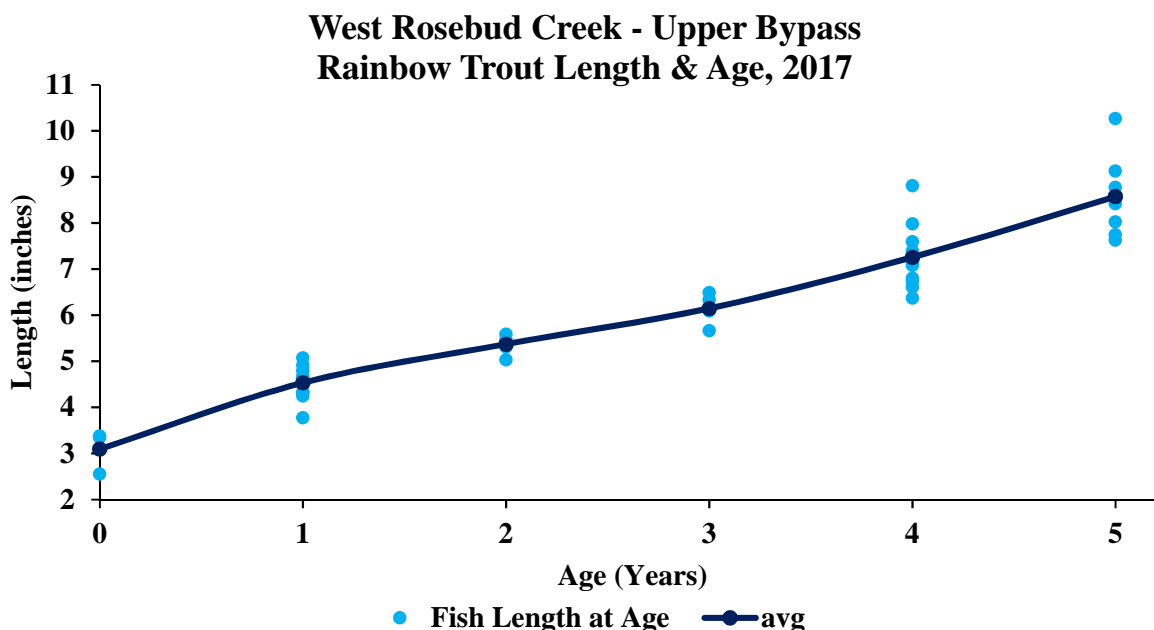
Rainbow trout (*Oncorhynchus mykiss*) is the only species of fish detected in the upper bypass reach. The rainbow trout population in the upper bypass reach appears to be stable with the population estimate ranging between 112 and 193 fish per 300 feet. The 2017 population estimate was the highest since monitoring began in 2011 (Table 2-1). The average length of the rainbow trout sampled each year has also remained similar over the years, ranging between 5.7 inches and 6.0 inches.

Table 2-1: Summary of the upper bypass reach sampling, including the species, sample year, population estimate per the 300-foot reach, upper confidence interval (UCI), and average length of sample size for efforts completed in 2011, 2012, 2014, and 2017.

Year	Species	Total Captured	Population Estimate per 300 feet	95% UCI	Avg. Length (inches)
2011	Rainbow	126	127	127	5.7
2012	Rainbow	110	112	116	6.0
2014	Rainbow	150	161	173	5.8
2017	Rainbow	186	193	201	5.3

MFWP also collected scales from 43 rainbow trout and evaluated age of the fish in 2017. The estimated age of the rainbow trout varied from young-of-the-year to age-5 (Figure 2-1). The variability in age classes represented in the sample was also observed in length-frequency analysis from surveys completed in 2011, 2012, and 2014 (NorthWestern, 2016). The rainbow trout population in the upper bypass reach includes multiple age classes, which is a general indicator of a healthy system with a naturally reproducing and rearing population.

Figure 2-1: Summary of the 2017 age analysis from scales collected from 43 rainbow trout in the upper bypass of West Rosebud Creek.



2.2 Results - Lower Bypass

Two species of fish, including rainbow trout and brown trout (*Salmo trutta*) were observed in the lower bypass reach in 2017, which was consistent with previous surveys completed in 2012 and 2014 (NorthWestern, 2016). In 2017, only one sampling or electrofishing pass was completed in the lower bypass. MFWP took the first pass information and compared it to the first pass data from previous surveys (Table 2-2). The number of rainbow trout captured during first pass electrofishing between 2012 and 2017 remained consistent while the number of brown trout increased with each

sample year from 6 fish to 26 fish (Table 2-2). The average length of rainbow trout in 2017 was 7.1 inches, similar to previous sample years. The average length of brown trout has shown more variability with 11.8 inches in 2012, 6.9 inches in 2014, and 7.9 inches in 2017.

Table 2-2: Summary of the lower bypass reach sampling, including the species, sample year, population estimate per the 300-foot reach, upper confidence interval (UCI), and average length of sample size for efforts completed in 2012, 2014, 2017.

Year	Species	Total Captured	First Pass	Population Estimate per 300 feet	95% UCI	Avg. Length (inches)
2012	Brown	7	6	7	8	11.8
2014	Brown	14	10	15	19	6.9
2017	Brown	26	26	NA	NA	7.9
2012	Rainbow	29	23	30	34	6.7
2014	Rainbow	42	26	44	48	6.7
2017	Rainbow	23	23	NA	NA	7.1

3. West Rosebud and Emerald Lake Fisheries

During the relicensing process (ILP), fisheries monitoring in West Rosebud and Emerald lakes were completed in 2006 and 2008 and continued every other year once the license was issued in 2010. An overview and summary of data collected between 2006 and 2015 are provided in the *6-year Fisheries Monitoring Report, 2010-2015* (NorthWestern, 2016).

In the 6-year Fisheries Monitoring Plan for 2016 through 2021, NorthWestern will continue to monitor fish assemblages in West Rosebud and Emerald lakes every third year starting in 2017 (NorthWestern, 2016a). Sampling conducted by MFWP in West Rosebud and Emerald lakes has been used as a trend indicator of relative changes to the fish assemblages. Sampling efforts in 2010, 2012, 2014, and 2017 were completed using floating and sinking experimental gillnets (one floater and two sinkers in West Rosebud Lake, one sinker in Emerald Lake) in standardized locations (Figure 3-1).

In 2010, 2012, 2014, and 2017, MFWP and USFS personnel sampled fish populations in West Rosebud and Emerald lakes in early May. Gillnetting efforts were implemented between May 7 and May 11 during each sample year. Gillnets were set for approximately 17 to 18 hours in West Rosebud Lake and approximately 17 to 21 hours in Emerald Lake during each sampling event.

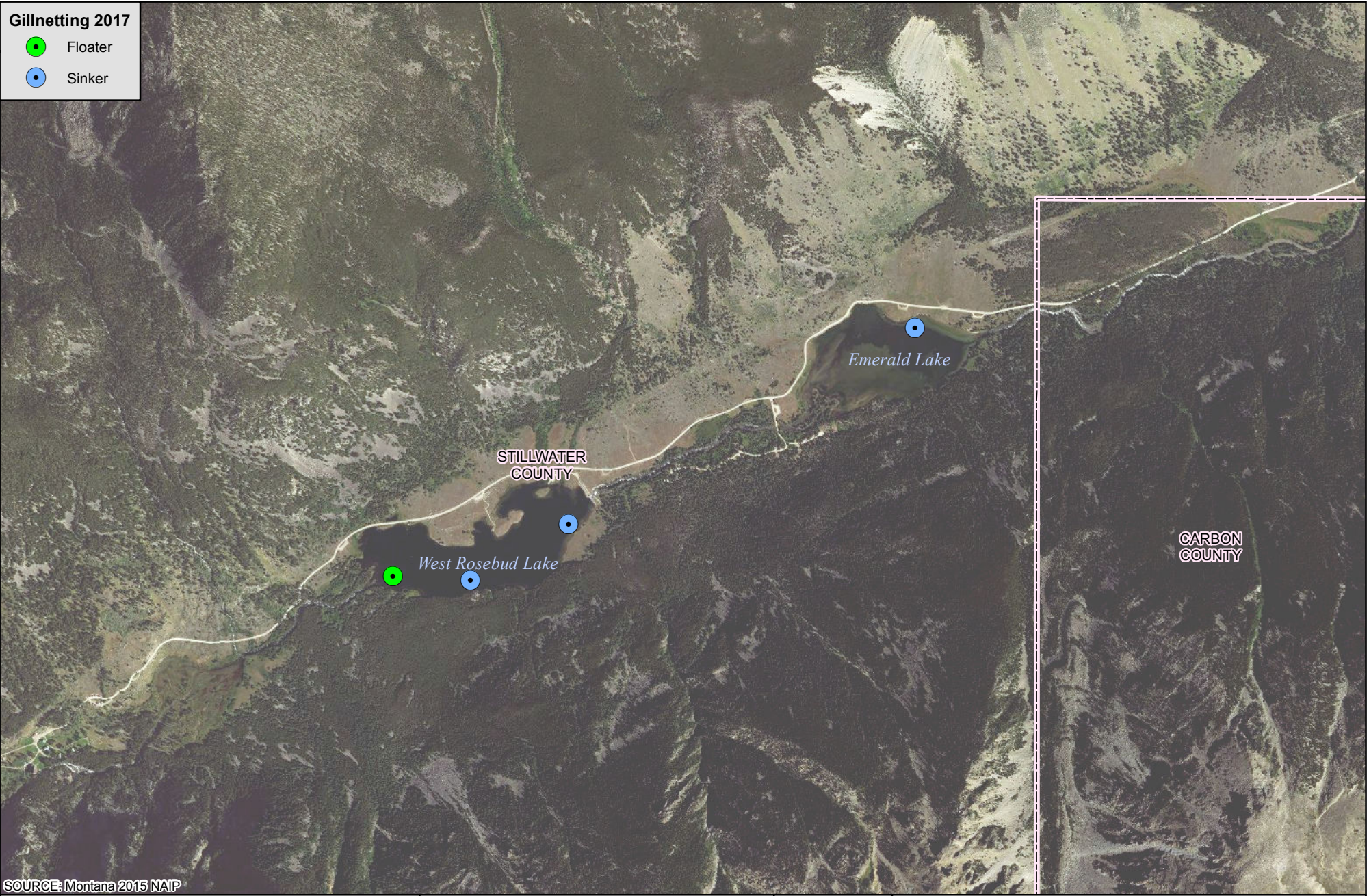
Biological data collected includes species length and weight. The CPUE was calculated combining the total hours for the three nets in West Rosebud Lake and total hours for the one sinker net in Emerald Lake. MFWP generated long-term graphs for biomass for all fish and relative weight by species and provided length-frequency analysis for brook trout (*Salvelinus fontinalis*), brown trout, and rainbow trout in West Rosebud and Emerald lakes.

MFWP stock West Rosebud Lake and Emerald Lake with fish annually to support recreational fishing. Although stocking records for West Rosebud Lake and Emerald Lake date back to 1931 and 1930, respectively, stocking data from MFWP's Montana Fisheries Information System (MFISH) were evaluated for the period between 2005 and 2014 are summarized in the *6-year Fisheries Monitoring Plan, 2010-2015* (NorthWestern, 2016) and stocking data from 2015 to 2017 is provided in this report (data from <https://myfwp.mt.gov/fishMT/plants/plantreport>).

Gillnetting efforts in West Rosebud and Emerald lakes occur generally prior to annual stocking efforts implemented by MFWP. Thus, the gillnetting efforts likely do not capture the influx of fish into the system via stocking.

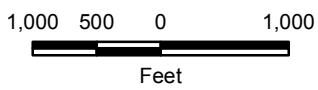
Gillnetting 2017

- Floater
- Sinker



14-May-2018 Z:\Projects\1800057_MysticLake\Gillnetting2017.mxd RS

SOURCE: Montana 2015 NAIP



Mystic Lake Hydroelectric Project
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**2017 GILLNETTING SITES IN
 WEST ROSEBUD LAKE AND EMERALD LAKE**
 MAY 2018 FIGURE 3-1

3.1 West Rosebud Lake

3.1.1 Fish Stocking

Three species of fish have been stocked in West Rosebud Lake since 2005, including rainbow trout, Arctic grayling (*Thymallus arcticus*), and Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*). Yellowstone cutthroat trout were stocked annually between 2011 and 2014 and Arctic grayling were only stocked once in 2009, while rainbow trout are stocked annually.

In 2009, approximately 270 Arctic grayling (average 9.5 inches) were stocked in West Rosebud Lake. A total of 4,638 Yellowstone cutthroat were stocked in West Rosebud Lake between 2011 and 2014 with an average length of 5.9 inches. Between 2005 and 2017, a total of 39,329 rainbow trout (approximately 3,025 annually) with an average length of approximately 7.8 inches were stocked in West Rosebud Lake. A summary of recent annual stocking in West Rosebud Lake from 2015 to 2017 is shown in Table 3-1.

Table 3-1: Summary of fish stocking in West Rosebud Lake from 2015 through 2017 (MFWP, 2018).

Year	Species	Number	Avg. Length (inches)
2015	RB	3,019	7.7
2016	RB	3,108	8.2
2017	RB	3,000	7.7

3.1.2 West Rosebud Lake Fisheries

A total of seven species, including mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*), brook trout, brown trout, rainbow trout, Arctic grayling, and Yellowstone cutthroat trout have been documented in West Rosebud Lake gillnet surveys. The most abundant fish in West Rosebud Lake are brown trout, brook trout, and mountain whitefish. Other less common species include Arctic grayling and Yellowstone cutthroat trout, which were only observed occasionally with one Arctic grayling caught in 2010 and two Yellowstone cutthroat trout sampled in 2014. A summary of 2017 gillnet results for West Rosebud Lake is provided in Table 3-1.

MFWP analyzed available historic data from 1990 through 2017. Various metrics were analyzed including catch rate per hour (Figure 3-2), biomass per net (Figure 3-3), and relative weight (Figure 3-4). In general, the 2017 results from West Rosebud Lake were slightly lower from the long-term average for the various metrics (catch per hour, biomass, relative weight), but still within the historic range of values.

Table 3-2: Summary of West Rosebud Lake gillnetting data (cumulative net hours for all 3 nets), including species (LL=brown trout, EB=brook trout, RB=rainbow trout, MWF=mountain whitefish, LN SU=longnose sucker), number captured, net hours, catch rate per hour, average length, range of lengths, and average weight collected in May 2017.

2017 Species	Number Caught	Net hours	No. Fish/hour	Avg. Length (inches)	Range Length (inches)	Avg. Weight (lbs)
LL	23	54	0.43	13.2	9.3-16.4	0.8
EB	42	54	0.78	11.1	8.7-13.1	0.5
RB	1	54	0.02	10.8	-	0.5
MWF	14	54	0.26	15.1	13.5-16.9	1.2
LN SU	9	54	0.17	14.2	11.3-18.2	0.6

Figure 3-2: Number of fish, by species, caught per hour gillnetting in West Rosebud Lake, 1990-2017. (EB=brook trout, GR=Arctic grayling, LL=brown trout, LN SU=longnose sucker, MWF=mountain whitefish, RB=rainbow trout, YCT = Yellowstone cutthroat trout).

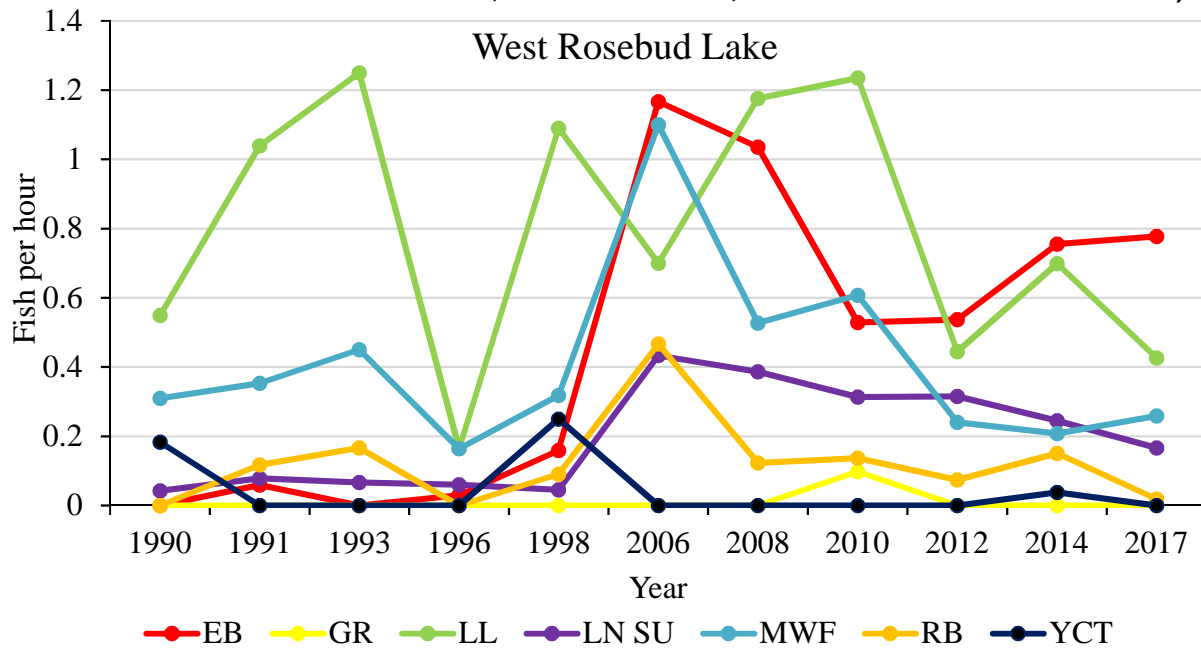


Figure 3-3: Biomass (pounds) per net in West Rosebud Lake, 1990-2017.

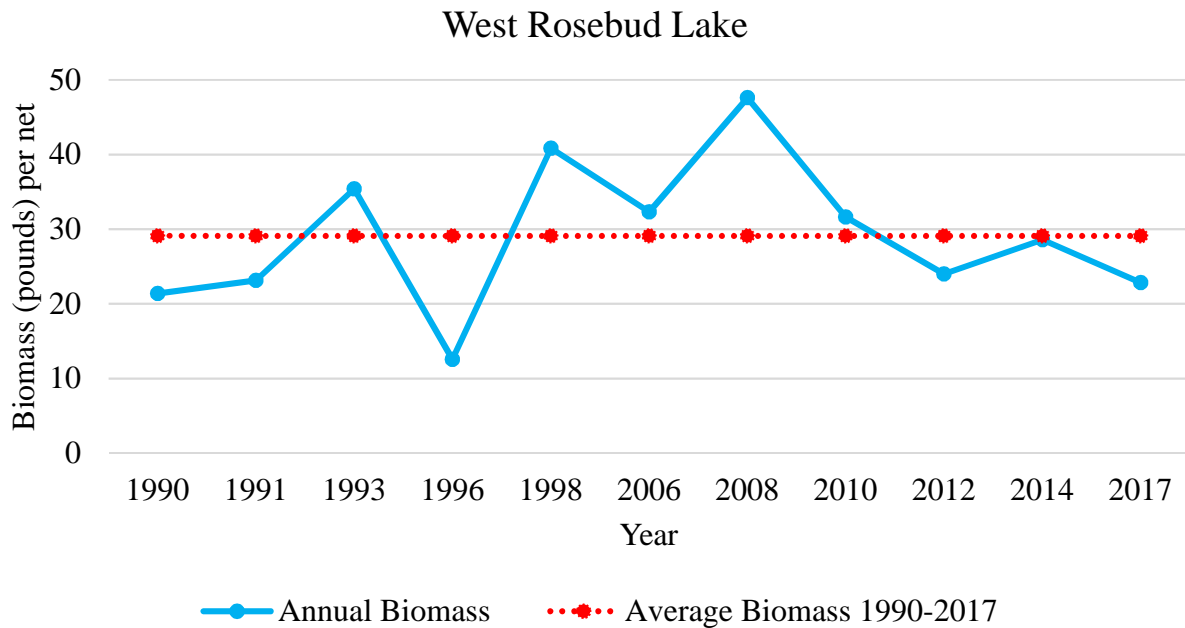
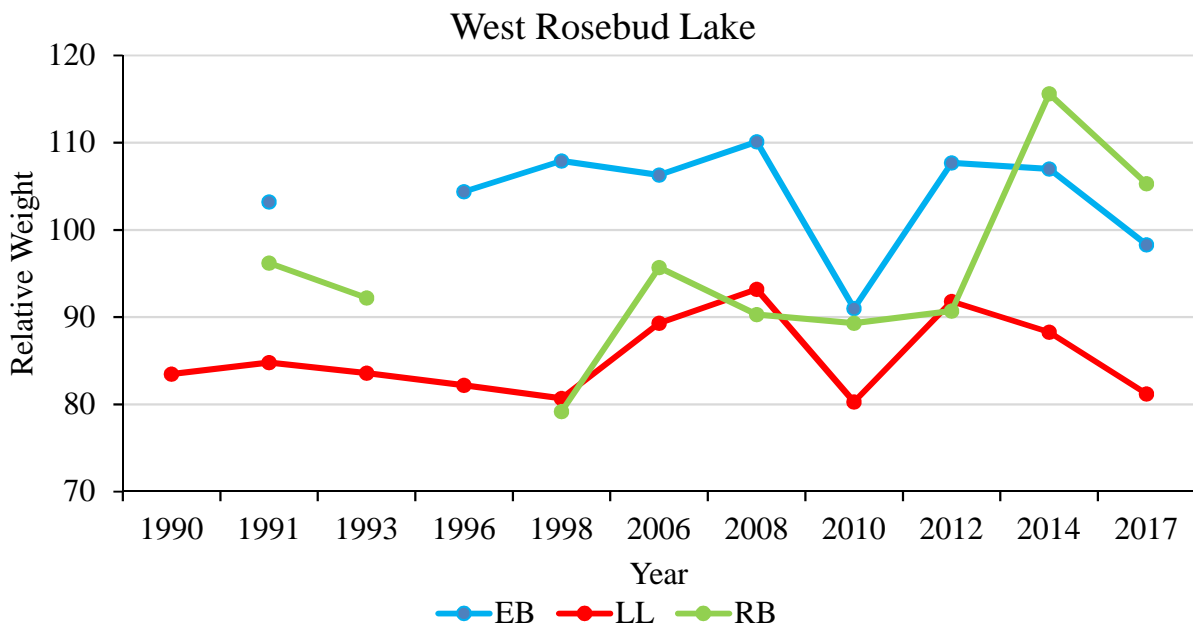


Figure 3-4: Relative weight for brook trout, brown trout, and rainbow trout in West Rosebud Lake, 1990-2017 (MFWP, unpublished).



Length-frequency histograms for brook trout (Figure 3-5), brown trout (Figure 3-6), and rainbow trout (Figure 3-7) from gillnet data collected in 2012, 2014, and 2017 are shown below. The distribution of size classes in 2017 for brook and brown trout was similar compared to previous years. Only one rainbow trout was sampled in 2017 measuring at 10.8 inches in length, which falls within the most common size class (10.0-10.99 inches in length) observed each sample season.

Due to the low sample size of rainbow trout in 2017, the distribution of size classes over time is difficult to assess.

Figure 3-5: Length frequency for brook trout in West Rosebud Lake, 2012, 2014, 2017 (MFWP, unpublished).

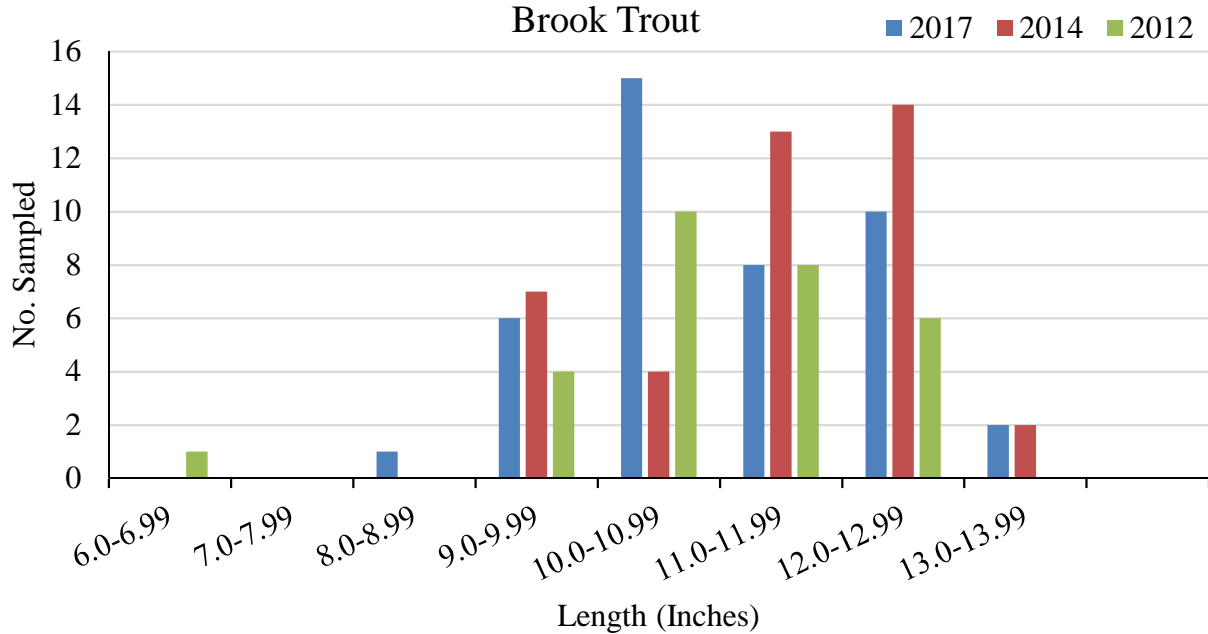


Figure 3-6: Length frequency for brown trout in West Rosebud Lake, 2012, 2014, 2017 (MFWP, unpublished).

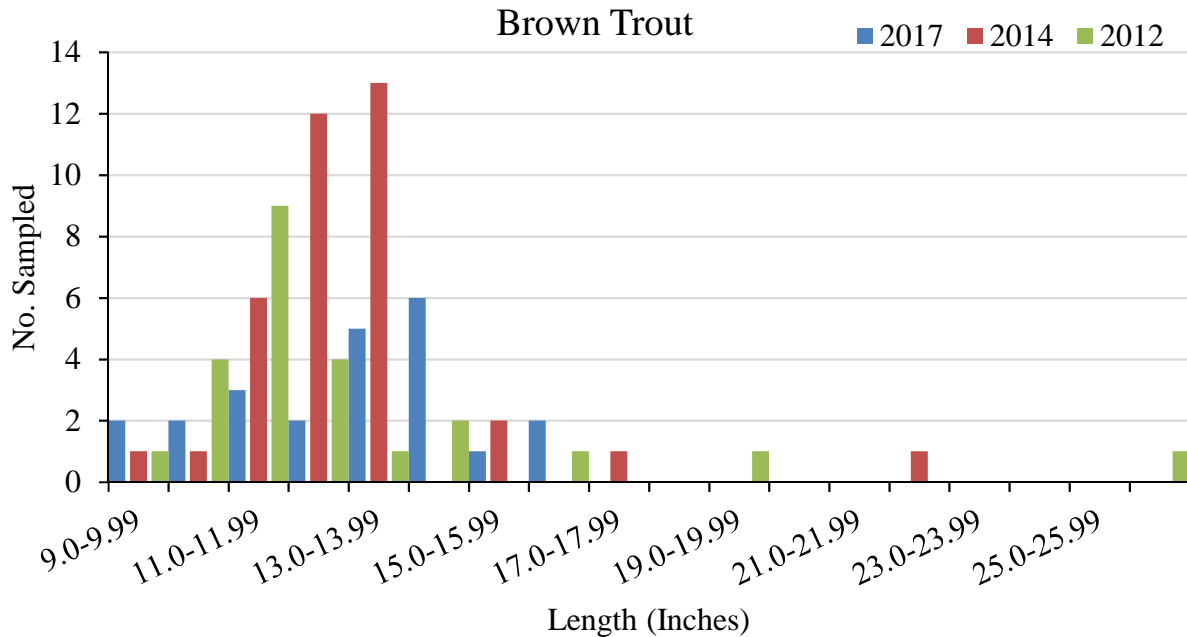
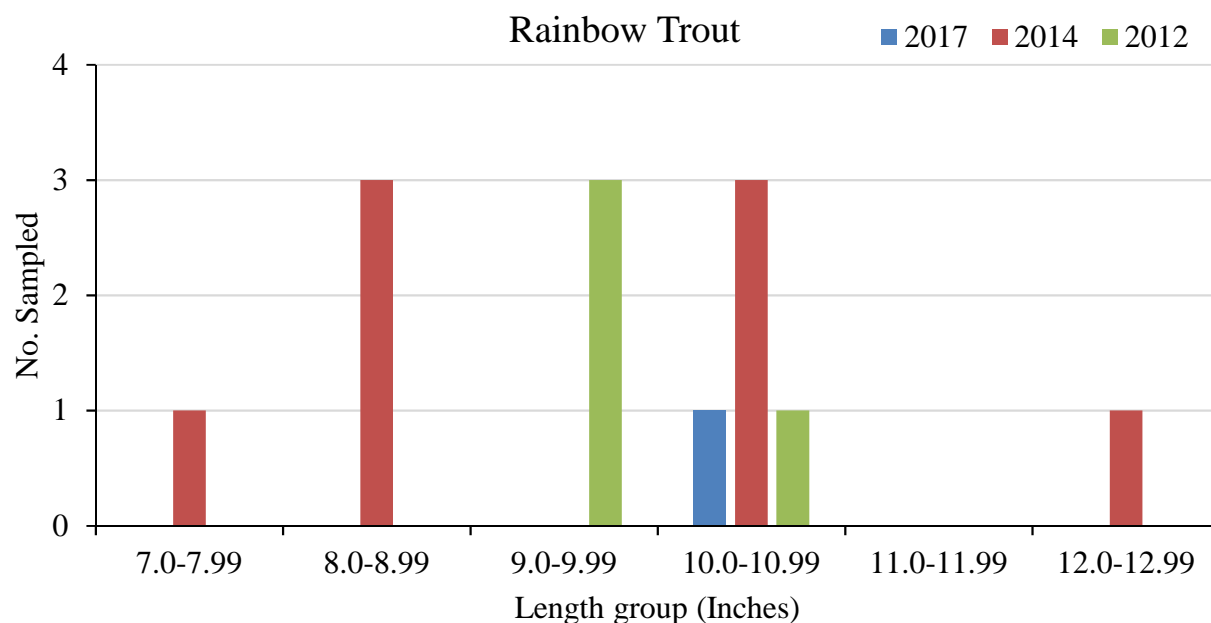


Figure 3-7: Length frequency for rainbow trout in West Rosebud Lake, 2012, 2014, 2017 (MFWP, unpublished).



3.2 Emerald Lake

3.2.1 Fish Stocking

As in West Rosebud Lake, Arctic grayling were also stocked once in Emerald Lake in 2009 (200 fish with an average length of 9.5 inches). However, no Arctic grayling were observed during gillnetting efforts in Emerald Lake following 2009. Rainbow trout were the only other species stocked in Emerald Lake between 2005 and 2017. An average of 1,784 rainbow trout (average length of 7.6 inches) were stocked annually between 2005 and 2017. During this period, a grand total of 22,990 rainbow trout were stocked in Emerald Lake. A summary of annual stocking in Emerald Lake from 2015 to 2017 is shown in Table 3-3.

Table 3-3: Summary of fish stocking in Emerald Lake from 2015 through 2017. (MFWP, 2018).

Year	Species	Number	Avg. Length (inches)
2015	RB	1,799	7.7
2016	RB	1,868	8.2
2017	RB	1,799	7.7

3.2.2 Emerald Lake Fisheries

A total of five species, including brook trout, brown trout, rainbow trout, mountain whitefish, and longnose suckers have been observed during gillnet surveys in Emerald Lake. However, no

rainbow trout were recorded in 2008 or 2017 and there were no brook trout observed in 2014. A summary of 2017 data is provided in Table 3-4.

Table 3-4: Summary of Emerald Lake gillnetting data, including species (LL=brown trout, EB=brook trout, RB=rainbow trout, MWF=mountain whitefish, LN SU=longnose sucker), number captured, net hours, catch rate per hour, average length, range of lengths, and average weight collected in May 2017.

2017 Species	Number Caught	Net hours	No. Fish/hour	Avg. Length (inches)	Range Length (inches)	Avg. Weight (lbs)
LL	4	24	0.17	15.95	11.6-25.5	2.15
EB	8	24	0.33	12.68	9.8-14.2	0.78
MWF	5	24	0.21	17.22	14.8-19.0	1.67
LN SU	3	24	0.13	14.50	13.3-15.8	1.46

MFWP analyzed available historic data for Emerald Lake fish sampling from 1984 through 2017. Various metrics were analyzed including catch rate per hour (Figure 3-8), biomass per net (Figure 3-9), relative weight (Figure 3-10). Results from Emerald Lake gillnetting found metrics (catch per hour, biomass, relative weight) to be slightly lower in 2017 compared to the long-term average for the site.

Figure 3-8: Number of fish, by species, caught per hour gillnetting in Emerald Lake, 1990-2017. (EB=brook trout, GR=Arctic grayling, LL=brown trout, LN SU=longnose sucker, MWF=mountain whitefish, RB=rainbow trout, YCT = Yellowstone cutthroat trout).

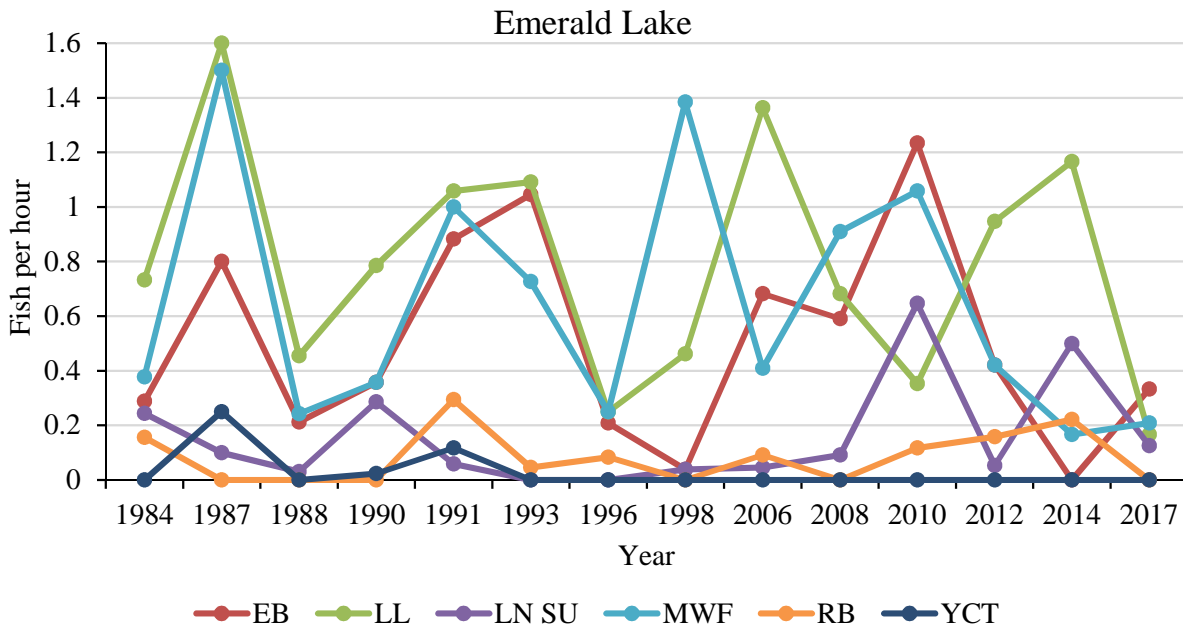


Figure 3-9: Biomass (pounds) per net in Emerald Lake, 1984-2017.

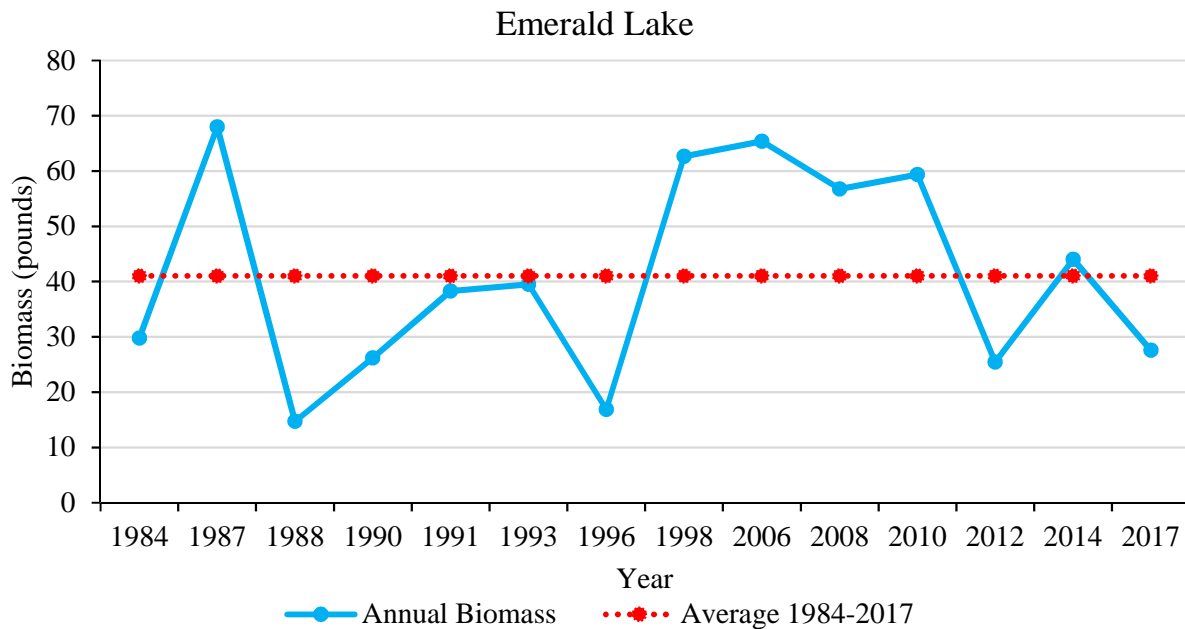
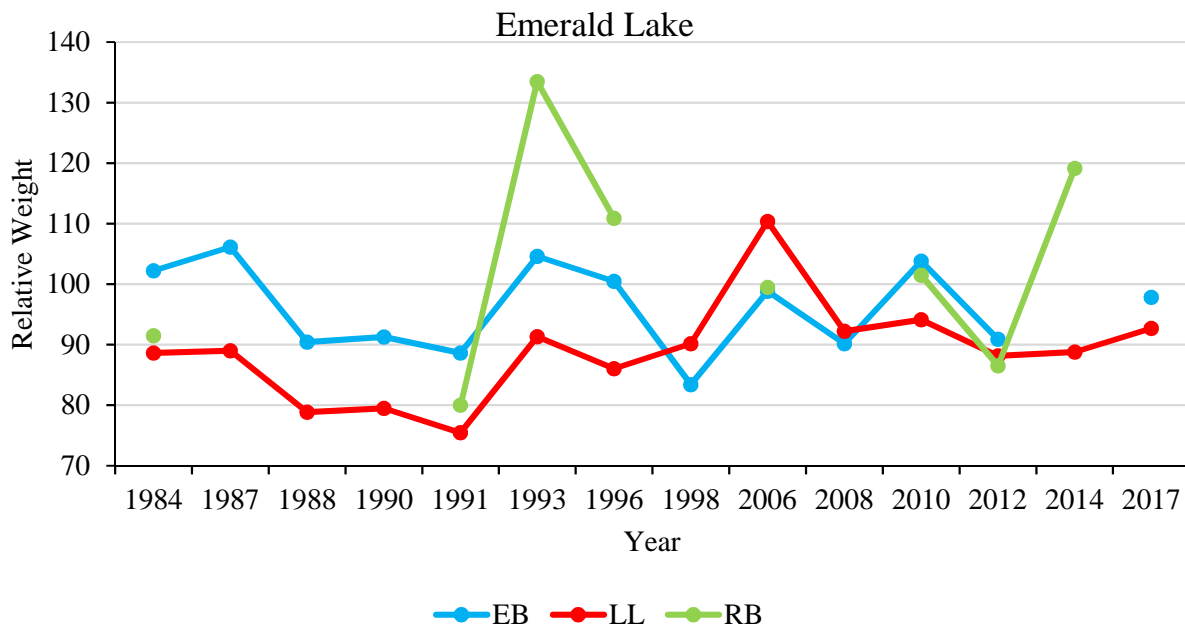


Figure 3-10: Relative weight for brook trout, brown trout, and rainbow trout in Emerald Lake, 1984-2017 (MFWP, unpublished).



Length-frequency histograms for brook trout (Figure 3-11), brown trout (Figure 3-12), and rainbow trout (Figure 3-13) from gillnet data collected in 2012, 2014, and 2017 are shown below. The distribution of size classes for brook trout in 2012 and 2017 for brook trout were similar with a few more larger fish observed in 2017 compared to 2012. There were fewer brown trout sampled

in 2017 compared to previous years and the size classes were representative of previous years with the exception of one fish exceeding 25 inches in length. There were no rainbow trout sampled in 2017. Previous sample years resulted in a low sample size of rainbow trout, thus the distribution of size classes over time is difficult to assess.

Figure 3-11: Length frequency for brook trout in Emerald Lake, 2012 and 2017. There were no brook trout sampled in 2014 (MFWP, unpublished).

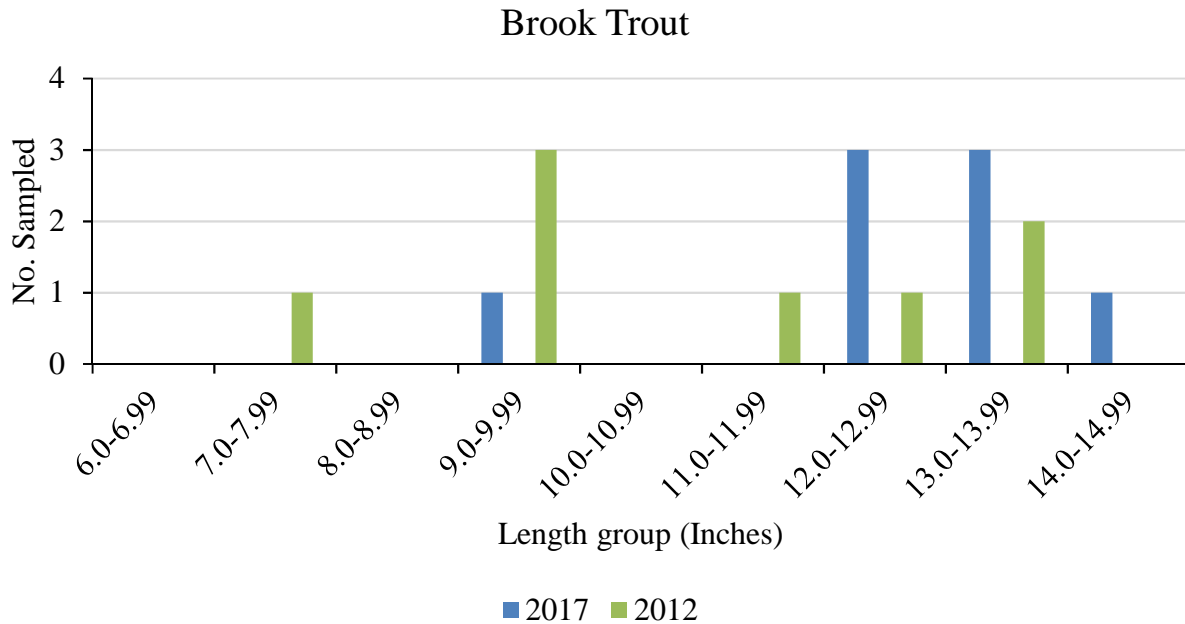


Figure 3-12: Length frequency for brown trout in Emerald Lake, 2012, 2014, 2017 (MFWP, unpublished).

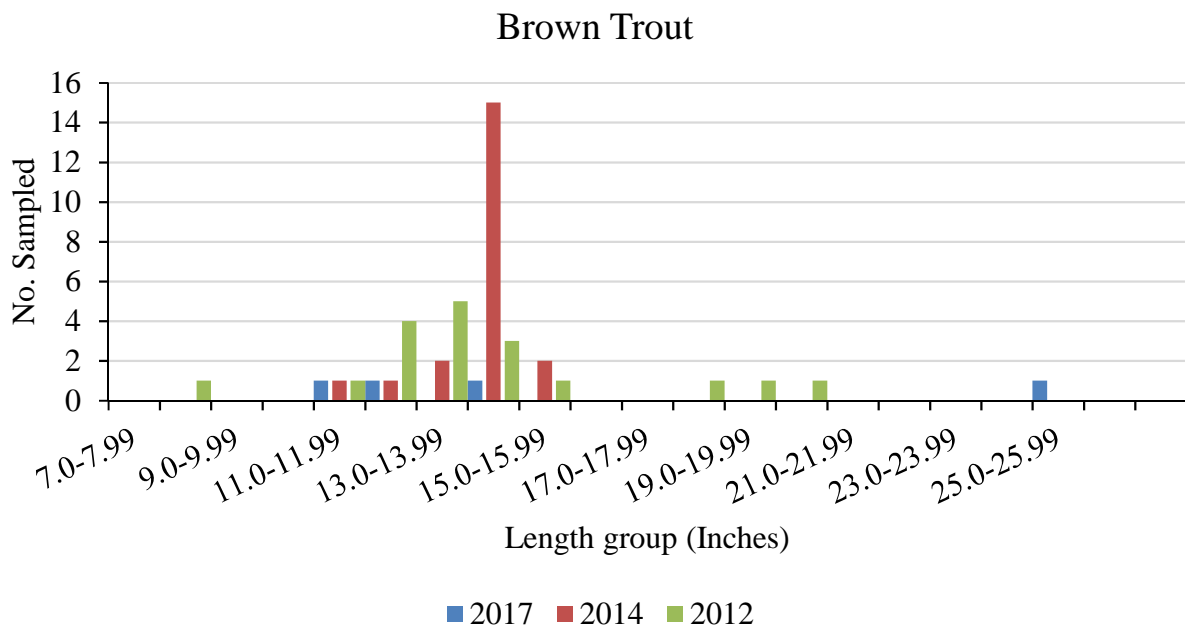
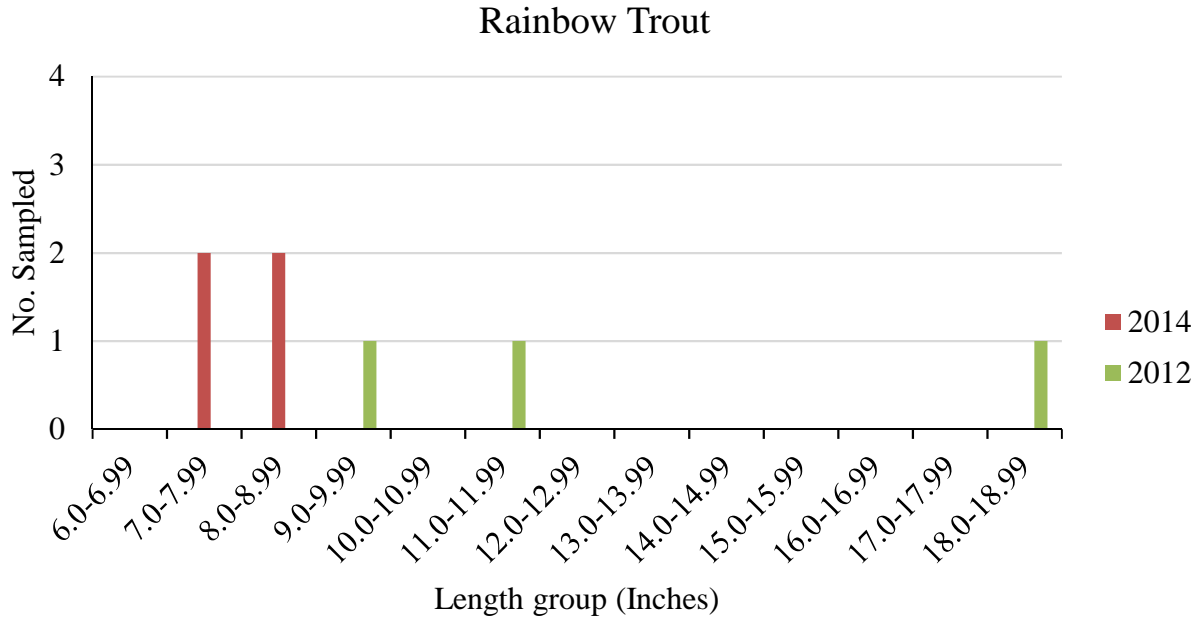


Figure 3-13: Length frequency for rainbow trout in Emerald Lake, 2012 and 2014. No rainbow trout were sampled in 2017 (MFWP, unpublished).



4. West Rosebud Creek Redd Count

Redd counts in West Rosebud Creek are scheduled to occur every other year, starting in 2017 according to the *2016-2021 Fisheries Monitoring Plan* (NorthWestern, 2016a). The survey reach is a 1.5-mile-long reach of West Rosebud Creek between the Pine Grove Campground and the bridge on the Mackay’s property, referred to as the Mackay Flat section (*refer to* Figure 1-1). The Mackay Flat section serves as an important spawning area for both resident West Rosebud Creek fish and migratory rainbow and brown trout from the Stillwater and Yellowstone rivers. Redd counts are performed in the autumn for brown trout. Details of previous spring and fall redd counts completed between 2008 and 2015 are provided in the respective annual reports (PPL Montana, 2011; 2012; 2013; 2014 and NorthWestern, 2015; 2016).

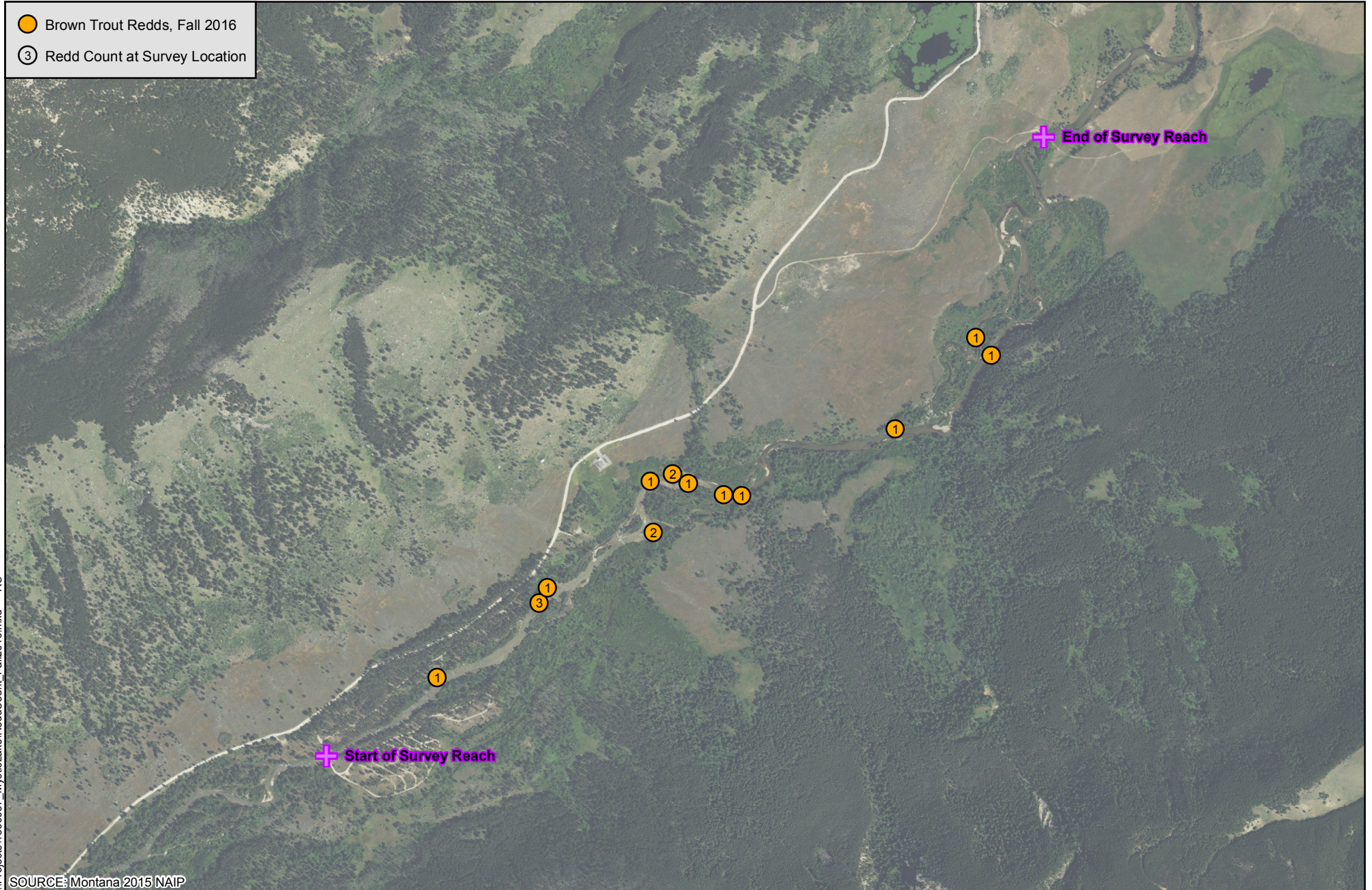
MFWP completed fall redd survey in November 2016 instead of 2017 (due to a scheduling error). A total of 16 brown trout redds were recorded on November 22, 2016. The 2016 survey was completed later than compared to previous surveys (Table 4-1). Since 2009, redd surveys have occurred between mid-October and mid-November with the exception of 2010 when the survey reach was iced over in early October preventing any survey to be completed (Table 4-1). More commonly, the area is iced over by early November.

Table 4-1: Survey dates for redd counts from 2009 to 2016 in West Rosebud Creek.

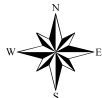
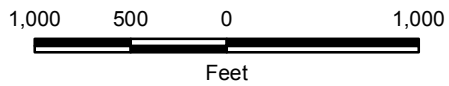
Year	Fall Survey Dates
2016	Nov 22
2015	Oct 27, Nov 5
2014	Oct 29
2013	Oct 12, Nov 7
2012	Oct 31; Nov 14, 15
2011	Oct 31; Nov 1, 15
2010	Oct 5
2009	Nov 11

The location of the redds observed in 2016 are shown in Figure 4- 1.

- Brown Trout Redds, Fall 2016
- ③ Redd Count at Survey Location



SOURCE: Montana 2015 NAIP



Mystic Lake Hydroelectric Project
 FERC No. 2301
 Stillwater and Carbon Counties, Montana
 NorthWestern Energy



FALL 2016 REDD COUNTS
 ON WEST ROSEBUD CREEK

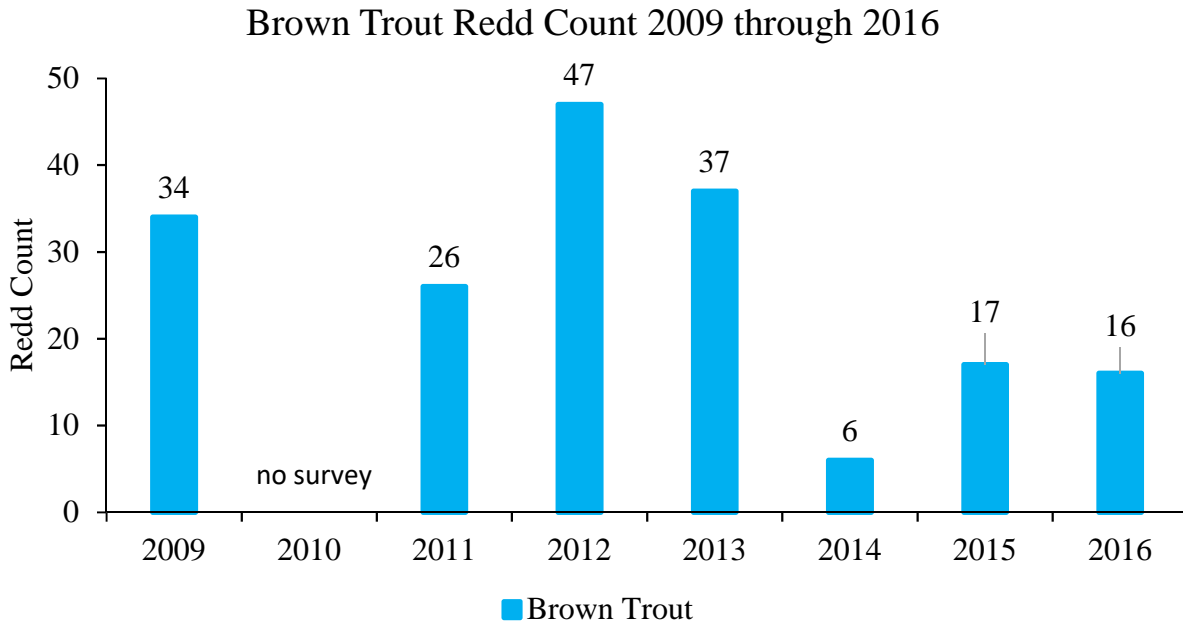
MAY 2018

FIGURE 4-1

18May2018 Z:\Projects\1800057_MysticLake\ReddCount_Fall2016.mxd RS

A summary of the total number of brown trout redds observed annually since 2009 is shown in Figure 4-2. Annual redd counts have varied from a low of 6 redds in 2014 to a high of 47 redds in 2012. Redd counts in 2016 were similar to 2015 survey but remain lower than redd counts between 2009 and 2013 (26-47 redds per year). The variability in redds observed may be related to limitations of a redd survey, natural variability in the system, or a combination of factors.

Figure 4-2: Summary of redd surveys along West Rosebud Creek, 2009 – 2016.



5. Fisheries Monitoring Schedule for 2018

In 2018, fisheries monitoring efforts in the Project area will focus on fish surveys in Mystic Lake and water temperature monitoring in West Rosebud Creek (*refer to* Table 1-1).

NorthWestern will continue to prepare and submit annual reports summarizing the previous year's monitoring activities to the TAC and posting these reports on the Mystic Lake Project Coordination website (www.mysticlakeproject.com). Every 6 years, the TAC will re-evaluate and file an updated Fisheries Monitoring Plan with the Commission, as required for the term of the Project License (40 years).

A comprehensive 6-year (2016–2021) summary report with an updated 6-year (2022–2027) Fisheries Monitoring Plan will be prepared in 2022 and submitted to the TAC agencies for review and approval prior to filing with the Commission. These two reports (2016-2021 summary report; 2022-2027 monitoring plan) will be filed with the Commission no later than December 31, 2022. The final reports will also be posted on the Mystic Lake Project Coordination website.

6. References

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