NorthWestern Energy
Delivering a Bright Future

NorthWestern Energy, 1801 South Russell, Missoula, Montana 59806

NWE-TFalls-2283

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

March 17, 2016

RE: NorthWestern Energy Files 2015 Annual Activity, Fish Passage and Bull Trout Take Report for the Thompson Falls Hydroelectric Project (1869)

Dear Secretary Bose:

Herein attached, per Item D of Commission Order dated February 12, 2009, is NorthWestern Energy's 2015 Annual Activity, Fish Passage and Bull Trout Take Report for the Thompson Falls Project completed in consultation with the U.S. Fish and Wildlife Service (USFWS), Montana Fish, Wildlife and Parks, Montana Department of Environmental Quality and Confederated Salish and Kootenai Tribes. The USFWS signature of approval (under their Section 7 Terms and Conditions Authority) for this report and filing with the Commission is included on page 2.

Sincerely,

Jon Jourdonnais
Leader, Hydropower License Compliance

cc: Wade Fredenberg, USFWS
Craig Barfoot, CSKT
Jason Garber, MDEQ
Randy Apfelbeck, MDEQ
Don Skaar, MFWP
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Mary Gail Sullivan, NorthWestern
Ginger Gillin, GEI Consultants, Inc.
Kristi Webb, New Wave

The USFWS has reviewed, and by signature below, approves this Thompson Falls Project 2015 Annual Activity, Fish Passage and Bull Trout Take Report filing with the Commission.

Ben Conard
Name

USFWS – Kalispell Suboffice Supervisor

03/17/2016
Date

2015 Annual Report
Fish Passage Project
Thompson Falls Hydroelectric Project
FERC Project Number 1869

Submitted to:
Federal Energy Regulatory Commission
Washington, D.C.

Submitted by:
NorthWestern Energy Corporation
Butte, Montana

In Collaboration With:
Montana Fish Wildlife and Parks
Thompson Falls, Montana

U.S. Fish and Wildlife Service
Kalispell, Montana

Montana Department of Environmental Quality
Helena, Montana

Confederated Salish and Kootenai Tribes of the Flathead Nation
Pablo, Montana

With Assistance From:
GEI Consultants, Inc.
Portland, Oregon

New Wave Environmental Consulting, LLC
Missoula, Montana

March 2016

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List of Acronyms

%	percent
AMFA	adaptive management funding account
AWS	auxiliary water system
Avista	Avista Corporation
BO	Biological Opinion
BULL	bull trout
BL BH	black bullhead
° C	degrees Celsius
cfs	Cubic feet per second
Ck	creek
Commission	Federal Energy Regulatory Commission
CPUE	catch per unit effort
CSKT	Confederated Salish and Kootenai Tribes of the Flathead Nation
EB	brook trout
EF	electrofishing
FERC	Federal Energy Regulatory Commission
ft	feet
FDX	full-duplex
FWP	Montana Fish, Wildlife and Parks
FWS or Service	U.S. Fish and Wildlife Service
GBT	gas bubble trauma
g	gram
HDX	half-duplex
HVJ	high-velocity jet
hrs	hours
kg	kilogram
km	kilometer
L	length
ladder	Thompson Falls Upstream Fish Passage Facility
LCFR	Lower Clark Fork River
Licensee	NorthWestern Energy Corporation
LL	brown trout
LT	lake trout
LMB	largemouth bass
LS SU	largescale sucker
LN DC	longnose dace
LN SU	longnose sucker
L WF	lake whitefish
MOU	Memorandum of Understanding
mbar	millibar
mm	millimeter

mmHg	millimeter of mercury
MDEQ	Montana Department of Environmental Quality
MWF	mountain whitefish
Msl	mean sea level
N	number
NP	northern pike
N PMN	northern pikeminnow
NorthWestern	NorthWestern Energy Corporation
Order	Order Approving Construction and Operation of Fish Passage Facilities for the Project
PEA	peamouth
PIT	passive integrated transponder
PPL Montana	PPL Montana, LLC
Project	Thompson Falls Hydroelectric Project
PUMP	pumpkinseed
RB	rainbow trout
RBxWCT	rainbow x westslope cutthroat trout hybrid
RS SH	redside shiner
SMB	smallmouth bass
TAC	Technical Advisory Committee
TCs	Terms and Conditions
TFalls	Thompson Falls
TDG	total dissolved gas
USGS	U.S. Geological Survey
WE	walleye
Wt	weight
WCT	westslope cutthroat trout
WF	West Fork
YP	yellow perch

Plan Abbreviations

Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020	Fish Passage Evaluation Plan
Final Thompson Falls Fish Ladder – Fishway Operations Manual 1.0	SOP
Thompson River Bull Trout Enhancement and Recovery Plan	Plan
Total Dissolved Gas Control Plan	TDG Control Plan

Executive Summary

NorthWestern Energy Corporation (NorthWestern) is owner and operator of the Thompson Falls Hydroelectric Project (No. 1869) (Project), located on the Clark Fork River near Thompson Falls, Montana. The current Federal Energy Regulatory Commission (FERC or Commission) License was issued to the Montana Power Company (purchased by PPL Montana in 1998 and subsequently purchased by NorthWestern in 2014) in 1979 and is scheduled to expire on December 31, 2025.

In 1998, the bull trout (*Salvelinus confluentus*) was federally-listed under the Endangered Species Act as a threatened species (Federal Register, 1998). Critical habitat was designated in 2005 and revised in 2010 (Federal Register 2005, 2010). The Licensee for Project 1869 conducted 5 years of studies and filed a Biological Evaluation with the Commission on April 7, 2008 discussing the effects of the Project on bull trout and proposed conservation measures.

The 2008 Biological Evaluation was adopted as the Commission's Final Biological Assessment and submitted to the U.S. Fish and Wildlife Service (FWS or Service) on May 1, 2008. On November 4, 2008 the FWS filed with the Commission a Biological Opinion (BO) (FWS, 2008) and an associated Incidental Take Statement, which includes reasonable and prudent measures, and Terms and Conditions (TCs) to minimize incidental take of bull trout. On February 12, 2009 the Commission issued an Order Approving Construction and Operation of Fish Passage Facilities for the Project (Order) (FERC, 2009). This Order included the reasonable and prudent measures, TCs, and conservation recommendations from the BO. The FERC agreed with the FWS's conclusion that the Project is currently adversely affecting bull trout and Licensee's proposed conservation measures will reduce, but not totally eliminate, adverse impacts of the Project.

The Order requires the Licensee to file with the Commission, by April 1 of each year through the remainder of the License, the annual report referenced in Term 7a of the FWS's TCs. In addition to the requirements stipulated in Term 7a, the annual report shall also address the Licensee's compliance with the FWS's TCs.

This report is intended to fulfill the annual reporting requirement, as specified in Term 7a of the BO and the requirements of the FERC Order. This report summarizes the Licensee's 2015 activities (Sections 2.0 through 8.0); compliance with the FWS's TCs of the BO (Section 9.0); and proposed activities in 2016 (Section 10.0).

Baseline Fisheries Studies

In 2015, the Licensee (NorthWestern Energy as of November 18, 2014) with assistance from Montana Fish, Wildlife and Parks (FWP) continued collecting baseline fisheries data as presented in Section 2.0 of this report. Baseline fisheries data includes spring electrofishing the Thompson Falls Reservoir; autumn electrofishing in Clark Fork River above the island complex;

and autumn gillnetting in Thompson Falls Reservoir. The resulting catch per unit effort (fish per hour or fish per net) over the years has been highly variable. Additionally, the detection of fish tagged at the Thompson Falls Upstream Fish Passage Facility (ladder) (between 2011 and 2015) has been limited in the baseline fisheries surveys. Since 2011, of six individual fish, including four rainbow trout and two brown trout, initially tagged at the ladder were captured upstream during baseline fisheries surveys (2 fish via gillnetting; 2 fish via electrofishing above the islands; 2 fish via electrofishing above the islands).

Upstream Fish Passage (10-Year Fish Passage Evaluation Plan)

In 2011, FERC issued two Orders, one on June 9, 2011 approving the Licensee's 10-year *Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) and the second on June 17, 2011 approving the Licensee's *Final Thompson Falls Fish Ladder – Fishway Operations Manual 1.0* (PPL Montana, 2010a). The ladder became operational in 2011. In 2015, the Licensee implemented the fifth year of studies as outlined in the Fish Passage Evaluation Plan.

In 2015, the ladder commenced operation on March 16 and was winterized on November 9. There were 8 consecutive days between March 23 and 30 when the ladder was not operational to address maintenance issues. During ladder operations in 2015, the ladder operated in orifice mode for the entire season. Approximately 11,647 fish representing 13 species and one hybrid, including two bull trout, ascended the ladder. For the first time, peamouth and walleye were recorded at the ladder in 2015. As in previous years, lake trout and walleye were not authorized by FWP for release upstream if captured at the Thompson Falls upstream fish passage facility.

The total number of fish recorded annually at the ladder has increased from 1,805 fish in 2011 to 11,647 fish in 2015. Since 2011, 25,685 fish were documented at the ladder and 25,554 fish have been released upstream of Thompson Falls Dam. The 131 fish not released upstream were either recorded as mortalities at the ladder or not authorized for release upstream (i.e., 9 lake trout; 2 walleye). The majority of fish recorded at the ladder since 2011 are non-salmonids, while salmonids represent approximately 8 percent of all fish. During the last 5 years of operations, 12 bull trout (representing 11 unique individuals) have ascended the ladder.

Since the ladder commenced operations in 2011, 2,674 fish (1,566 passive integrated transponder [PIT] and 1,108 Floy tags) were uniquely tagged at the ladder. These fish represent 10 species and one salmonid hybrid. The number of uniquely tagged fish represent nearly 75 percent of all salmonids and 4.7 percent of non-salmonids recorded at the ladder between 2011 and 2015. For the last 5 years, the majority of fish PIT-tagged at the ladder were salmonids with approximately 82 percent of the PIT-tagged salmonids represented by rainbow trout and brown trout. Non-salmonids have been primarily Floy-tagged with the majority of the tagged non-salmonids represented by smallmouth bass.

In 2015, 62 salmonids and 20 non-salmonids were identified as returning fish having already ascended the ladder one or more times. The majority of the salmonids were returning from previous year(s) while all 20 returning non-salmonids were classified as "fallback." Based on the total number of salmonids individually tagged at the ladder between 2011 and 2015 (1,557 fish), approximately 158 individuals have been recorded returning to the ladder one or more times. The corresponding percentage of the tagged fish identified as fallback in any given year has varied between 0.7 percent and 4.8 percent.

Bull Trout Incidental "Take"

In 2015, the Licensee collected four bull trout (2 at the ladder; 1 via electrofishing in the upper section of the Thompson Falls Reservoir; 1 via electrofishing above the islands in the Clark Fork River), all of which were released live. The bull trout recorded on May 17 at the ladder was released upstream of the dam and then recaptured via electrofishing in the Big Hole section of the Thompson River by FWP on June 2, 2015 (also released alive). The second bull trout recorded at the ladder on June 3 was implanted with two HDX tags (after testing the first HDX tag with no successful reading, a second HDX tag was implanted in the fish) and released live upstream of the dam. The bull trout that was sampled via electrofishing in the Clark Fork River above the islands on October 20, 2015 was initially captured and tagged by Avista Corporation (Avista) below Cabinet Gorge Dam on April 14, 2015. In April, FWP transported the bull trout upstream to Region 4 where it was released in the Clark Fork River approximately 0.6 miles downstream of the confluence with the Thompson River.

Since operations at the ladder began (2011-2015), 27 individual bull trout have been sampled by the Licensee in the Project area with approximately three to seven individual bull trout sampled annually. Sampling has included collecting bull trout via electrofishing efforts upstream and downstream of Thompson Falls Dam, as well as bull trout recorded at the ladder. Of the 27 bull trout, one ascended the ladder twice and during the second ascent (2012), the bull trout jumped out of a pool and died. This mortality has been the only occurrence in the Project area and subsequently, a cover was placed over the holding pool to mitigate the potential for this to occur again.

Avista Bull Trout Passage and Monitoring

The number of bull trout transported by Avista has been documented in each annual report for the Project since 2009. From 2009 through 2015, Avista captured 76 bull trout that were genetically assigned to Region 4 (upstream of Thompson Falls Dam) and transported 63 bull trout to Region 4 with an average of approximately 9 bull trout transported annually to Region 4.

In 2015, Avista captured 56 unique bull trout (≥350 mm) downstream of the Cabinet Gorge Hydroelectric Project and transported 39 of the bull trout upstream and released them in either the Cabinet Gorge Reservoir (number [n]=17); Noxon Reservoir (n=13); or upstream of Thompson Falls Dam (n=9).

The nine bull trout transported upstream of the Thompson Falls Project were PIT-tagged and released in the Clark Fork River approximately 0.6 miles downstream of the confluence with the Thompson River (n=2); in the Thompson River (n=5); or in the St. Regis River (n=2).

Total Dissolved Gas (TDG) and Gas Bubble Trauma (GBT) Monitoring

The snowpack in the Lower Clark Fork basin started with 90 percent of normal snowpack in January 2015, but continually declined to approximately 49 percent of normal by early April. March storms brought precipitation in the form of rain with very little or no snow accumulations. The April 1, 2015 runoff forecast for the Clark Fork River near Plains was 89 percent of normal. Therefore, the forecast was below the monitoring threshold of 125 percent of normal so monitoring of TDG and GBT was not implemented in 2015.

Thompson Falls Reservoir Monitoring Plan

In 2010, the Licensee developed and submitted the *5-Year Reservoir Monitoring Plan, 2011-2015* to the Commission in compliance with Term 5a of the FWS's BO TCs. The Commission issued an Order on February 9, 2011 approving the 5-Year Reservoir Monitoring Plan, and the Licensee began implementation in 2011 and included annual progress updates in subsequent annual reports.

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile bull trout survivorship and evaluate the site specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO (FWS, 2008). However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS along with the proposed changes, were filed with the Commission on December 17, 2014. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement has been achieved through the annual reports since 2011 and postponing the development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" from the end of 2015 to December 31, 2020. The 2020 report will include a full review of the results from the 2014-2015 study evaluating out migration of juvenile bull trout from the Thompson River. A detailed analysis of the results from the 2014 and 2015 field data collection are anticipated to be submitted to the TAC by December 31, 2016.

TAC-Funded Projects

In 2013, the Licensee renewed the Memorandum of Understanding (MOU, 2013) for a 7-year term (January 1, 2014 through December 31, 2020). The MOU was approved and signed by FWS, FWP, Confederated Salish and Kootenai Tribes of the Flathead Nation (CSKT), and the Licensee.

The terms of the renewed 2014-2020 MOU are similar to the first term of the 2009-2013 MOU (MOU, 2008). The adaptive management funding account (AMFA) started with $150,000 on January 1, 2014. The Licensee will provide $100,000 annually for 7 years and allow a maximum of $250,000 to accrue in the account from unspent or transferred annual TAC funds. The AMFA is designated for implementation of downstream passage minimization measures in addition to Project License required studies, monitoring activities, reports, upstream fish passage minimization measures, gas abatement monitoring, predator control measures, and other means to reducing impacts on bull trout caused by operation of the Project.

In 2015, the Licensee, through the TAC, allocated funds for bull trout protection, mitigation, or enhancement either in whole or in partnership to the following projects:

- Funding provided for improvement of the bull trout genetic baseline database for Little Joe Creek (North and South forks).
- Funding provided for the second year of data collection in support of the Thompson Falls Reservoir study of juvenile bull trout out-migration from the Thompson River and purchase of supporting equipment (e.g., transmitters, receivers, mobile tracking data logger and hydrophone).
- Funding provided for a portion of the costs for FWP to acquire the Rehbein-property in the West Fork Fish Creek drainage.

The TAC authorized/allocated funds totaling approximately $88,794 in support of the following projects that are anticipated to be implemented in 2016 and 2017:

- Cedar Creek Phase 2 Road Relocation and LWD Enhancement Project ($30,000)
- Beartrap Fork Culvert Removal Project ($11,000)
- Rattlesnake Creek Fish Screen Project, Phase I ($13,125)
- Bull Trout Genetics Analysis ($10,000)
- Final Year of Thompson Falls Reservoir Study of Juvenile Bull Trout Out-Migration ($24,669) (report expected to be available to the TAC by December 31, 2016)

1.0 Introduction

1.1 Background

NorthWestern Energy Corporation (NorthWestern) is owner and operator of the Thompson Falls Hydroelectric Project (No. 1869) (Project), located on the Clark Fork River near Thompson Falls, Montana. The current Federal Energy Regulatory Commission (FERC or Commission) License was issued to Montana Power Company (purchased by PPL Montana in 1998 and subsequently purchased by NorthWestern in 2014) in 1979 and is scheduled to expire on December 31, 2025.

In 1998, the bull trout (*Salvelinus confluentus*) was federally-listed under the Endangered Species Act as a threatened species (Federal Register, 1998). Critical habitat was designated in 2005 and revised in 2010 (Federal Register, 2005, 2010). The U.S. Fish and Wildlife Service (FWS or Service) proposed a revision to the Critical Habitat Designation on January 13, 2010. The Final Critical Habitat Designation Rule for bull trout was submitted by FWS on September 30, 2010 and was effective as of November 17, 2010. The Project area is within the designated critical habitat for bull trout. Because bull trout are present within the Project area, a draft Biological Evaluation was prepared for the Project and submitted to FWS and FERC in 2003.

After 5 years of studies, the Licensee filed a new Biological Evaluation with the Commission, discussing the effects of the Project on bull trout and proposed conservation measures with the Commission on April 7, 2008. The Biological Evaluation identified several factors directly related to Project operation that negatively impact bull trout in the Clark Fork River. Inhibition of upstream migration and subsequent access to spawning habitat by the Project was identified as a major concern. Consequently, the Licensee proposed to install a full-height fishway at the Project and filed 90-percent drawings for the structure on April 7, 2008. The filing also contained a Memorandum of Understanding (MOU) signed by the Licensee, the Confederated Salish and Kootenai Tribes of the Flathead Nation (CSKT), Montana Fish, Wildlife and Parks (FWP), and FWS (MOU, 2008). In 2013, the Licensee filed the renewed MOU with the Commission on November 11, 2013. The renewed MOU was developed in consultation with CSKT, FWP, and FWS and is effective from January 1, 2014 through December 31, 2020 (MOU, 2013).[1]

In 2008, the Commission concluded that the Project is adversely affecting bull trout and the proposed conservation measures will reduce, but not totally eliminate, the Project's adverse

[1] The MOU provides Terms and Conditions regarding the collaboration between the Licensee and the FWS, FWP, and CSKT and the implementation of minimization measures for bull trout.

effects on bull trout. The 2008 Biological Evaluation was adopted as the Commission's Final Biological Assessment and submitted to FWS on May 1, 2008.

On November 4, 2008 the FWS filed with the Commission a Biological Opinion (BO) and associated Incidental Take Statement, which includes reasonable and prudent measures and Terms and Conditions (TCs) to minimize incidental take of bull trout. The FWS concluded in its BO that the Project is currently adversely affecting bull trout and the Licensee's proposed conservation measures will reduce, but not totally eliminate, adverse impacts of the Project (FWS, 2008).

On February 12, 2009 the Commission issued an Order Approving Construction and Operation of Fish Passage Facilities for the Thompson Falls Project (FERC, 2009). This Order included the reasonable and prudent measures, TCs, and conservation recommendations from the FWS's BO.

1.2 Compliance with the FERC Order

The 2009 FERC Order required the Licensee to file with the Commission for approval, study and operational plans referenced in the FWS's TCs 1 through 7, after development and approval by the FWS and the Thompson Falls Technical Advisory Committee (TAC). In order for the Commission to ensure compliance with the FWS's TCs, the Licensee is required to file with the Commission, by April 1 of each year through the remainder of the License, the annual report referenced in Term 7a of the FWS's TCs (*see* Section 9.7.1 for details).

The 2009 FERC Order also specifies, in Term 7b (*see* Section 9.7.1 for details), the Licensee will prepare a comprehensive summary of the first 5 years of upstream fish passage operations by December 31, 2015. The purpose of the report is to gather and assess fish passage efficacy in order to assess the potential need to modify operations at the facility in support of bull trout passage. In 2014, the Licensee and FWS consulted on the requirements of Term 7b and concurred there was no need for a comprehensive 5-year report due to the extensive and thorough summary of information provided in the existing annual reports. NorthWestern filed a letter to the Commission documenting this consultation and proposed modification to Term 7b on December 17, 2014.

This annual report is intended to fulfill the annual reporting requirement, as specified in Term 7a of the BO and the requirements of the FERC Order. This report summarizes the Licensee's 2014 activities in Sections 2.0 through 8.0; NorthWestern's compliance with the FWS's TCs of the BO (Section 9.0); and NorthWestern's proposed activities in 2015 (Section 10.0).

2.0 Baseline Fisheries Studies

Fisheries monitoring of the Thompson Falls Reservoir using gillnets and electrofishing has been conducted annually, within the same general time frame, since 2004. The locations for autumn and spring electrofishing and autumn gillnetting completed in 2015 are displayed in Figure 2-1.

In 2010, the Licensee added a new upstream electrofishing site in the Clark Fork River upstream of the Thompson Falls Hydroelectric Project (Project) between the towns of Plains and Paradise, Montana. This site was surveyed each autumn in 2010, 2011, 2012, and 2014. Since 2012, the sampling interval of the Plains to Paradise reach was modified from annual to every other year with the next survey scheduled for autumn 2016.

The main objective for these sampling efforts is to establish baseline information on species composition and relative abundance within the Thompson Falls Reservoir and upstream of the Thompson Falls Reservoir. This information will help track changes to the fish community annually and over a long period of time. This is especially important with the full-height fish ladder at the Project that commenced operations in spring 2011. This is one monitoring tool that gives managers the ability to track potential system-wide changes with fish passing into the Thompson Falls Reservoir from downstream.

Fish recorded through the baseline fisheries data and fish passage are listed in Table 2-1 along with each species abbreviation, common name, and scientific name. Tables and figures in this report refer to the species abbreviation provided in Table 2-1.

Table 2-1: Summary of abbreviations for fish identification, species common name, and scientific name.

Fish Abbreviation	Common Name	Scientific Name
BL BH	Black bullhead	*Ameiurus melas*
BULL	Bull trout	*Salvelinus confluentus*
EB	Brook Trout	*Salvelinus fontinalis*
LL	Brown trout	*Salmo trutta*
LMB	Largemouth bass	*Micropterus salmoides*
LN DC	Longnose dace	*Rhinichthys cataractae*
LN SU	Longnose sucker	*Catostomus*
LS SU	Largescale sucker	*Catostomus macrocheilus*
LT	Lake trout	*Salvelinus namaycush*
L WF	Lake whitefish	*Coregonus clupeaformis*
MWF	Mountain whitefish	*Prosopium williamsoni*
NP	Northern pike	*Esox lucius*
N PMN	Northern pikeminnow	*Ptychocheilus oregonensis*
PEA	Peamouth	*Mylocheilus caurinus*
PUMP	Pumpkinseed	*Lepomis gibbosus*
RB	Rainbow trout	*Oncorhynchus mykiss*

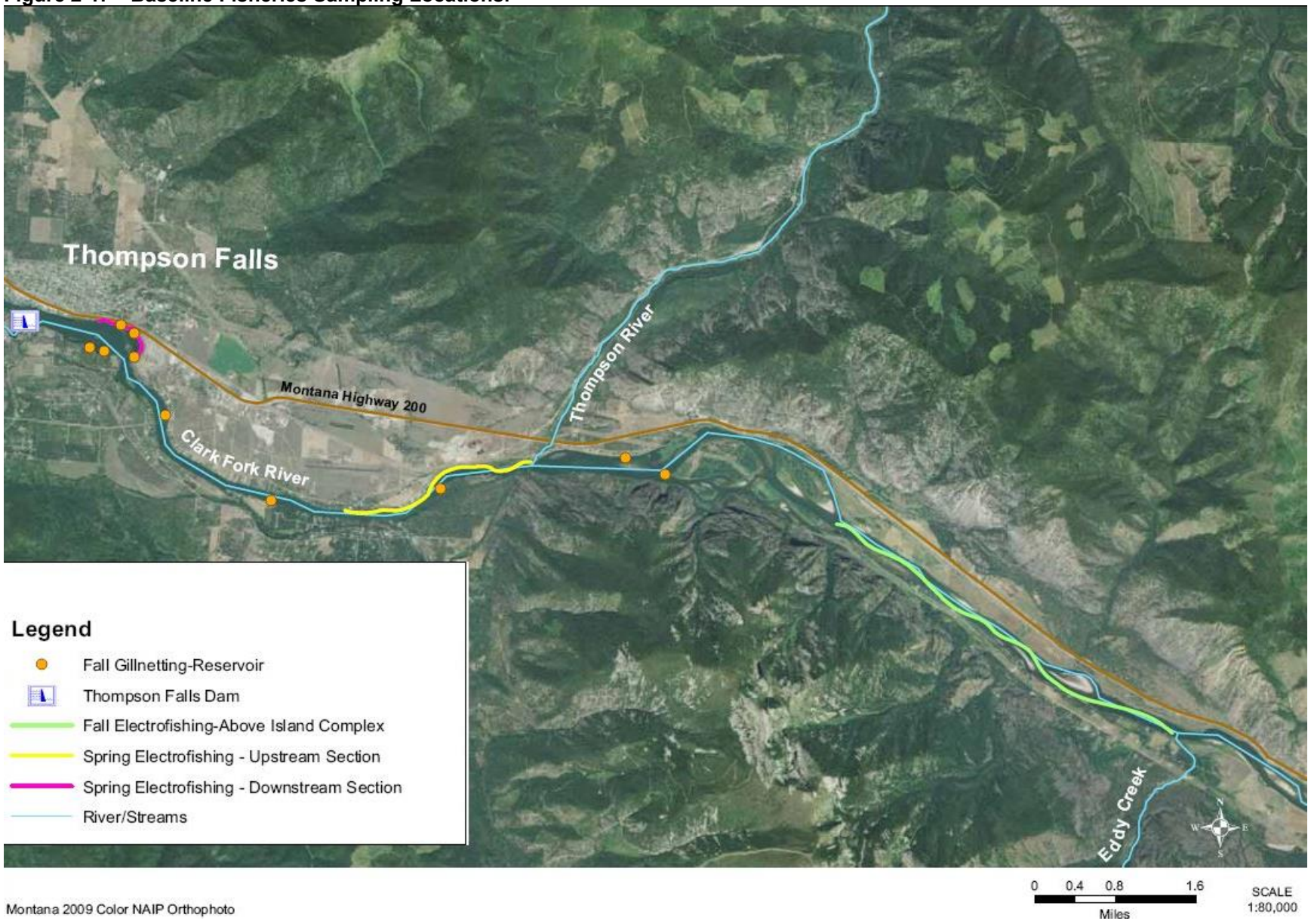
Fish Abbreviation	Common Name	Scientific Name
RBxWCT	Rainbow x Westslope cutthroat trout hybrid[2]	*Oncorhynchus clarkii lewisi and Oncorhynchus mykiss*
RS SH	Redside shiner	*Richardsonius balteatus*
SMB	Smallmouth bass	*Micropterus dolomieu*
WCT	Westslope cutthroat trout	*Oncorhynchus clarkii lewisi*
WE	Walleye	*Sander vitreus*
YP	Yellow perch	*Perca flavescens*
YL BL	Yellow bullhead	*Ameiurus natalis*

2.1 Spring Electrofishing

Spring electrofishing in the Thompson Falls Reservoir consists of two locations, the lower section located immediately upstream of Project and the upper section located immediately downstream of the confluence with the Thompson River (Figure 2-1). Spring electrofishing is conducted using boat-mounted electrofishing equipment. The boat is navigated slowly along the shoreline after daylight hours. The downstream section is parallel with Highway 200 from the Wild Goose Landing boat launch, upstream to a location approximately 750 feet above the pump house. The upstream section is on the right bank of the Clark Fork River from the confluence of the Thompson River to about 1 mile downstream of the Cherry Creek boat launch. The upstream site has riverine characteristics, with noticeable flowing water, average widths around 459 feet, little to no aquatic vegetation, and some recreational docks. The downstream site has substantially lower water velocity, mean widths near 1,673 feet, abundant aquatic vegetation, and is off the main river channel.

[2] Introgressed rainbow and westslope cutthroat trout, for convenience referred to as "hybrid" in this report.

Figure 2-1: Baseline Fisheries Sampling Locations.



In 2015 sampling occurred on April 13 and 14, which was similar to the sampling dates from previous years as shown in Table 2-2.

Table 2-2: Summary of the sample dates, water temperature, duration of electrofishing efforts, and streamflows (USGS Gage #12389000) completed in the lower and upper sections of the Thompson Falls Reservoir 2009-2015.

Lower Section			Upper Section			USGS Gage
Date	**Water Temperature ºC**	**Duration of Electrofishing (hrs)**	**Date**	**Water Temperature ºC**	**Duration of Electrofishing (hrs)**	**Streamflow (cfs)**
4-20-09	10.0	0.6	**4-21-09**	10.5	0.6	17,000 - 18,200
4-28-10	9.0	0.9	**4-29-10**	7.5	2.1	14,300 - 14,600
4-13-11	5.8	1.0	**4-14-11**	5.1	1.9	24,500 - 25,100
4-16-12	7.4	0.8	**4-17-12**	7.2	1.9	14,400 - 14,900
4-11-13	7.0	0.9	**4-10-13**	7.0	1.9	21,000 - 21,800
4-14-14	7.0	1.0	**4-15-14**	7.0	2.1	27,800 - 27,500
4-14-15	6.4	1.0	**4-13-15**	7.0	2.1	24,900 - 25,200
Total hours		**6.2**	**Total hours**		**10.7**	

2.1.1 Lower Section

In 2015, spring electrofishing in the lower section captured 100 fish representing seven species, including one salmonid species. The species included 38 yellow perch, 28 northern pike, 16 largemouth bass, 13 black bullhead, three pumpkinseed, one northern pikeminnow, and one rainbow trout (Table 2-3).

The lower section has been surveyed annually since 2009 with the number of individual fish caught ranging between 34 and 100 fish, representing between seven and 15 species. In 2015, the highest catch rates (fish per hour) were recorded for species such as yellow perch, northern pike, and largemouth bass, and black bullhead (Table 2-3). Black bullhead showed a notable increase in catch rate from 3.4 fish per hour (hr) in 2014 to 12.5 fish/hr in 2015. In general, non-salmonids were more common in the lower section than salmonids in all survey years (Figure 2-2). Other fish observed in the lower section, but at lower rates (less than 3 fish/hr), included pumpkinseed, northern pikeminnow, and rainbow trout. Other species that were recorded in previous years, such as bull trout, brown trout, longnose suckers, largescale suckers, mountain whitefish, peamouth, smallmouth bass, and westslope cutthroat trout were not observed in 2015.

Figure 2-2: Summary of the 2009- 2015 annual catch rate for all salmonids and all fish captured during spring electrofishing efforts in the lower section of the Thompson Falls Reservoir.

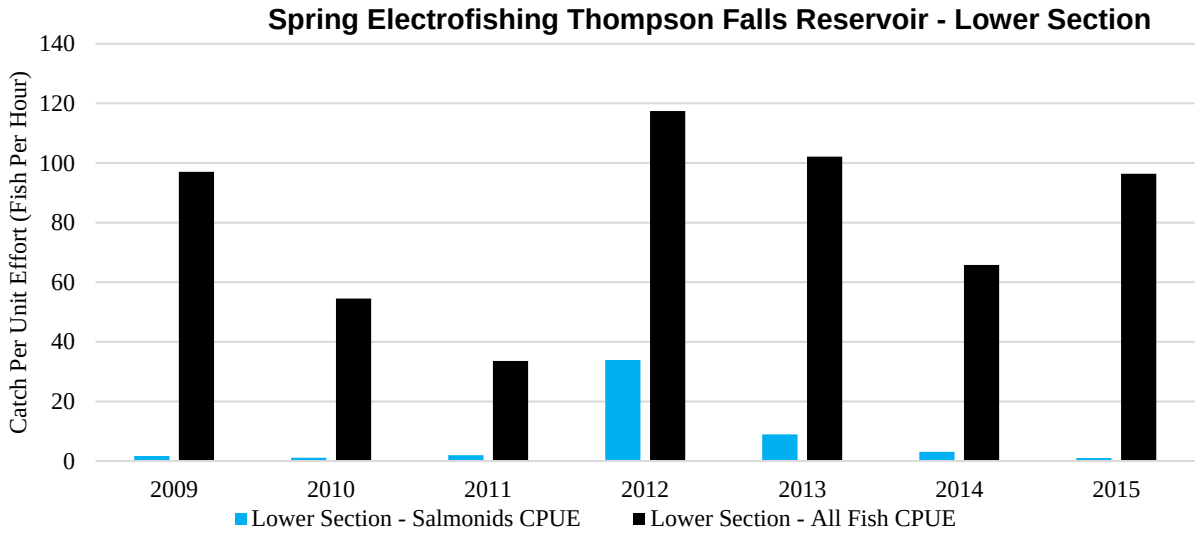


Table 2-3: Summary of spring electrofishing results in the Thompson Falls Reservoir lower section, including number (N) of species and CPUE (catch per hour) from 2009 through 2015 and the average CPUE (6.2 hrs) for 2009-2015.

Lower Section	2009		2010		2011		2012		2013		2014		2015		Total 2009-2015	
Species	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**Avg CPUE**
BL BH	2	3.4	1	1.1	-	-	1	1.2	-	-	3	3.1	13	12.5	20	3.2
BULL	-	-	-	-	-	-	1	1.2	-	-	-	-	-	-	1	0.2
LL	-	-	-	-	-	-	9	10.9	2	2.2	1	1	-	-	12	1.9
LMB	20	34	3	3.3	7	6.9	8	9.7	2	2.2	5	5.1	16	15.4	52	8.4
LN SU	-	-	-	-	-	-	6	7.3	-	-	-	-	-	-	6	1.0
LS SU	11	18.7	3	3.3	1	1	23	27.9	2	2.2	1	1	-	-	38	6.1
MWF	-	-	-	-	-	-	1	1.2	-	-	-	-	-	-	1	0.2
NP	10	17	14	15.2	17	16.8	10	12.1	30	33.6	21	21.6	28	27.0	130	21.0
N PMN	7	12	1	1.1	1	1	17	20.6	3	3.4	2	2.1	1	1	32	5.2
PEA	-	-	-	-	-	-	1	1.2	-	-	-	-	-	-	1	0.2
PUMP	2	3.4	2	2.2	5	4.9	2	2.4	-	-	1	1	3	2.9	15	2.4
RB	-	-	-	-	1	1	4	4.8	6	6.7	1	1	1	1	13	2.1
RS SH	1	1.7	-	-	-	-	-	-	-	-	-	-	-	-	1	0.2
SMB	-	-	-	-	-	-	1	1.2	-	-	-	-	-	-	1	0.2
WCT	1	1.7	1	1.1	1	1	2	2.4	-	-	1	1	-	-	6	1.0
YP	3	5.1	25	27.2	1	1	11	13.3	46	51.6	28	28.8	38	36.6	152	24.5
Subtotal Salmonids	**1**	**1.7**	**1**	**1.1**	**2**	**2**	**17**	**33.9**	**8**	**9.0**	**3**	**3.1**	**1**	**1.0**	**33**	**5.3**
TOTAL FISH	**57**	**97**	**50**	**54.5**	**34**	**33.6**	**97**	**117.4**	**91**	**102.1**	**64**	**65.8**	**100**	**96.4**	**493**	**79.5**

2.1.2 Upper Section

The 2015 sampling of the upper section resulted in 93 fish captured representing 10 species, including five species of salmonid (Table 2-4). The species included 31 largescale suckers, 18 northern pikeminnow, 13 northern pike, 13 rainbow trout, eight brown trout, four smallmouth bass, two westslope cutthroat trout, two yellow perch, one mountain whitefish, and one bull trout. The bull trout measured 219 millimeters (mm) in length, weighed 88 grams (g), and was implanted with a passive integrated transponder (PIT) tag (#989001004067249). A genetic sample was also taken (ID# 118-093) and results are pending.

Annual spring electrofishing in the upper section has occurred since 2009 (Table 2-4). During this period, between 66 and 253 individual fish representing nine to 13 species were recorded annually. The number of salmonids caught per year has varied between 10 and 92 individual fish. The catch rate for salmonids and all fish has varied annually with peak catch rates recorded in 2012 and 2013 (Figure 2-3).

In 2015, the catch rate of fish (fish per hour) in the upper section was greatest (listed in declining order) for largescale suckers, northern pikeminnow, northern pike, rainbow trout, and brown trout. Other species such as smallmouth bass, westslope cutthroat trout, yellow perch, mountain whitefish, and bull trout catch rates were all below two fish per hour in 2015. Other fish observed in previous year(s) such as black bullhead, pumpkinseed, rainbow x westslope cutthroat trout, and redside shiner were not recorded in 2015. Compared to previous years, the total 2015 catch rate for salmonids (12 fish per hour) was the lowest for all sample years and the total 2015 catch rate for all fish (44 fish per hour) was lower than most years, with only 2009 and 2011 sample years yielding lower catch rates (18 and 21 fish per hour, respectively).

Figure 2-3: Summary of the 2009-2015 annual catch rate for all salmonids and all fish captured during spring electrofishing efforts in the upper section of the Thompson Falls Reservoir.

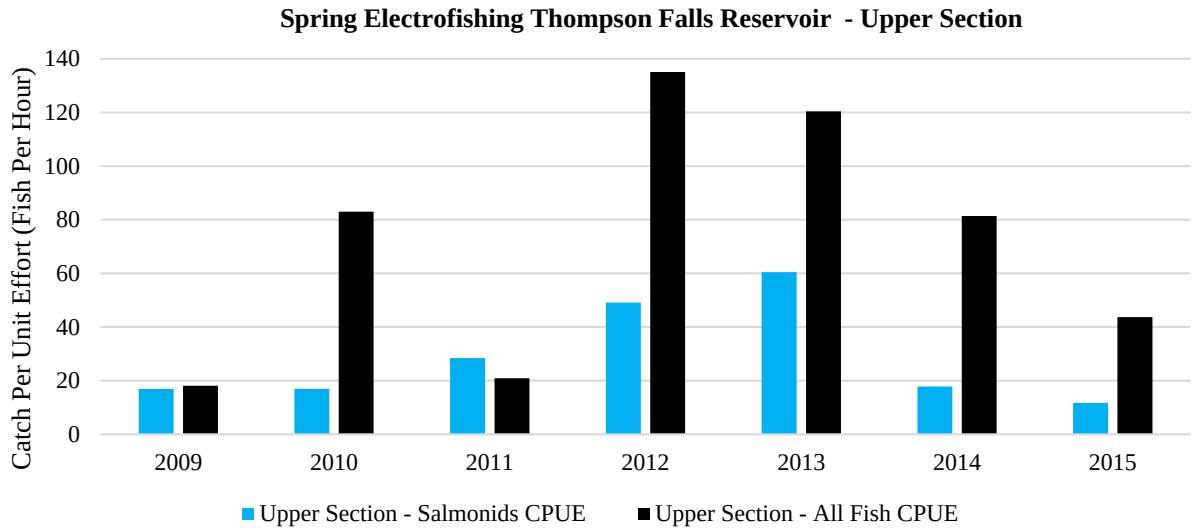


Table 2-4: Summary of spring electrofishing results in the Thompson Falls Reservoir upper section (Clark Fork River downstream of the confluence of the Thompson River), including number (N) of species and CPUE (catch per hour) from 2009 through 2015, and the average CPUE (10.7 hrs) for 2009-2015.

Upper Section	2009		2010		2011		2012		2013		2014		2015		Total 2009-2015	
Species	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**Avg CPUE**
BL BH	2	3.4	-	-	-	-	-	-	-	-	1	0.5	-	-	3	0.3
BULL	-	-	-	-	-	-	1	0.5	1	0.5	1	0.5	1	0.5	4	0.4
LL	2	3.4	5	2.4	8	4.2	21	11.2	27	14.2	8	3.7	8	3.8	79	7.4
LN SU	-	-	1	0.5	-	-	-	-	-	-	-	-	-	-	1	0.1
LS SU	51	86.2	15	7.2	61	32.1	119	63.6	72	37.8	66	30.9	31	14.6	415	38.8
LT	1	1.7	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1
MWF	1	1.7	1	0.5	12	6.3	19	10.1	21	11.0	4	1.9	1	0.5	59	5.5
NP	6	10.1	8	3.9	8	4.2	4	2.1	11	5.8	17	8.0	13	6.10	67	6.3
N PMN	6	10.1	3	1.4	17	8.9	35	18.7	29	15.2	41	19.2	18	8.5	149	13.9
PUMP	-	-	-	-	-	-	-	-	-	-	1	0.5	-	-	1	0.1
RB	6	10.1	26	12.6	31	16.3	47	26.1	44	23.1	18	8.4	13	6.1	185	17.3
RBxWCT	-	-	-	-	-	-	2	1.1	1	0.5	1	0.5	-	-	4	0.4
RS SH	2	3.4	-	-	-	-	1	0.5	1	0.5	1	0.5	-	-	5	0.5
SMB	2	3.4	-	-	1	0.5	2	1.1	1	0.5	5	2.3	4	1.9	15	1.4
WCT	-	-	3	1.4	3	1.6	2	1.1	21	11.0	6	2.8	2	0.9	37	3.5
YP	-	-	1	0.5	7	3.7	-	-	-	-	4	1.9	2	0.9	14	1.3
Subtotal Salmonids	**10**	**16.9**	**35**	**17.0**	**54**	**28.4**	**92**	**49.1**	**115**	**60.4**	**38**	**17.8**	**25**	**11.7**	**369**	**34.5**
TOTAL FISH	**79**	**133.5**	**63**	**30.4**	**148**	**77.8**	**253**	**135.1**	**229**	**120.4**	**174**	**81.4**	**93**	**43.7**	**1039**	**97.1**

2.1.3 Summary

In 2015, the total number of fish captured in the lower and upper sections along with the catch rate of fish per hour were within the range of values recorded since 2009 (Figure 2-5). As in previous years (2009 through 2014), species composition varied greatly between the sections in 2015 (Tables 2-3 and 2-4). In the lower section, species such as northern pike, yellow perch, largemouth bass, and black bullhead were most common in 2015. In the upper section, species composition was dominated by largescale suckers followed by northern pikeminnow, northern pike, rainbow trout, and brown trout.

In general, the species diversity and number of salmonids remains greatest in the upper section than the lower section (Figure 2-4). In 2015, 25 salmonids were captured in the upper section representing bull trout, brown trout, mountain whitefish, rainbow trout, and westslope cutthroat trout in contrast to one rainbow trout captured in the lower section. The difference in species composition and abundance of salmonids is likely related to habitat conditions. The upper sampling section is more of a riverine environment. The lower sampling section, which is closer to the dam, is more lacustrine.

2.2 Autumn Electrofishing

During the autumn of 2015, NorthWestern and MFWP surveyed one reach of the Clark Fork River, above the island complex. The Paradise-to-Plains reach is scheduled for surveying every other year, with the next survey anticipated in autumn of 2016.

2.2.1 Electrofishing above the Island Complex

In 2015 electrofishing efforts in the Clark Fork River were completed from the confluence with Eddy Creek downstream to the Island Complex (*refer to* Figure 2-1). The autumn electrofishing section (Eddy Creek to the Island Complex) is characterized as riverine habitat. The 2015 survey covered the same length of reach surveyed annually since 2010. In 2009, electrofishing efforts started at the confluence with Eddy Creek and extended further downstream to the confluence of the Thompson River. Approximately 2 miles of the 5-mile section were not sampled in 2010 due to poor habitat and few captures from the downstream end of the Island Complex to the Thompson River.

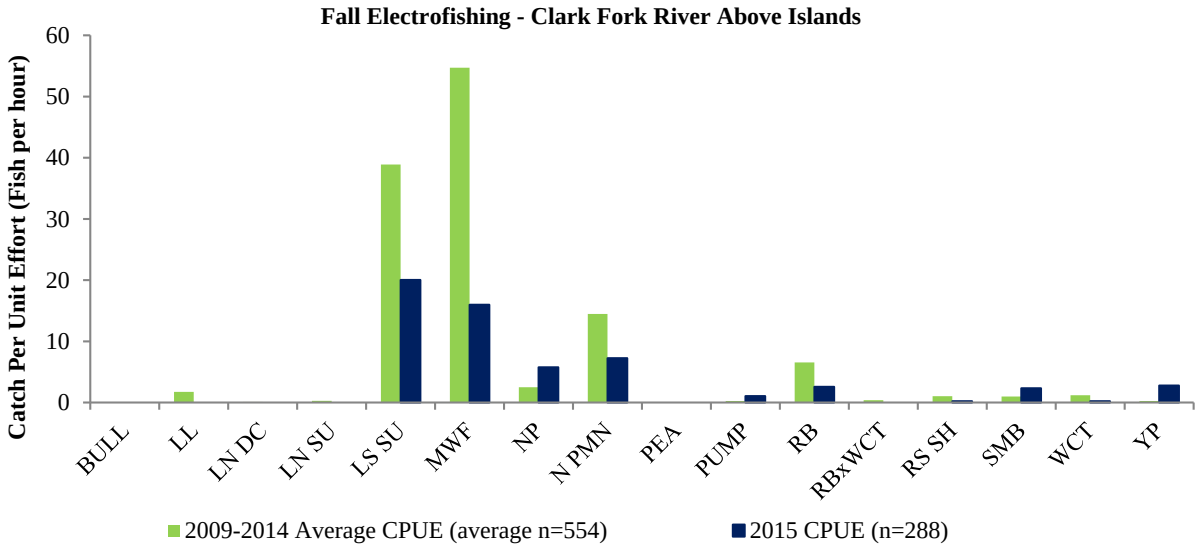
In 2015, river left was electrofished the night of October 19 and river right was electrofished the night of October 20. Stream temperatures were approximately 11 degrees Celsius (°C). A summary of the CPUE by species (river left and right combined) is provided for each year of sampling from 2009 through 2015 in Table 2-5. The duration of the electrofishing has been consistent through the years ranging between 4.1 and 5.6 hours (4.7 hours in 2015).

Table 2-5: Autumn electrofishing CPUE (river right and left combined) in the Clark Fork River above the Island Complex from 2009 to 2015.

Species	2009		2010		2011		2012		2013		2014		2015	
	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE
BULL	-	-	1	0.2	-	-	-	-	-	-	-	-	**1**	**0.2**
LL	5	0.9	5	1.2	7	1.5	16	3.9	8	1.8	5	1.2	**13**	**2.8**
LN DC	-	-	1	0.2	-	-	-	-	1	0.2	-	-	**1**	**0.2**
LN SU	-	-	1	0.2	2	0.4	1	0.2	2	0.5	-	-	**-**	**-**
LS SU	338	60.8	133	31.0	150	33.0	101	24.7	150	34.2	204	49.7	**94**	**20.0**
MWF	196	35.3	215	50.1	336	73.8	397	97.3	221	50.4	88	21.4	**75**	**16.0**
NP	11	2.0	8	1.9	11	2.4	12	2.9	20	4.6	5	1.2	**27**	**5.8**
N PMN	88	15.8	71	16.5	70	15.4	49	12.0	55	12.5	60	14.6	**34**	**7.2**
PEA	1	0.2	-	-	-	-	-	-	-	-	-	-	**-**	**-**
PUMP	-	-	-	-	-	-	-	-	-	-	1	0.2	**5**	**1.1**
RB	44	7.9	29	6.8	39	8.6	37	9.1	24	5.5	6	1.5	**12**	**2.6**
RBxWCT	4	0.7	-	-	2	0.4	1	0.2	2	0.5	-	-	**-**	**-**
RS SH	-	-	5	1.2	9	2.0	2	0.5	7	1.6	-	-	**1**	**0.2**
SMB	1	0.2	4	0.9	6	1.3	2	0.5	9	2.1	4	1.0	**11**	**2.3**
WCT	9	1.6	5	1.2	6	1.3	2	0.5	10	2.3	1	0.2	**1**	**0.2**
YP	2	0.4	1	0.2	1	0.2	-	-	2	0.5	-	-	**13**	**2.8**
Subtotal Salmonids	258	46.4	255	59.4	390	85.7	453	111.0	265	60.4	99	24.1	**102**	**21.7**
TOTAL FISH	**699**	**125.8**	**479**	**111.6**	**639**	**140.4**	**620**	**151.9**	**511**	**116.5**	**374**	**91.1**	**288**	**61.4**

The 2015 electrofishing efforts collected 288 fish (right and left banks combined) representing 13 species, of which five species were salmonids (bull trout, brown trout, mountain whitefish, rainbow trout, and westslope cutthroat trout). The species composition resulting from the 2015 sampling efforts were similar to previous years with the majority of fish represented by largescale suckers, mountain whitefish, and northern pikeminnow (Figure 2-4). However, the catch rate (fish per hour) for most species was lower in 2015 compared to the average catch rate for 2009 to 2014 (Figure 2-4).

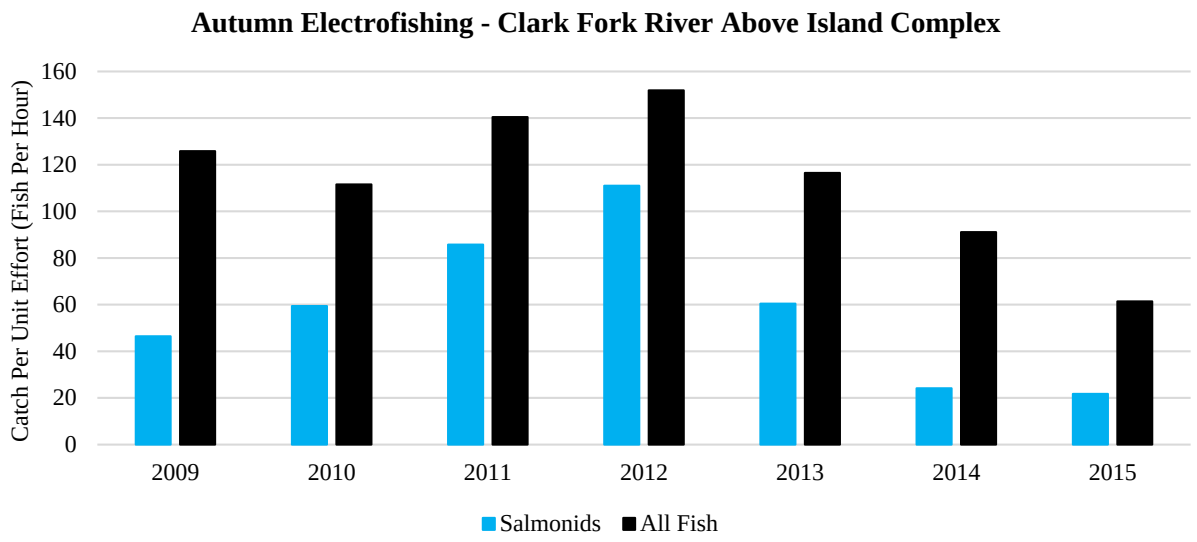
Figure 2-4: Summary of average catch rate (fish per hour) between 2009 and 2014 compared to the catch rate in 2015 in the Clark Fork River – Above the Island Complex.



In previous sample years, between 2009 and 2014, the number of fish captured ranged between 374 fish and 699 fish during autumn electrofishing efforts in the same reach. Catch rates for salmonids have varied from a low of 21.7 salmonids per hour in 2015 to a high of 111 salmonids per hour in 2012. Catch rates for all species has varied from a low of 61.4 fish per hour in 2015 to a high of approximately 152 fish per hour in 2012. Sampling efforts in 2015 resulted in the lowest number of total fish (and salmonids) and catch rate (fish per hour) since annual electrofishing efforts began in 2009 (Figure 2-5).

Between 2009 and 2012, the catch rate of fish show an increasing trend followed by a declining trend since 2012 (Figure 2-5). The variability may be related to several factors, including but not limited to the timing of each annual sampling event, streamflow, stream temperatures, etc. Sampling in the above islands section is generally completed the third week in October each year. However, sampling has occurred anytime between late September and the end of October, depending on availability of personnel and equipment. Conditions during the autumn vary annually with respect to streamflow and water temperature, which may contribute to the observed annual variability in catch rates (Figure 2-5).

Figure 2-5: Summary of the 2009-2015 annual catch rate for all salmonids and all fish captured during autumn electrofishing efforts in the Clark Fork River – Above the Island Complex.



2.3 Autumn Gillnetting

Autumn (October) gillnetting in the Thompson Falls Reservoir has been performed in designated locations since 2004 (*refer to* Figure 2-1). Every year, 10 gillnets are set, except in 2004 when six nets were set (Table 2-6).

Table 2-6: Summary of gillnetting in Thompson Falls Reservoir from 2004-2014.

Year	# Gillnets	Date Net Set	Date Net Pulled	Total # of Fish Captured	# of Species
2004	6	10/13	10/14	48	8
2005	10	10/13	10/14	79	7
2006	10	10/12	10/13	116	7
2007	10	10/11	10/12	122	9
2008	10	10/8	10/9	59	7
2009	10	10/19	10/20	55	6
2010	10	10/14	10/15	50	9
2011	10	10/5	10/6	33	9
2012	10	10/12	10/13	53	7
2013	10	10/22	10/23	40	6
2014	10	10/15	10/16	62	8
2015	**10**	**10/13**	**10/14**	**231**	**9**

Nylon multifilament experimental sinking gillnets were used at 10 established locations in the Thompson Falls Reservoir (*see* Figure 2-1). These nets are 38 meters (125 feet) long and 1.8 meters (6 feet) deep with five separate 7.6-meter (25-foot) panels consisting of 1.9-cm (0.75-inch), 2.5-cm (1-inch), 3.2-cm (1.25-inch), 3.8-cm (1.5-inch), and 5.1-cm (2-inch) square

mesh. Nets were set on October 13, 2015 between 3:20 PM and 5:04 PM and pulled approximately 16 to 18 hours later between 8:50 and 10:32 AM on October 14, 2015. The mean catch per net, by species, during the annual gillnetting efforts from 2004 to 2015 is displayed in Table 2-7.

Table 2-7: Mean catch per net, by species, during annual October gillnetting series on Thompson Falls Reservoir from 2004 to 2015. A dash indicates no (zero) fish of that species was captured during that year's gillnetting sampling effort.

Species	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
BL BH	2.8	3.4	8.3	6	0.6	-	-	-	-	0.1	1.3	**14.1**
LL	-	-	-	-	-	-	-	-	0.2	-	-	**-**
LMB	0.2	-	-	0.3	-	-	-	0.1	-	-	0.1	**0.2**
LN SU	0	-	-	-	-	-	0.1	0.5	-	-	0.1	**-**
LS SU	0.7	1.3	0.7	1	0.8	1.2	0.8	0.6	1.3	0.6	0.8	**0.8**
NP	1.3	1.8	1.7	2	1.3	3.1	2.4	1.0	2.4	2.1	2.4	**4.6**
N PMN	0.2	0	0.5	0.5	0.2	0.8	0.3	0.3	0.3	0.6	0.5	**1**
PEA	0.0	0.1	0.1	0.1	-	-	0.1	0.1	-	-	-	**-**
PUMP	0.3	0.1	0.2	0.5	1.8	0.1	0.1	-	-	-	-	**0.4**
RB	-	-	-	-	-	0.2	0.2	-	0.4	-	-	**-**
SMB	0.3	0.1	-	0.5	0.1	-	0.1	0.1	0.3	0.1	0.4	**0.1**
WCT	-	-	-	-	-	-	-	0.2	-	-	-	**-**
YP	1.7	0.7	0.1	1.2	0.2	0.1	0.9	0.4	0.4	0.5	0.6	**1.8**
YL BL	-	-	-	-	-	-	-	-	-	-	-	**0.1**

In 2015, 231 fish representing nine species were captured during gillnetting efforts. The total number of fish captured in 2015 was the highest recorded since sampling began in 2004. In addition, one yellow bullhead was recorded for the first time.

The total number of fish captured since sampling began in 2004 has varied between 33 fish (2011) to 122 fish (2007). Catch rates (number of fish per net) has varied from a low of 3.3 fish per net in 2011 to a high of 23.1 fish per net in 2015 (Figure 2-6). The average catch rate prior to 2015 (e.g., years 2004-2014) was 6.6 fish per net. The increase in the catch rate per net in 2015 is primarily attributed to the significant increase in the number of black bullhead (n=141) captured, which represent 61 percent of the total fish captured. Northern pike (n=46), yellow perch (n=18), northern pikeminnow (n=10), and largescale suckers (n=8) were the other more common fish recorded in 2015. Although the catch rate per net by species varies annually, the species composition remains similar (Figure 2-7). The mean catch rate per net between 2004 and 2014 compared to the catch rate per net in 2015 by species is shown in Figure 2-7.

Between 2004 and 2007, black bullhead were the most abundant fish caught gillnetting. Following a reservoir drawdown in the autumn of 2008, black bullhead numbers declined significantly in 2008 and remained either absent or suppressed during gillnetting surveys until 2015. An additional drawdown in the summer of 2011 may have also influenced the species

composition in the reservoir. The drawdown of the Thompson Falls Reservoir often results in a short-term reduction in the lacustrine habitat typically available at full pool.

Figure 2-6: Summary of the all fish species caught per net during the annual autumn gillnetting in the Thompson Falls Reservoir between 2004 and 2015.

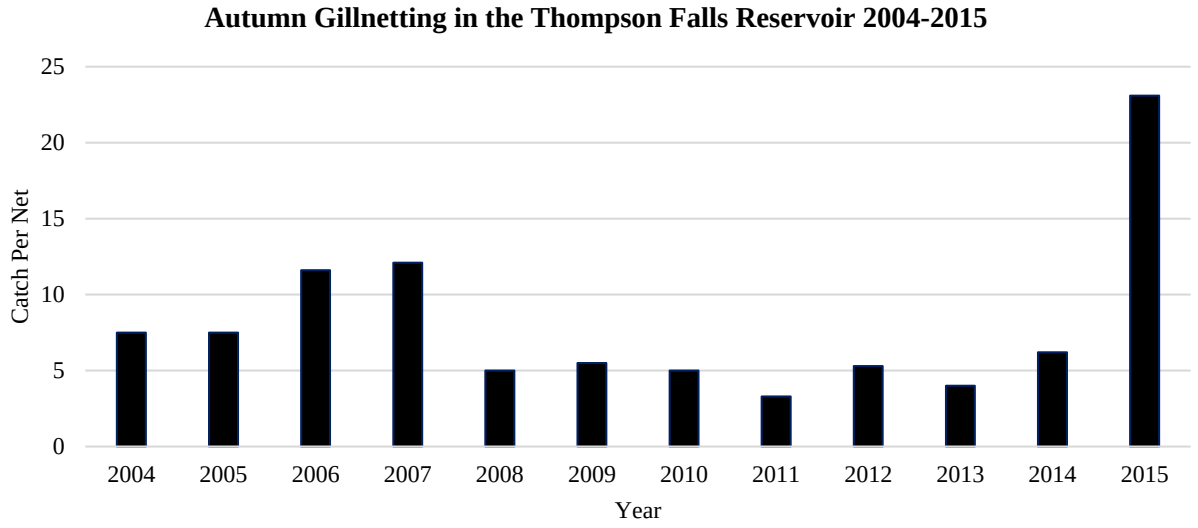
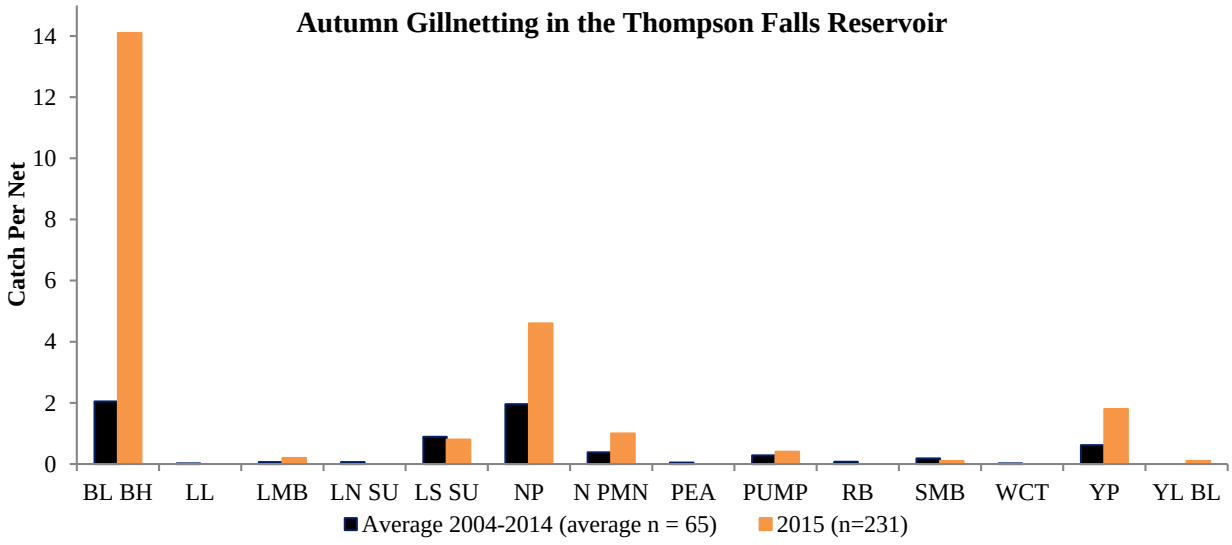


Figure 2-7: Summary of fish species captured via autumn gillnetting in the Thompson Falls Reservoir, comparing the average number of fish caught per net between 2004 and 2014 to the number captured per net in 2015.



3.0 Upstream Fish Passage Evaluation

3.1 2015 Upstream Fish Passage Facility Evaluation

FERC issued an Order on June 9, 2011 approving the Licensee's *10-year Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan). The Thompson Falls Upstream Fish Passage Facility (ladder) became operational in 2011 and has operated for five full seasons (2011-2015). The Licensee has implemented the first 5 years of studies outlined in the Fish Passage Evaluation Plan.

3.1.1 Effectiveness of Fish Passage

The following sections summarize the data collected at the ladder during the 2015 operational season. The data were collected to evaluate the effectiveness of the ladder. The ladder results provided in this report include the following:

- Ladder operations
- Clark Fork River hydrology and water temperatures
- Total number of fish and species ascending the ladder and passed upstream
- Fish morphology
- Biomass passed upstream
- Number of fish returning to the ladder at Thompson Falls Dam
- Number of fish that fallback after passing the Thompson Falls Dam
- Time/duration for fish to ascend the ladder
- Movement patterns/active period(s) for fish ascending the ladder
- Movement patterns of fish released upstream

3.2 Ladder Operations

Since the ladder commenced operations in 2011, the operational season has started in mid-March and generally ended in mid-October. The operational season depends on weather conditions and when air temperatures are above freezing to allow for equipment to operate. The operational season in 2015 commenced on March 16 and ended on November 9. The operational season was extended into early November in 2015 in an effort to allow for more autumn spawning fish (e.g., mountain whitefish) to access the ladder.

Since 2011, the total number of days the ladder has been closed has declined from 84 days in 2011 to only 8 days in 2015. Ladder closures are either due to debris/sediment issues related to high spring streamflows or maintenance issues at the ladder that require a closure. During the 2015 season, the ladder was shut down once for 8 consecutive days between March 23 and 30 to address maintenance issues.

The ladder operated in orifice mode for the entire 2015 season. The holding pool at the top of the ladder was typically checked once a day (in the morning) for fish, for 140 ladder checks in 2015. In 2015, 11,647 fish were recorded at the ladder, more than double the number of fish recorded in 2014.

The table below summarizing periods of time the ladder was in operation each year between 2011 and 2015, the number of ladder checks per year, the number of days the ladder was closed, and annual weir operations (Table 3-1).

Table 3-1: Summary of when the ladder was in operation, 2011-2015.

Year	Operating Season (ladder opened and closed)	Total # of Times Ladder Checked*	# of Days Ladder Closed During Season	Weir Mode (notch and/or orifice)
2011*	Mar 17 – Oct 17	160	84	Alternating Notch and Orifice Mode
2012	Mar 13 – Oct 15	168	22	
2013	Mar 13 – Oct 15	147	14	Orifice Mode Only
2014	Mar 25 – Oct 21	133	16	
2015	Mar 16 – Nov 9	140	8	

*Some days the ladder was checked twice a day

3.3 Clark Fork River Hydrograph and Water Temperatures

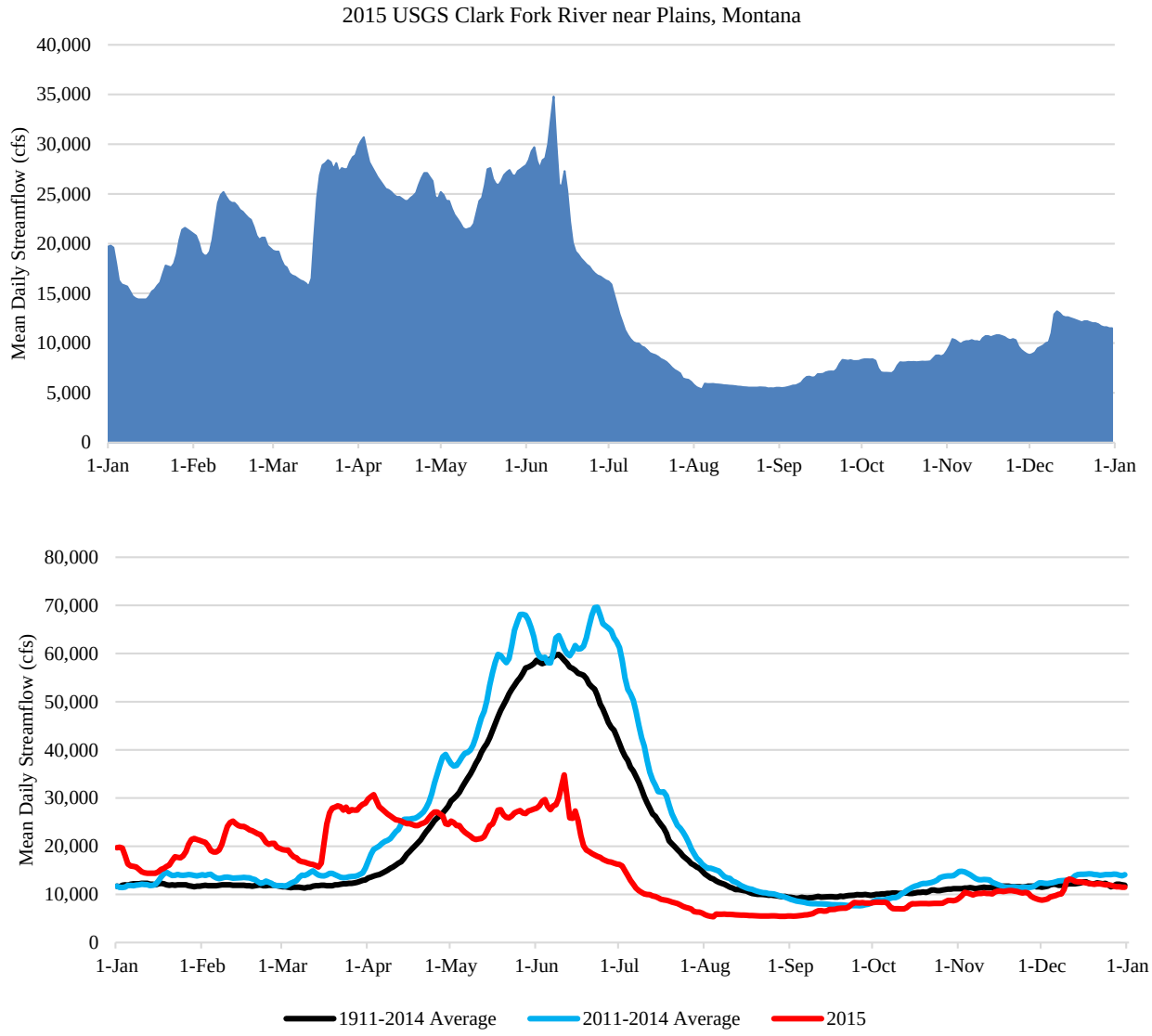
Mean daily streamflow data are collected by the USGS gage station #12390000 on the Clark Fork River near Plains, Montana (approximately 30 miles upstream of Thompson Falls Dam). Since ladder operations began in 2011, the highest water year was in 2011 with the peak streamflow of approximately 104,000 cubic feet per second (cfs) on June 10 and the lowest water year was in 2015 with the peak streamflow of approximately 35,700 cfs on June 11. Actual peak flows at Thompson Falls Dam were likely higher with the contribution of other sources such as tributaries (e.g., Thompson River) and groundwater.

The annual hydrograph in the lower Clark Fork River has varied greatly since ladder operations commenced in 2011. The area has experienced higher than average streamflows in 2011, lower than average streamflows in 2013 and 2015, and average streamflows in 2012 and 2014. The long-term (1911-2014) average peak streamflow is approximately 60,000 cfs and occurs between the end of May and early June. Between 2011 and 2014, the average streamflows and timing of the spring runoff followed the long-term trend, although each individual year varied in the duration and timing of the peak flow.

In contrast to the short-term (2011-2014) and long-term (1911-2014) averages, the peak streamflow in 2015 was significantly lower than the average (Figure 3-1). In 2015, the peak flow was approximately 35,700 cfs on June 11. The warmer than average winter and low snow pack

resulted in early snow melt, which subsequently resulted in higher than average winter and early spring flows and a relatively flat peak flow compared to an average year. The differences between the short-term, long-term, and 2015 hydrographs are shown in Figure 3-1.

Figure 3-1: Mean daily streamflow in the lower Clark Fork River for the 2015 calendar year measured at the USGS gage 12389000 near Plains, Montana. The top graph displays the 2015 hydrograph. The bottom graph displays the average mean daily streamflow for the period between 1911-2014 and 2011-2014, as well as the 2015 hydrograph.



During each operating season (approximately mid-March through mid-October), water temperatures in the ladder were recorded through a combination of a single measurement (coinciding with each ladder check) and continuously recording thermographs. Each year water temperatures (in °C) are recorded in the upper most pool (Pool 48) in the ladder and air temperatures are recorded at the work station located at the ladder. Thermographs were set to record air and water temperature on a timed interval. In 2015, air and water temperatures were

collected hourly. Due to some operational interruptions and maintenance activities resulting in period(s) of ladder closure, water temperature data was not available when water was not flowing in the ladder. In 2012, there was a technical issue with the continuous recording thermographs and only air and water temperature readings taken during each ladder check were available. The air and water temperatures collected via the continuous thermographs between March 16 and November 9, 2015 are presented in Figure 3-2.

Figure 3-2: Continuous ambient air and water temperatures (Pool 48) at the fish ladder from March 16 to November 9, 2015.

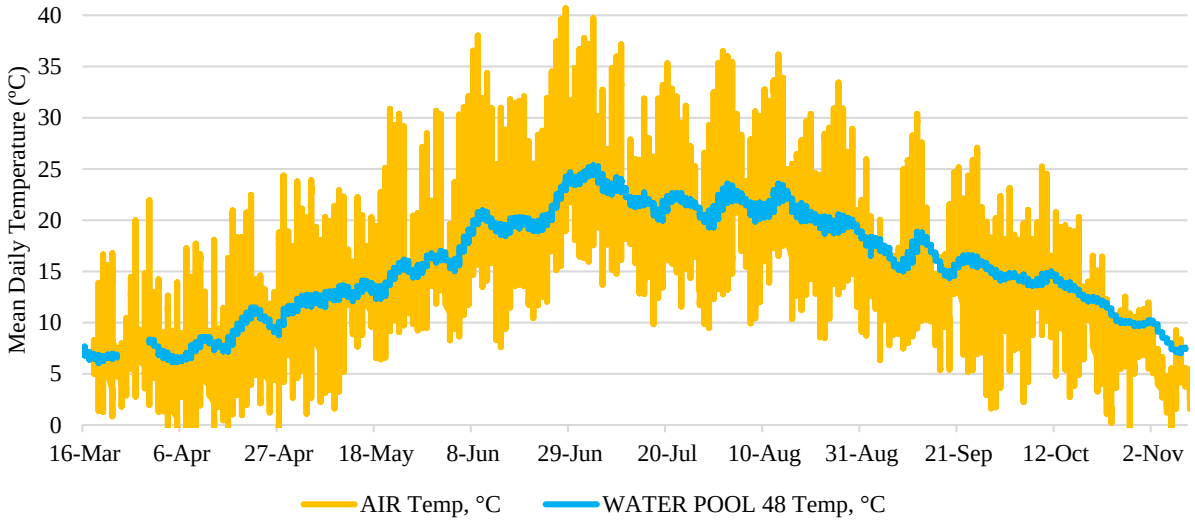
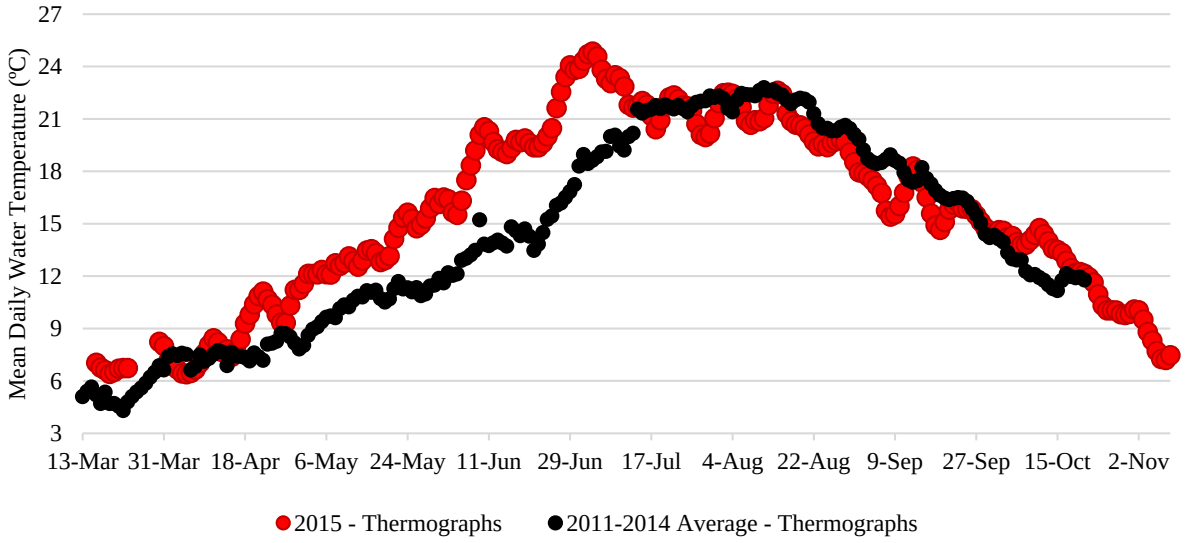


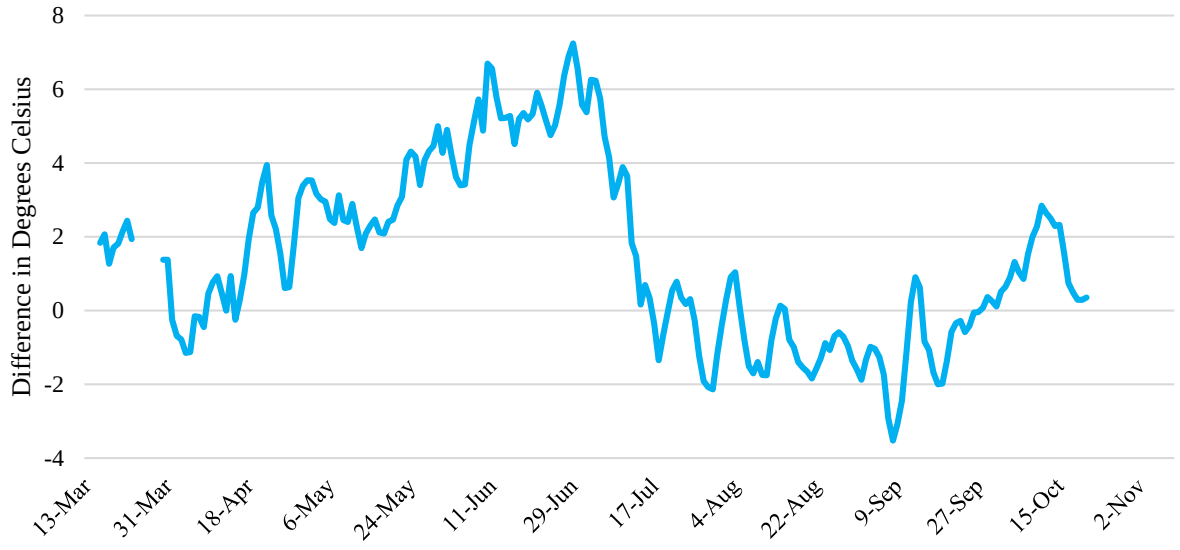
Figure 3-3: Summary of the mean daily water temperature data collected at the Thompson Falls fish ladder (Pool 48) between 2011 and 2014 compared to 2015.



The mean daily water temperatures in 2015 were greater than the average of the mean daily temperatures collected between 2011 and 2014, as shown in Figure 3-3.

Figure 3-4 displays the difference in the mean daily temperatures by subtracting the 2011 to 2014 average daily temperature from the 2015 mean daily temperature. In general, water temperatures in the spring and early summer in 2015 exceeded the 2011 to 2014 average. The mean daily water temperatures exceeded the average for 2011 to 2014 by as much as 7.2 degrees in late June. Water temperatures at the ladder appeared to peak at the end of June and declined to more typical summer temperatures by mid-July and August (Figure 3-4).

Figure 3-4: The difference between the mean daily water temperature data collected in 2015 and the average of the mean daily water temperatures collected between 2011-2014, as shown in Figure 3-3, at the Thompson Falls fish ladder (Pool 48).



The information provided in Table 3-2 illustrates the annual variability in streamflows and temperatures in the lower Clark Fork River and provides the mean annual and peak streamflow for each calendar year, as well as the maximum water temperature recorded in the ladder during each respective season.

Table 3-2. Summary of annual mean and peak streamflows for each calendar year, and the maximum water temperatures recorded during each season of ladder operations.

Year	Mean Annual Streamflow (cfs)	Peak Streamflow (cfs)	Max Water Temp (°C)
2011	28,472	104,000	24.8
2012	23,020	75,300	22.8
2013	16,846	63,700	24.7
2014	22,741	82,800	23.6
2015	15,634	35,700	25.4

3.4 Ladder Design and Observations

The fish ladder was designed to pass fish with streamflows up to 48,000 cfs. Since the ladder was operational in 2011, streamflows have exceeded this threshold annually with the exception of the 2015 season.

Between 2011 and 2014, the ladder was checked 91 times when streamflows exceeded 48,000 cfs. Fish were recorded during 26 of the ladder checks (28 % of the time), with a total of 45 fish representing six species, including bull trout. Ladder checks have been completed with streamflows varying between 48,000 cfs and 95,700 cfs. Fish have only been recorded at the ladder with a maximum streamflow of approximately 69,000 cfs. The highest mean daily streamflow measured concurrent with a bull trout recorded at the ladder was 51,600 cfs (measured at the USGS gage station near Plains, Montana).

Table 3-3 provides a summary of the number ladder checks that occurred annually when streamflows exceeded 48,000 cfs, the number of fish and species recorded during these higher flow periods, and the time of year when these flows were recorded.

Table 3-3. Summary of ladder checks and the number of fish (and species) recorded when streamflows exceeded 48,000 cfs at the USGS gage near Plains during ladder operations between 2011 and 2015.

	2011	2012	2013	2014	2015
USGS Peak Flow	104,000	75,300	63,700	82,800	35,700
Number of Ladder Checks when Flows >48,000 cfs	14	34	16	27	No Flows over 48,000 cfs
# of Ladder Checks with Flows > 48,000 cfs with Fish Recorded in Ladder	4	8	6	8	-
Total Number of Fish Recorded in Ladder with Flows >48,000 cfs	**9**	**13**	**13**	**10**	-
Species Recorded	3 RB, 3 LSSU, 3 NMPN	2 BULL, 9 RB, 1 WCT, 1 LSSU	12 LSSU, 1 NPMN	1 RB, 1 LL, 4 WCT, 4 LSSU	-
Range of Flows (>48,000cfs) with Fish Recorded at Ladder	55,900 - 69,000 cfs	49,600 - 63,300 cfs	52,200 - 61,800 cfs	50,300 - 58,300 cfs	-
Range of Flows with No Fish Recorded at Ladder	over 69,000 cfs (max operation check at 95,700 cfs)	> 64,100 (max operation check at 74,800 cfs)	> 61,800 cfs (max operation check at 62,600 cfs)	>59,300 (max operation check at 66,700 cfs; ladder closed at 67,000 cfs, then reopened when 55,900 cfs)	-
Total # of Fish Recorded at Ladder	**1,805**	**2,668**	**3,830**	**5,735**	**11,647**

3.5 Fish Ascending the Ladder

The total number of fish recorded annually at the ladder has increased from 1,805 fish (2011) to 11,647 fish (2015) (Table 3-4). Since 2011, 25,685 fish were documented at the ladder and 25,554 fish have been released upstream of Thompson Falls Dam. The 131 fish not released upstream were either recorded as mortalities at the ladder or not authorized for release upstream (i.e., 9 lake trout; 2 walleye). The majority of fish recorded at the ladder since 2011 are non-salmonids, while salmonids represent approximately 8 percent of all fish (Table 3-4). During the last 5 years of operations, 12 bull trout (representing 11 unique individuals) have ascended the ladder.

Table 3-4: Summary of the total number of fish recorded at the Thompson Falls Dam fish ladder annually between 2011 and 2015.

Year	Salmonids	Bull Trout	Non-Salmonids	Total Fish
2011	242	2	1,563	1,805
2012	305	1	2,363	2,668
2013	392	5	3,438	3,830
2014	573	1	5,162	5,735
2015	570	2	11,077	11,647
TOTAL	**2,082**	**12**	**23,603**	**25,685**

In 2015, approximately 11,647 fish representing 13 species and one hybrid, including two bull trout ascended the ladder. For the first time since ladder operations commenced, peamouth and walleye were recorded at the ladder in 2015. A summary of the fish species recorded at the ladder in 2015 compared to previous years (along with mortalities/fish not passed upstream in parenthesis) is provided in Table 3-5.

Table 3-5: Summary of the fish species recorded at the Thompson Falls Dam ladder between 2011 and 2015 and passed upstream. The number (#) in parentheses represent number of total mortalities/fish not released upstream.

Species	Number of Fish in 2015	Range of Fish 2011-2014	Total Number of Fish 2011-2015
BULL	2	1 - 5 (1)	12 (1)
EB	2	0 - 1	3
RB	281 (4)	164 - 213 (5)	1,053 (9)
RB x WCT	4	7 - 13	45
WCT	37	21 - 48	163
LL	184 (2)	28 - 111 (4)	446 (6)
MWF	54	2 - 254	351
LN SU	28	0 - 10 (1)	39 (1)

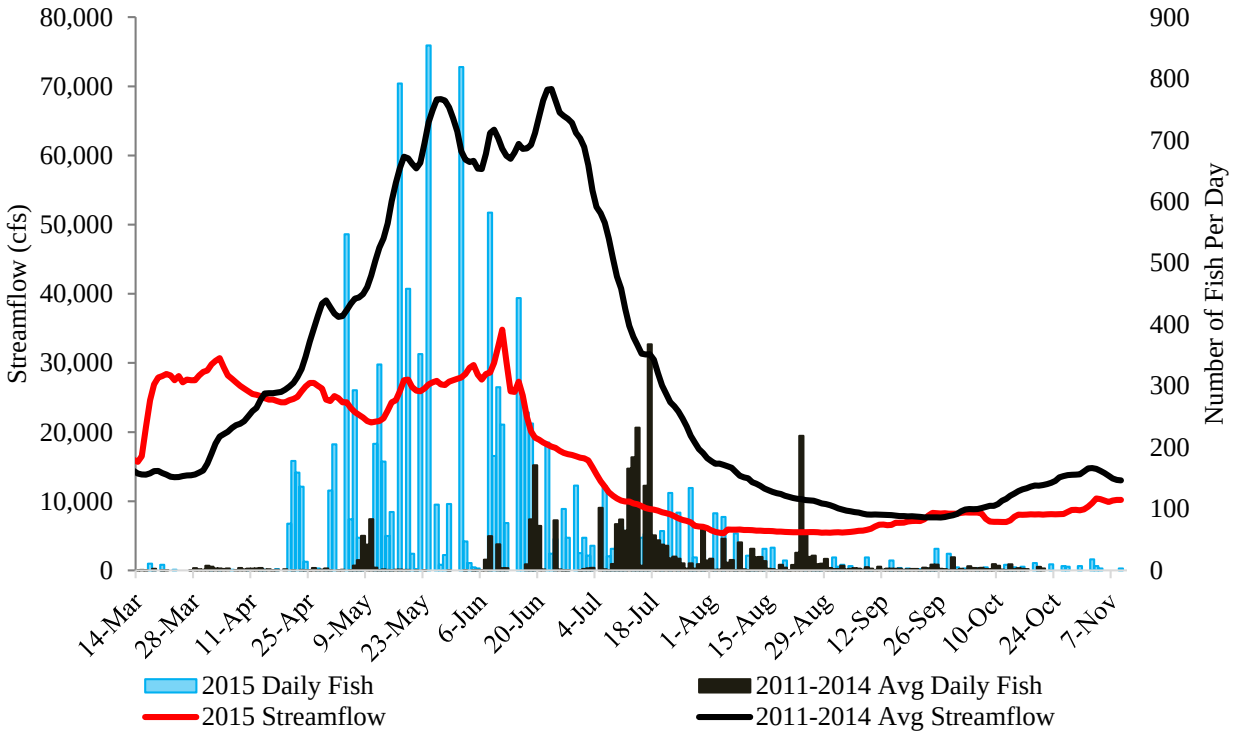
Species	Number of Fish in 2015	Range of Fish 2011-2014	Total Number of Fish 2011-2015
LS SU	6,324 (7)	418 - 3,041 (10)	13,991 (17)
N PMN	3,356 (4)	387 - 1,003 (75)	6,672 (79)
SMB	1,244 (2)	8 - 1,355 (5)	2,777 (7)
PEA	122	0	122
LT	6 (6)	0 – 1 (3)	9 (9)
WE	2 (2)	0	2 (2)
Total Fish Count	11,647 (27)	1,805 - 5,735 (109)	25,685 (131)
Total # Passed Upstream	11,620	1,723 – 5,733	25,554

As noted in previous annual reports, FWP authorized the release of all species upstream into the Thompson Falls Reservoir with the exception of lake trout and walleye. In 2015, 11,620 fish were released upstream into the Thompson Falls Reservoir. The fish that were not passed upstream were either not authorized for release upstream by FWP or were recorded as mortalities. The 27 fish that were not passed upstream included seven largescale suckers, six lake trout, four northern pikeminnow, four rainbow trout, two brown trout, two smallmouth bass, and two walleye.

3.5.1 Daily Fish Count

In 2015, the daily number of fish recorded at the ladder was much higher than previous years between late April and June, which was likely related to lower than average streamflows (and consequently warmer stream temperatures) that allowed for fish to access the falls below the dam during the spring when average streamflows and conditions might impede/reduce upstream movement through the falls due to higher water velocities, higher turbidity, cooler water temperatures, etc. The daily fish count (including both salmonids and non-salmonids) at the ladder in 2015 and the average daily fish count between 2011 and 2014 are shown in Figure 3-5. The figure also includes the 2015 hydrograph compared to the average hydrograph between 2011 and 2014.

Figure 3-5: Summary of the daily fish count at the ladder in 2015 and the average daily fish count between 2011 and 2014, along with the respective hydrograph.

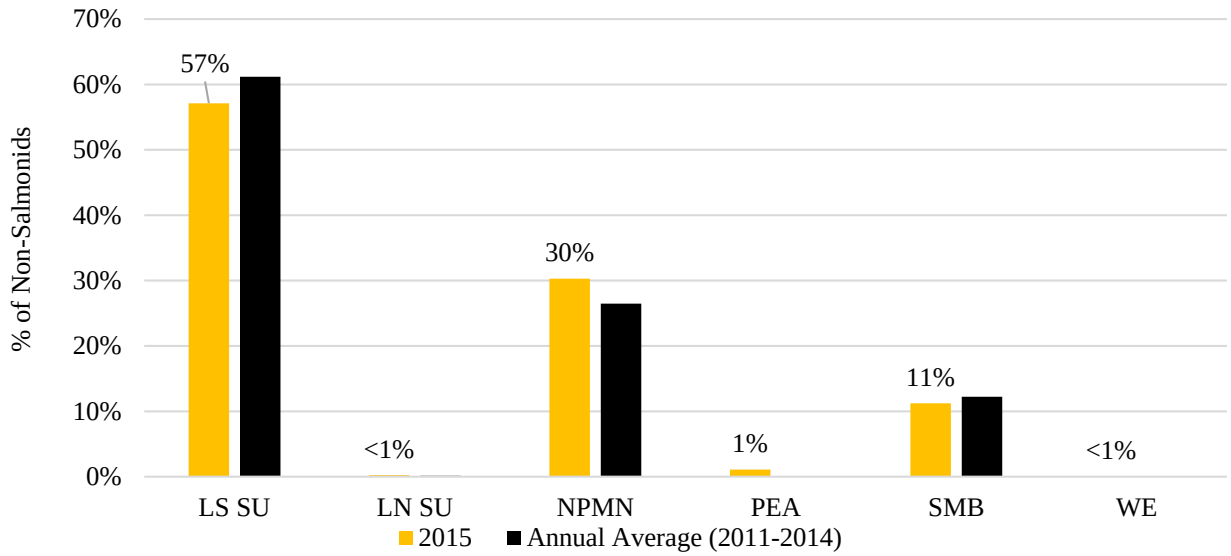


3.5.2 Species Composition

Non-salmonids represent the majority of the fish recorded at the ladder. Between 2011 and 2015, non-salmonids represented between 86 and 95 percent of all fish recorded at the ladder. Cumulatively for the 5-year-period the ladder has operated, non-salmonids represent nearly 92 percent of all fish recorded at the ladder.

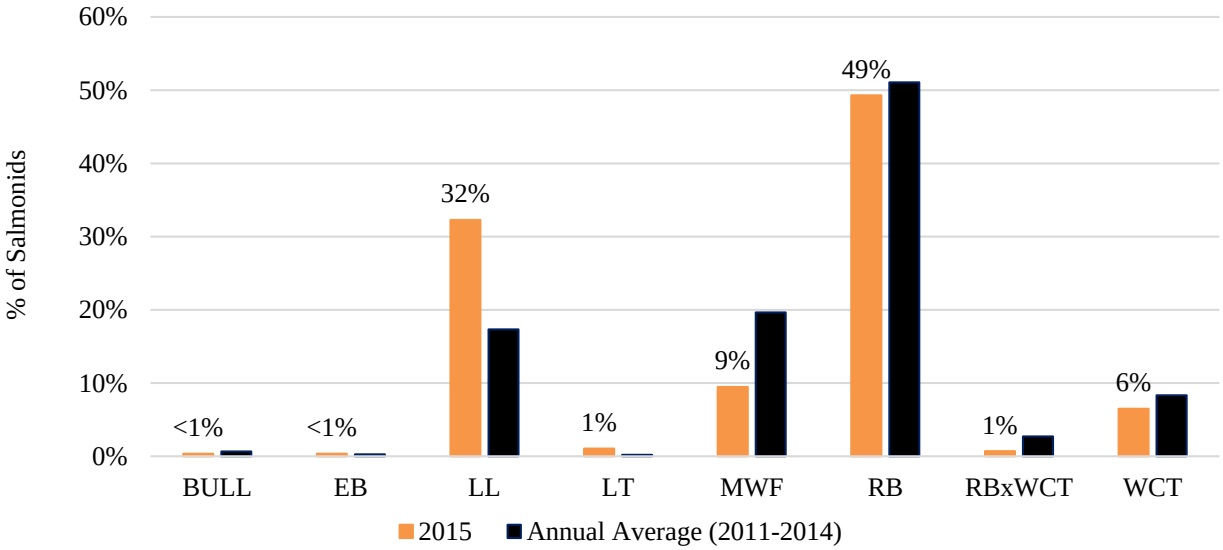
Non-salmonid species recorded at the ladder are primarily largescale suckers, northern pikeminnow, and smallmouth bass. The percent composition of non-salmonid species in 2015 compared to the average percent composition between 2011 and 2014 is shown in Figure 3-6. With the exception of 2011, largescale suckers have represented over half of the non-salmonids recorded at the ladder (54-88 %) each year. In 2011, the ladder was closed during the majority of the summer (June to August) when largescale suckers are most often observed at the ladder, which may explain why the species only represented about 27 percent of non-salmonids that year. The percentage of northern pikeminnow has varied between 11 percent in 2013 to 64 percent in 2011. The presence of smallmouth bass at the ladder has varied between less than 1 percent in 2013 to approximately 26 percent in 2014. Other non-salmonids detected, but less common, include longnose suckers, peamouth, and walleye. Peamouth and walleye were only detected in 2015. Walleye is the only non-salmonid species not released upstream of the dam.

Figure 3-6: Percent composition of non-salmonid species that ascended the ladder in 2015 compared to the average percent composition between 2011 and 2014.



Salmonids recorded at the ladder are represented by seven species and one hybrid (Figure 3-7). Between 2011 and 2014, salmonids represented between 10 to 13 percent of all fish recorded at the ladder. In 2015, the total number of salmonids was similar to 2014, but with the significant increase in non-salmonids recorded at the ladder, salmonids represented approximately 5 percent of all fish.

Figure 3-7: Percent composition of salmonid species that ascended the ladder in 2015 compared to the average percent composition between years 2011-2014.



The majority of salmonids recorded at the ladder annually are represented by (in order from greatest to least) rainbow trout, brown trout, westslope cutthroat trout, and mountain whitefish. Rainbow trout generally represent about half the salmonids recorded at the ladder each year.

Brown trout represent between 12 and 32 percent of the salmonids recorded annually. Westslope cutthroat trout represent about 6 to 12 percent of salmonids annually. Mountain whitefish have fluctuated the most of all species at the ladder, which is likely due to their autumn movement patterns and whether the ladder is open during that period of time. Mountain whitefish have represented between one and 44 percent of salmonids. In 2013, only two mountain whitefish were recorded; in 2014, 254 mountain whitefish were recorded. In 2015, the ladder was operated into early November in an attempt to capture the autumn movement of mountain whitefish, as was accomplished in 2014. Although the second highest number of mountain whitefish was recorded in 2015 (n=54), representing about 9 percent of the salmonids, the number of mountain whitefish was still only about one-fifth of the count in 2014. Other species recorded at the ladder but at a small scale of a few individuals annually have included bull trout, rainbow x westslope cutthroat trout hybrids, brook trout, and lake trout. Lake trout is the only salmonid species not released upstream.

3.5.3 Fish Metrics

At the ladder, the majority of salmonids ascending the ladder were measured for total length in millimeters (mm) and weight in grams (g), marked via fin clip, and implanted with a PIT tag. Non-salmonids were also measured for total length and weight, and sub-samples were measured when large groups of non-salmonids were recorded at the ladder. The following data summarize fish metric data collected at the ladder.

3.5.3.1 Fish Length and Weight

In 2015, the largest fish recorded at the ladder was a brown trout (607 mm and 4,328 g). The smallest fish to ascend the ladder in 2015 was a smallmouth bass measuring 151 mm and weighing 36 g.

Since 2011, 11 individual bull trout have been recorded at the ladder with sizes varying from 365 mm and 364 g to 598 mm 2,306 g. In 2015, the two bull trout recorded at the ladder were similar in size, approximately 520 mm and 1,228 g.

A summary of the length and weight measurements collected for each fish species recorded at the ladder in 2015 is provided in Table 3-6.

Table 3-6: Summary of the number of fish measured and the mean and range of lengths (mm) and weights (g) for each fish species that ascended the ladder and was moved upstream in 2015.

Species	Count	Mean Length (mm)	Length (mm) Range	Mean Weight (g)	Weight (g) Range
BULL	2	520	519 - 520	1,228	1,112 - 1,344
EB	2	387	354 - 420	514	400 - 634
RB	276	367	185 - 620	563	70 - 2,670
RBxWCT	4	511	458 - 610	1,296	884 - 2,024
WCT	37	334	221 - 468	390	98 - 970
LL	178	364	187 - 635	563	70 - 4,328
MWF	54	370	280 - 568	468	220 - 2,034
LS SU	658	443	373 - 477	917	558 - 1,260
LN SU	203	415	225 - 406	763	106 - 706
N PMN	507	371	196 - 610	528	66 - 2,114
PEA	78	330	272 - 380	310	170 - 434
SMB	1,242	214	107 - 455	146	6 - 1,638

3.5.3.2 Fish Biomass Passed Upstream

The total biomass, in kilograms (kg), of the fish that were passed upstream of Thompson Falls Dam, is summarized by species and year in Table 3-7. The figure and table do not include fish mortalities in the biomass calculations. In the event that a subsample of a species was taken and the weight(s) of the individual fish were not measured (e.g., non-salmonid species), the average weight for that species was used in the calculation for biomass.

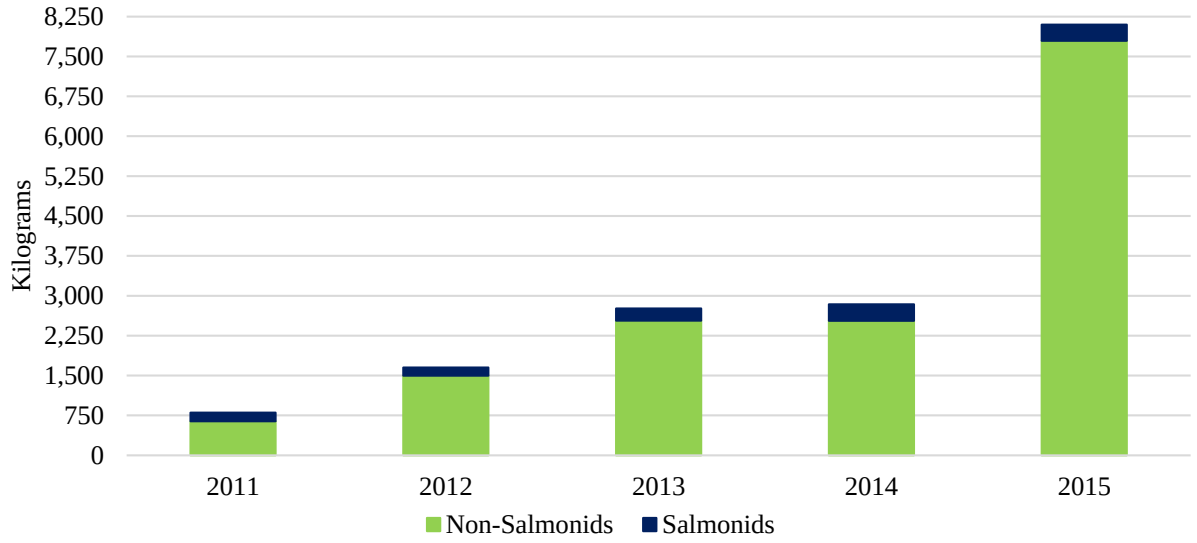
Table 3-7: Summary of the estimated total biomass in kilograms (kg) for each fish species that ascended the ladder and was passed upstream of Thompson Falls Dam annually between 2011 and 2015.

Species	Approximate Total Biomass (kg) Passed Upstream					
	2011	2012	2013	2014	2015	Total
BULL	2	1	8	1	2	15
EB	-	-	-	1	1	2
RB	119	102	116	124	154	615
RBxWCT	5	4	8	8	5	30
WCT	11	10	25	15	14	75
LL	18	28	69	61	101	277

Species	Approximate Total Biomass (kg) Passed Upstream					
	2011	2012	2013	2014	2015	Total
MWF	6	8	1	100	25	140
LS SU	268	1,041	2,414	2,037	5,789	11,549
LN SU	5	-	1	1	20	26
N PMN	344	445	115	320	1,767	2,991
PEA	-	-	-	-	38	38
SMB	24	12	3	172	181	391
Salmonid Biomass	**161**	**153**	**227**	**310**	**303**	**1,153**
Non-Salmonid Biomass	**641**	**1,498**	**2,533**	**2,530**	**7,794**	**14,996**
TOTAL Biomass	**801**	**1,650**	**2,761**	**2,840**	**8,097**	**16,149**

The total volume of fish biomass that was passed upstream of Thompson Falls Dam has increased from approximately 801 kg in 2011 to an estimated 8,097 kg in 2015. Since ladder operations began in 2011, approximately 16,149 kg of biomass has been released upstream of Thompson Falls Dam. Annually, non-salmonid species represent the majority of the fish biomass (80-96%) while salmonids represent between 3.7 and 20 percent of the fish biomass moved upstream of Thompson Falls Dam (Figure 3-8).

Figure 3-8: The approximate total biomass of non-salmonids and salmonids annually moved upstream of the Thompson Falls Upstream Fish Passage Facility between 2011 and 2015.



3.6 Bull Trout Ascending the Ladder

In 2015, two bull trout ascended the ladder, the first bull trout (PIT# 985121023302169) was documented on May 17 and the second bull trout (PIT# 985121023464730) on June 3. On May 17, the water temperature was approximately 12.9 ºC and streamflows were approximately 26,400 cfs (USGS gage near Plains). On June 3, the water temperature had warmed to approximately 15.6 ºC and streamflows were approximately 29,900 cfs. Both bull trout were released upstream of Thompson Falls Dam alive. The bull trout recorded at the ladder in May was later recaptured (and released alive) on June 2, 2015 by FWP during their annual electrofishing survey of the Big Hole section in the Thompson River.

During the past 5 years of ladder operations, the majority of the bull trout have ascended the ladder between April and June with the exception of one bull trout that ascended the ladder in August of 2013. In total, there have been 11 individual bull trout that have ascended the ladder between 2011 and 2015. Five of the 11 individual bull trout have been detected since being released upstream of Thompson Falls Dam. The most recent detections of the five bull trout include two mortalities (one jumped out of a pool at the ladder; one was captured via gillnetting downstream in the Noxon Reservoir), two bull trout detected downstream of Thompson Falls Dam in Prospect Creek, one bull trout detected (via electrofishing) upstream of Thompson Falls Dam in the Thompson River (Table 3-8). A summary of the bull trout that have ascended the ladder between 2011 and 2015 is provided in Table 3-8. *Refer to* Section 4.0 for a summary of bull trout sampled by NorthWestern in the Thompson Falls Hydroelectric Project (Project) area between 2011 and 2015 as well as genetic assignments.

Table 3-8: Summary of bull trout that ascended the ladder, 2011-2015. Note: The 2015 fish are listed in bold.

Date	Length (mm)	Weight (g)	PIT Tag	Water Temp (°C)	USGS Mean Daily Streamflow (cfs)	Last Detection of Bull Trout
4/13/2011	365	364	985121023302169	6.6	24,500	Released live upstream of TFalls Dam
4/26/2011	547	1438	985121023464730	7.8	25,900	*See Comments on 5/21/2012*
5/15/2012	510	1172	985121021877906/ 982000357016269	11.3	51,000	First observed below TFalls Dam on 5/31/2011; ascended TFalls Ladder on 5/15/2012; released live upstream of TFalls Dam; detected Downstream of TFalls Dam by Avista in Prospect Creek 7/7/2013 – 8/13/2013
5/21/2012	563	1404	985121023464730	11.1	56,100	Returned to TFalls Ladder, **Mortality** (jumped out of pool)
4/30/2013	598	2306	982000357016065	8.9	25,100	Released live upstream of TFalls Dam
5/6/2013	576	1694	982000357016109	10.6	24,000	Released live upstream of TFalls Dam; detected downstream of TFalls Dam by Avista in Prospect Creek on 9/21/2014
5/7/2013	478	978	982000357016155	11.3	25,000	Released live upstream of TFalls Dam
6/7/2013	596	1926	Half-duplex (HDX) tag not recorded (Genetics 118-073)	15.5	38,100	Released live upstream of TFalls Dam
8/9/2013	482	1058	982000357016151	22.3	8,680	Released live upstream of TFalls Dam
5/16/2014	523	1264	982000357016169	10.8	44,000	Released live upstream of TFalls Dam; recaptured during 2014 annual reservoir monitoring led by FWP in Noxon Reservoir on 10/13/2014 via gillnet **(Mortality)**
5/17/2015	**519**	**1334**	**982000363519407**	**12.9**	**26,400**	**Released live upstream of TFalls Dam; recaptured during 2015 FWP electrofishing in Big Hole Section of Thompson River on 6/2/2015 (543mm, 1348g) and released live in Thompson River**
6/3/2015	**520**	**1112**	**982000357016242 982000357016210**	**15.6**	**29,900**	**Released live upstream of TFalls Dam**

3.7 Length of Time to Ascend the Ladder

Three remote antennas (non-directional) were installed in the lower (Pools 7 and 8) and upper (Pool 45) pool of the ladder for detecting the presence of PIT-tagged fish. PIT tag fish records from the remote antennas were used to calculate the length of time it took an individual fish to ascend the ladder between Pools 7/8 and Pool 45 (also known as the "holding pool"). Not all fish detected in Pool 45 were recorded at the ladder indicating that some fish escaped the holding pool. Some of the fish that entered the ladder were initially PIT-tagged via electrofishing downstream of Thompson Falls Dam while others were PIT-tagged initially at the ladder. A summary of the fish detected via the remote antennas in the ladder between years 2011 and 2015 is presented in Table 3-9.

Table 3-9: Summary of the species, number of species detected via remote antennas in the ladder, and the median, average, and range of time (hours) spent ascending the ladder between 2011-2014 and in 2015.

	2011-2014				2015			
Species	**Number**	**Median Time**	**Avg Time**	**Range of Time**	**Number**	**Median Time**	**Avg Time**	**Range of Time**
BULL	2	2.6	2.6	2.4-2.8	-	-	-	-
LL	24	1.7	2.2	1.0-10.8	12	2.9	3.6	0.9-12.0
RB	65	1.9	4.6	0.9-40.8	24	2.2	4.2	0.9-23.5
MWF	2	1.9	1.9	1.6-2.1	-	-	-	-
WCT	5	2.5	3.2	1.4-6.4	5	4.0	4.2	2.0-6.4
RBxWCT	2	10.5	10.5	2.0-19.1	3	2.2	3.5	1.5-7.1
LS SU	15	7.0	9.6	1.7-31.0	20	9.1	10.3	5.3-17.8
Salmonids	**100**	**1.9**	**4**	**0.9-40.8**	**44**	**2.0**	**4**	**0.9-23.5**
Non-Salmonids	**15**	**7.0**	**9.6**	**1.7-31.0**	**20**	**9.1**	**10.3**	**5.3-17.8**
TOTAL	**115**	**2.1**	**4.7**	**0.9-40.8**	**64**	**4.3**	**6.0**	**0.9-23.5**

In 2015, 64 fish of four species and one hybrid (brown trout, rainbow trout, westslope cutthroat trout, rainbow x westslope cutthroat trout hybrid, and largescale suckers) were detected via the remote antennas and recorded with an ascent time at the ladder. Salmonids expended between 0.9 hour and 23.5 hours to ascend the ladder with the median ascent time of 2 hours. Non-salmonids (largescale suckers) spent between 5.3 hours and 17.8 hours to ascend the ladder with a median time of 9.2 hrs.

Between 2011 and 2014, the median ascent time for 100 salmonids was approximately 1.9 hours and the average ascent time for salmonids was approximately 4 hours. During the same period, the median ascent time for 15 non-salmonids (largescale suckers) was approximately 7 hours and the average ascent time for non-salmonids was approximately 9.6 hours.

The median ascent time for salmonids and non-salmonids between 2011 and 2014 compared to 2015 were nearly identical for salmonids and similar for non-salmonids. Variability exists within species and among the species, which is expected and may be related to various factors such as, but not limited to fish condition, the number of fish present in the ladder, or other physical/biological conditions influencing behavior and/or swimming abilities.

3.8 Movement Patterns

Fish movement is likely influenced by a myriad of elements such as, but not limited to, thermal regimes, hydrologic regime, life history cycle, attractant flow at the ladder, ladder operations (e.g., closures or weir mode), and/or other physical or biological factors. Some of the variability in ladder operations since 2011 potentially influencing fish movement and behavior in the ladder has included the reduction in the periods of ladder closures since 2011 thus allowing more days for fish to ascend the ladder. In addition, the weir mode at the ladder was operated in alternating modes (orifice and notch) in 2011 and 2012 before continuously operating in orifice mode in 2013, 2014, and 2015. Although there are several potential factors working in concert to influence fish movement and behavior, the potential mechanisms, such as hydrology and water temperature are the only elements discussed in this report.

The fish movement analysis includes all fish collectively recorded at the ladder between 2011 and 2015. During the last 5 years of operation, 25,685 fish were recorded at the ladder, representing 2,082 salmonids and 23,603 non-salmonids.

The following sections evaluate fish movement patterns for salmonids and non-salmonids based on mean daily streamflow measurements and daily water temperature measurements coinciding with when fish were recorded at the ladder between 2011 and 2015. Streamflow measurements are taken at the USGS gage in the Clark Fork River near Plains, Montana. Water temperature measurements reflect temperatures recorded during each ladder check.

Seasonal and daily movement patterns are also discussed. Seasonal movements focus on salmonids (spring and autumn spawners) and non-salmonids (spring spawners) recorded at the ladder. Daily movements are based on the time of day fish (with PIT tags) were detected entering the lower pool(s) in the ladder via the remote antenna.

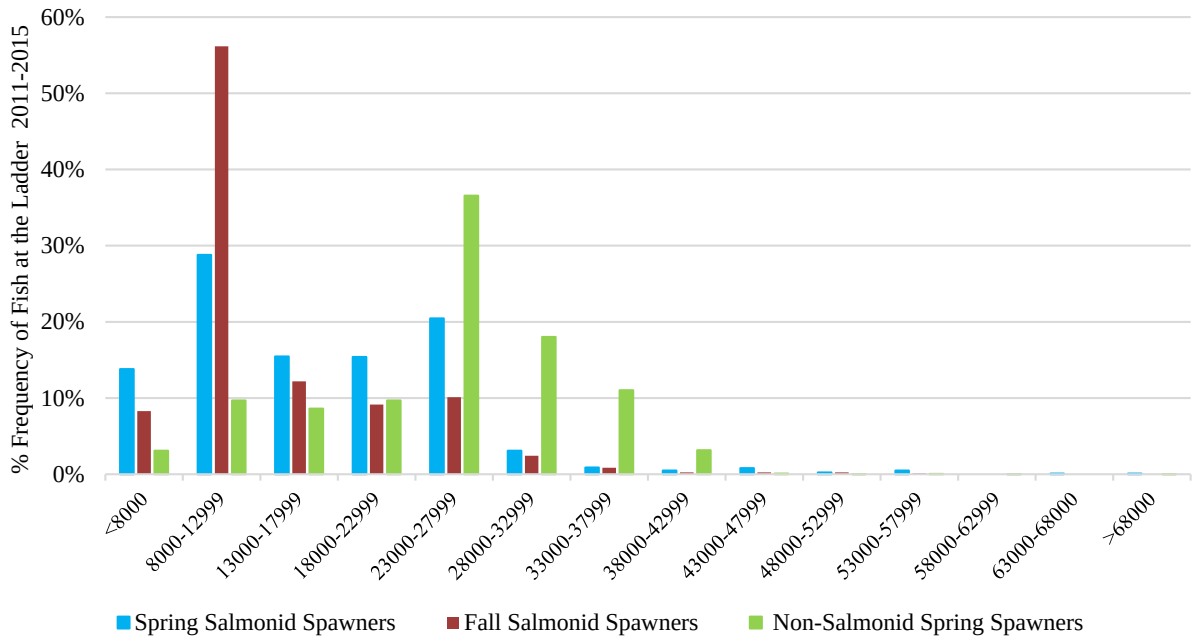
3.8.1 Streamflow and Fish Movement to the Ladder

As discussed in Section 3.3, the annual hydrograph in the lower Clark Fork River between 2011 and 2015 has varied greatly and experienced above average streamflows in 2011, lower than average streamflows in 2013 and in 2015, and relatively normal or average streamflows in 2012 and 2014. In general, peak spring flows are around 60,000 cfs and occur in May/June. Baseline flows in the early spring, autumn and winter months are approximately 10,000 cfs. At the Main Dam (at Thompson Falls), spill is initiated once in-river flows exceed 23,000 cfs.

In Figure 3-9, streamflows were grouped in intervals of 5,000 cfs starting with 8,000 cfs and peaking at 68,000 cfs. This grouping helps illustrate potential fish response to spill operations when spill is initiated at the Main Dam at streamflows exceeding 23,000 cfs.

The frequency of salmonids and non-salmonids recorded at the ladder between 2011 and 2015 at various streamflow intervals is presented in Figure 3-9. Salmonids are categorized as spring spawners (i.e., rainbow trout, westslope cutthroat trout, and rainbow x westslope cutthroat trout hybrids) and autumn spawners (i.e., bull trout, brook trout, brown trout, lake trout, mountain whitefish). Non-salmonids recorded at the ladder (i.e., peamouth, smallmouth bass, largescale suckers, longnose suckers, northern pikeminnow, and walleye) represent spring spawners. Between 2011 and 2015, 2,082 salmonids (1,261 spring spawners and 821 autumn spawners) and 23,603 non-salmonids (total of 25,685 fish) were recorded at the ladder and are represented in Figure 3-9.

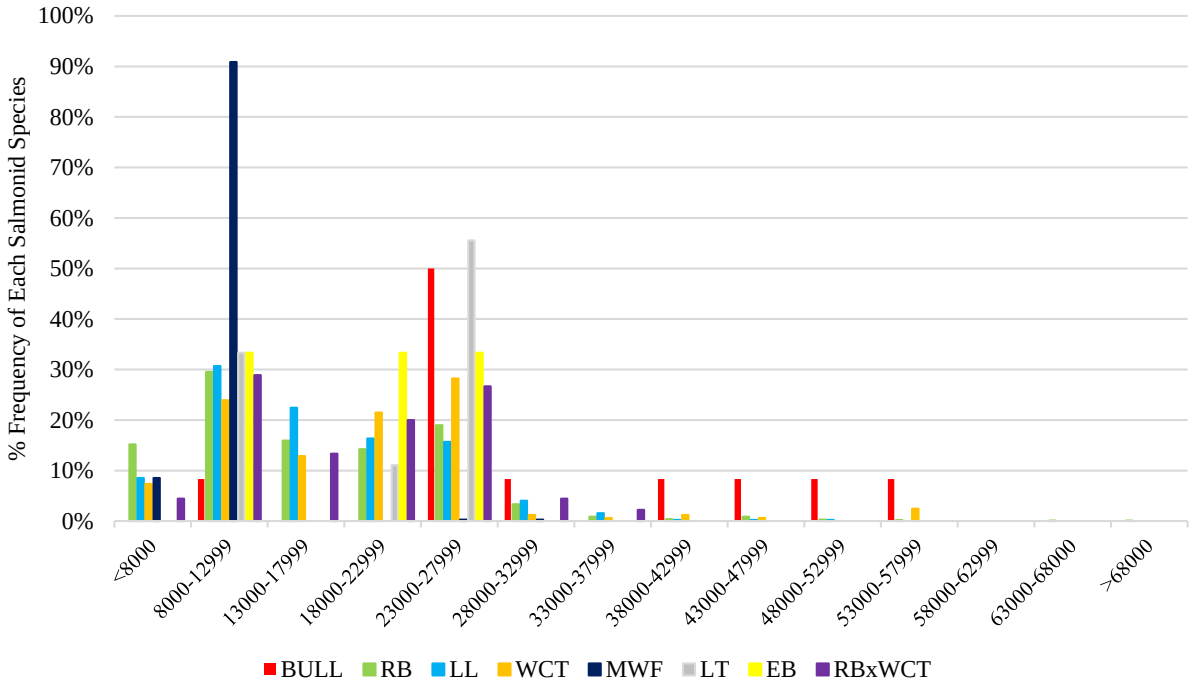
Figure 3-9: Percent frequency of salmonids (1,261 spring spawners and 821 autumn spawners) and 23,603 non-salmonids recorded (spring spawners) recorded the Thompson Falls fish ladder between 2011 and 2015 during various streamflows.



Both salmonids and non-salmonids were recorded at nearly every streamflow interval (Figure 3-9). The majority of salmonids (95%), including spring and autumn spawners were recorded at the ladder when flows were less than 28,000 cfs with the peak frequency (40% salmonids) occurring when flows were between 8,000 and 12,999 cfs. Although non-salmonids were most commonly recorded at the ladder when flows were between 23,000 and 27,999 cfs, approximately 94 percent of non-salmonids were recorded at the ladder when flows ranged between 8,000 and 38,000 cfs.

The frequency of salmonids species at the ladder at various stream flows is depicted in Figure 3-10. Of the autumn spawning salmonids, just over 90 percent of mountain whitefish were recorded at the ladder when flows were between 8,000 and 12,999 cfs, while only about one-third of brown trout, one-third of lake trout, and one-third of brook trout were recorded at the same streamflows (Figure 3-10). Half of the bull trout (n=6), were recorded at streamflows between 23,000 and 27,999 cfs, while five individual bull trout were recorded at streamflows greater than 28,000 cfs. Movement patterns based on flow appears to vary among autumn spawning salmonid species. For example, while bull trout and mountain whitefish are both autumn spawning fish, bull trout were recorded at the ladder more often during the ascending limb of the hydrograph (May and June), while mountain whitefish were more common in the autumn (September, October, November) during baseline flows.

Figure 3-10: Percent frequency of each salmonid species recorded the Thompson Falls fish ladder between 2011 and 2015 during various streamflows.

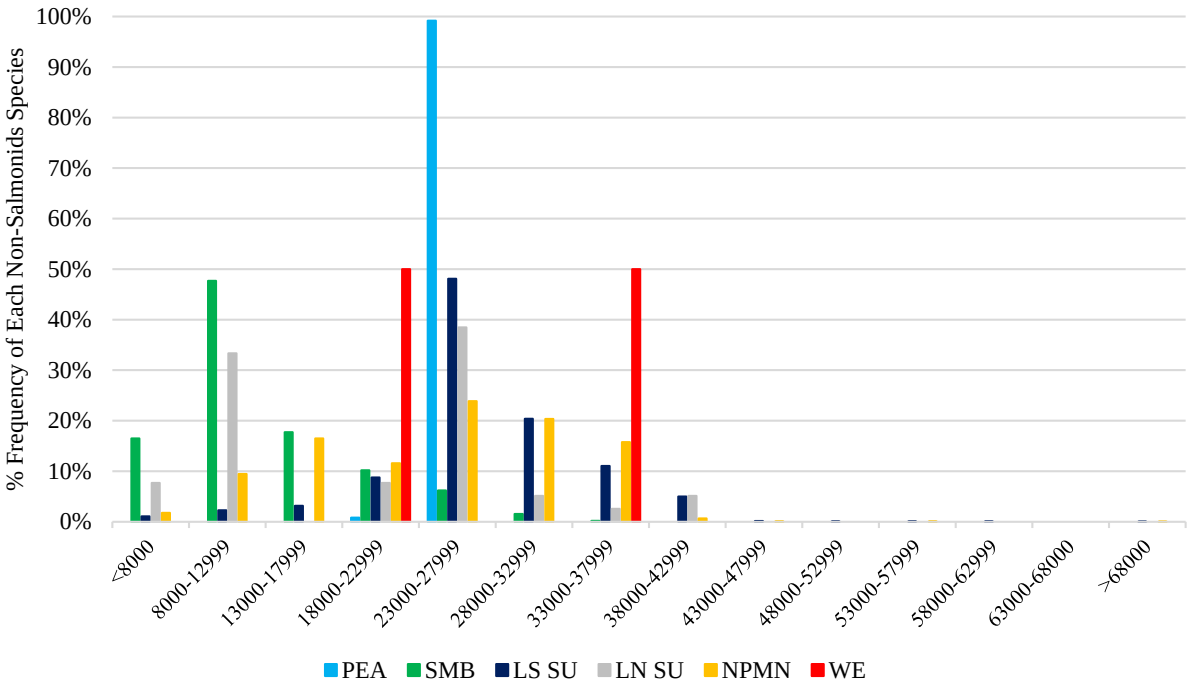


Of the spring spawning salmonids, approximately 94 percent of each species and hybrid (rainbow trout, westslope cutthroat trout, and rainbow x westslope cutthroat trout hybrid) were recorded at the ladder when flows were less than 28,000 cfs. Spring spawning salmonid species appear to move at similar streamflows in contrast to autumn spawning salmonid species. However, spring salmonids do not appear to limit their movement to one time of year. The streamflows that spring salmonids are recorded at the ladder represent varying times of the year, as will be further discussed in Section 3.8.3.

Peak movements of spring spawning non-salmonids also varied among species. The frequency of non-salmonid species at the ladder at various instream flows is depicted in Figure 3-11.

Approximately 99 percent of the peamouth were recorded when flows were between 23,000 cfs and 27,999 cfs, while approximately 82 percent of smallmouth bass were more commonly recorded at the ladder when flows were less than 18,000 cfs. In contrast, when streamflows were between 23,000 and 38,000 cfs, only about 8 percent of the smallmouth bass were recorded at the ladder compared to over half of the northern pikeminnow (60%) and largescale suckers (79%).

Figure 3-11: Percent frequency of each non-salmonid species recorded the Thompson Falls fish ladder between 2011 and 2015 during various streamflows.

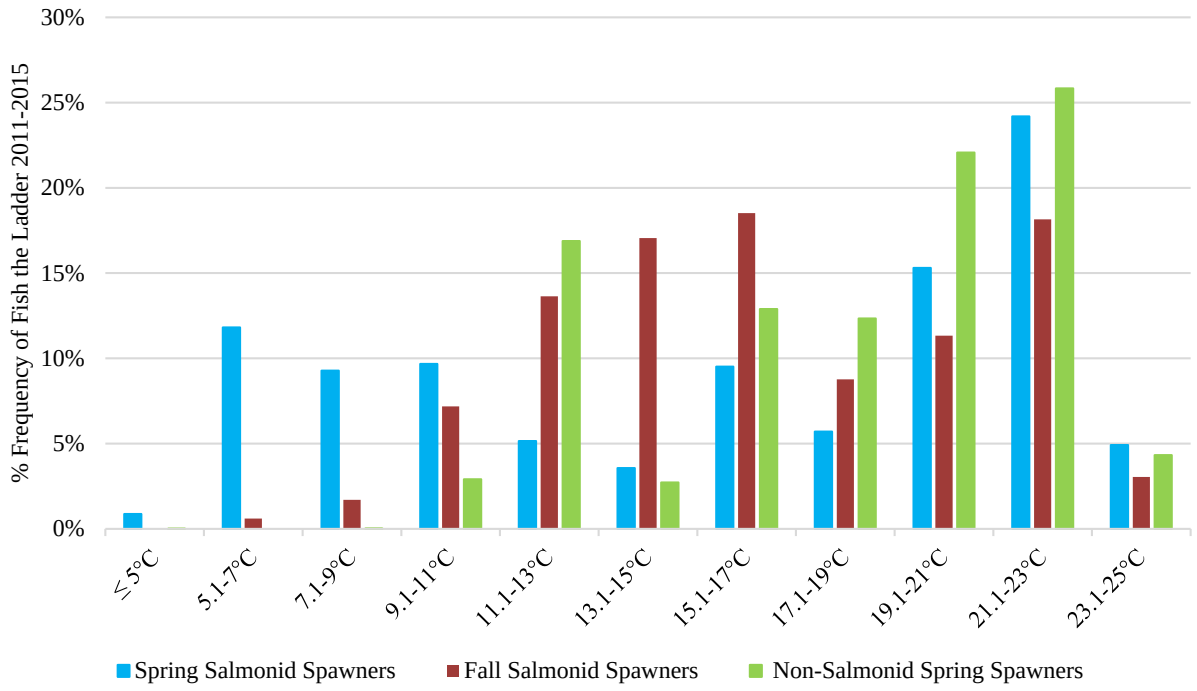


The variability observed among salmonid and non-salmonids species at different streamflow intervals is likely related to multiple factors such as life history strategies, swimming abilities, ability to detect the fish ladder opening at various streamflows, temperature, etc.

3.8.2 Water Temperature and Fish Movement to the Ladder

The frequency of salmonids (spring and autumn spawners) and non-salmonids (spring spawners) at various water temperature intervals recorded at the ladder between 2011 and 2015 is shown in Figure 3-12. The warmest water temperature recorded during a ladder check was 24.9 ºC in 2015 and the coldest water temperature recorded was 4.3 degrees in 2011. There were 4 days (1 day in March 2011 and 3 days in March 2012) when water temperatures were recorded less than 5 ºC concurrent with fish recorded at the ladder.

Figure 3-12: Percent frequency of salmonids (1,261 spring spawners and 821 autumn spawners) and 23,603 non-salmonids recorded (spring spawners) recorded at the Thompson Falls fish ladder between 2011 and 2015 during various water temperatures.



Salmonids and non-salmonids were recorded at the ladder at nearly all water temperatures. Spring spawning salmonids were recorded at all temperatures, but were most common when temperatures were between 19 ºC and 23 ºC. Spring spawning salmonids were also more frequent at cooler water temperatures (less than 9.1 ºC) compared to autumn spawning salmonids and non-salmonids.

The majority of spring spawners are represented by rainbow trout (n=1,053) and westslope cutthroat trout (n=163). Rainbow trout were most frequent at water temperatures between 5.1 ºC and 7 ºC, 15.1 ºC and 17 ºC, and 19.1 ºC to 23 ºC. Westslope cutthroat trout were most common at water temperatures between 7.1 ºC and 11 ºC and between 21.1 ºC and 23 ºC.

Autumn spawning salmonids are collected at the ladder at water temperatures greater than 11 ºC (Figure 3-12). Autumn spawning salmonids were more frequent than spring spawning salmonids when temperatures were between 11.1 ºC and 19 ºC. Although autumn spawning salmonids were present at water temperatures between 19 ºC and 25 ºC, spring spawning salmonids were more common.

The majority of autumn spawning salmonids are represented by brown trout (n=446) and mountain whitefish (n=351). Mountain whitefish were most common when water temperatures were between 13.1 ºC and 17 ºC. Although brown trout were present at all temperatures greater than 5 ºC, brown trout were most prevalent (53%) when water temperatures were between 19.1 ºC and 23 ºC. In contrast to brown trout and mountain whitefish, bull trout were more

common at lower water temperatures. Approximately 75 percent of the bull trout (n=9) were recorded at the ladder when temperatures were less than 13 ºC, two bull trout were recorded at water temperatures between 15.5 ºC and 15.6 ºC, and one bull trout was recorded at 22.3 ºC.

Non-salmonids were most often collected when water temperatures exceeded 11.1ºC and nearly half of all non-salmonids (48%) were recorded when water temperatures were between 19.1 ºC and 23 ºC. As observed with streamflows, the frequency of non-salmonids at various water temperatures varied by species. Peamouth were only recorded when water temperatures were between 12.2 ºC and 16.1 ºC. Both walleye (n=2) were recorded when water temperatures were greater than 19.1 ºC. Smallmouth bass were present when water temperatures were above 13.1 ºC, and were most commonly collected when water temperatures were between 19.1 ºC and 25 ºC. Largescale suckers were observed in the ladder at water temperatures as cool as 7.8 ºC, but were most common when temperatures were above 11.1 ºC. Northern pikeminnow were recorded at the ladder when water temperatures were greater than 9.1 ºC and were most common (84%) when water temperatures were between 17.1 ºC and 23 ºC.

Although salmonids and non-salmonids were recorded at temperatures greater than 23 ºC, there was a substantial decline in the frequency of all fish when stream temperatures exceeded 23 ºC. The decline in frequency of fish may be related to having fewer data points at these warmer water temperatures compared to other temperature intervals (e.g., fewer days with water temperatures recorded above 23 ºC over the last 5 years of operation because these water temperatures are uncommon) or the decline may represent a biological response to warmer water temperatures indicating an upper thermal threshold to some fish movement.

3.8.3 Seasonal Movements

Salmonids and non-salmonids recorded at the ladder between 2011 and 2015 display distinct and different movement strategies. In this section, the seasonal movements (by month) for salmonids and non-salmonids are evaluated based on when fish were recorded at the ladder between 2011 and 2015. The analysis is only representative of the period of time the ladder was in operation, which was generally between March and October. In 2015, the season was extended until November 9 and data from November 2015 are included in the figures.

3.8.3.1 Salmonid Seasonal Movements

The figures below show the frequency of spring spawning salmonids (Figure 3-13) and autumn spawning salmonids (Figure 3-14) recorded at the ladder collectively between 2011 and 2014 compared to those fish recorded at the ladder in 2015. November movements were only recorded in 2015.

Figure 3-13: Frequency of spring spawning salmonids recorded at the ladder between 2011 and 2014 (n=939) and in 2015 (n=322).

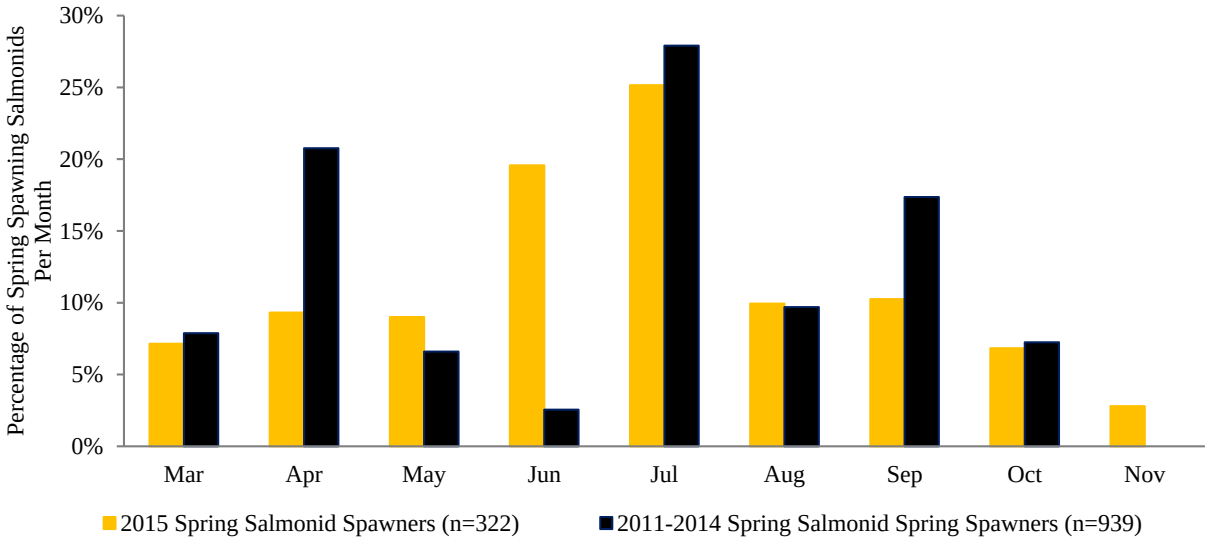
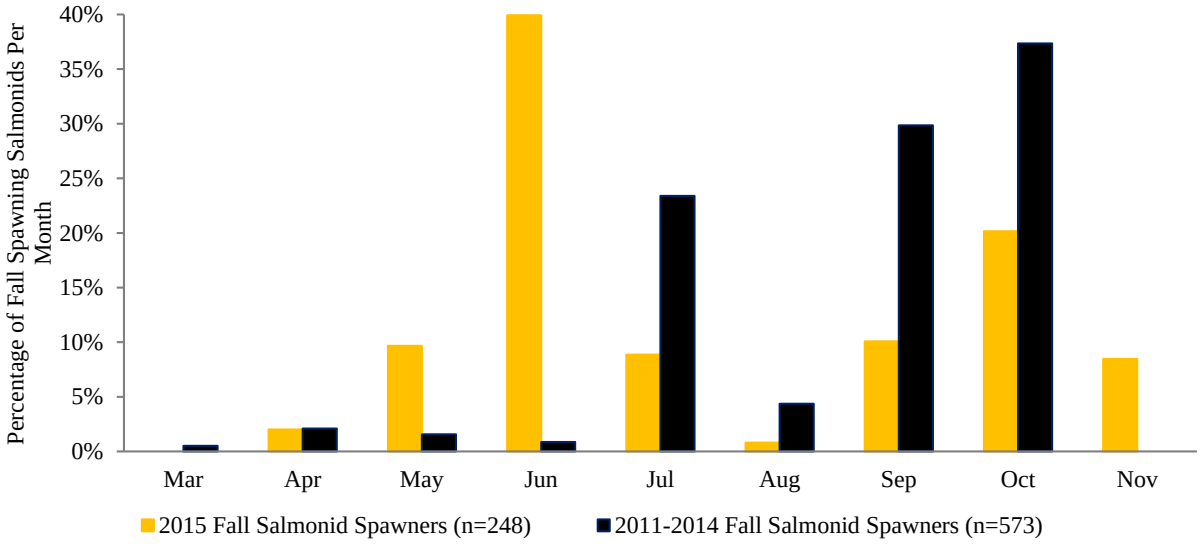


Figure 3-14: Frequency of autumn spawning salmonids recorded at the ladder between 2011 and 2014 (n=573) and in 2015 (n=248).



Spring spawning salmonids were recorded at the ladder throughout each operating season between 2011 and 2015. Based on data collected between 2011 and 2014, the peak frequency of spring spawning salmonids appeared to occur three times a year (April, July, and September) as shown in Figure 3-13. In 2015, the three peaks of movement were less pronounced and the frequency of spring salmonids remained more consistent in the spring (March-May), late summer (August), and early autumn (September and October); while the peak movement (approximately 45%) of the spring spawning salmonids was recorded in June (20%) and July (25%) as shown in Figure 3-13. In previous years (2011-2014), the frequency of spring spawning salmonids in June was less than 3 percent. The lower frequency in June in previous years (2011-

2014) is likely related to fish not ascending the ladder as a result of higher spring flows and cooler temperatures and/or ladder closures during peak spring flows.

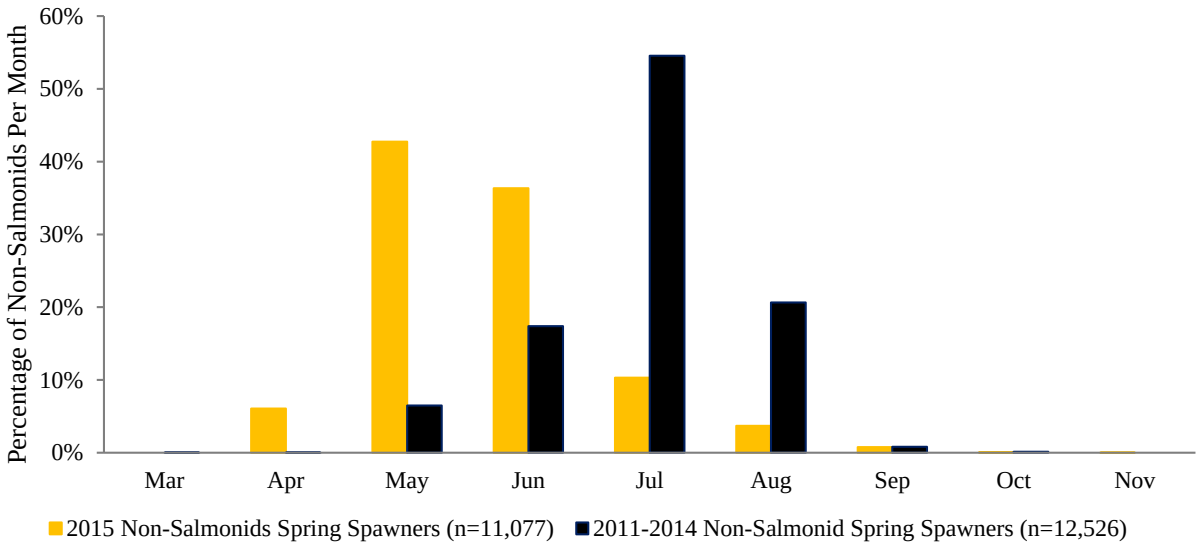
Based on records of fish at the ladder, spring spawning salmonids do not appear to ascend the ladder specifically with the goal/objective of moving upstream to a tributary to spawn in the same year. Remote PIT tag array data collected in the Thompson River (*refer to* Section 3.11.2) provides more insight to movement patterns and behavior of spring spawning salmonids. For example, rainbow trout detected in the Thompson River in 2014 - 2015 display varying movement patterns indicating spawning is not always the primary reason for upstream movement in the Clark Fork River. Five individual fish are discussed here to illustrate these observations. For example, one rainbow trout (410 mm, 692 g) ascended the ladder in July 2014 and was later detected in the Thompson River in March, April, and September 2015. A second rainbow trout (480 mm, 860 g) was recorded at the ladder in August 2014, then the Thompson River in June 2015, then again at the ladder in October 2015, and then 2 days later in the Thompson River. A third rainbow trout (575 mm, 1990 g) was recorded at the ladder in September 2014, later detected in the Thompson River in June 2015, followed by a second ascent at the ladder (measuring 620 mm, 2670 g) in October 2015, and a detection 2 days later in the Thompson River. A fourth rainbow trout (460 mm, 916 g) was recorded at the ladder in March 2015 and then detected in the Thompson River in September and October 2015. A fifth rainbow trout ascended the ladder in October 2014 (334 mm, 398 g) and then was detected in the Thompson River in July and September 2015. All of these examples indicate these fish are likely utilizing the Clark Fork River for more than just a migration corridor to their spawning grounds with the variable seasonal movement patterns observed at the ladder and in the Thompson River. Upstream fish passage at Thompson Falls is providing various opportunities (not just migration related to spawning in the same year) for fish to explore new areas and access to new resources related to overwintering, foraging, and evening spawning in future years.

Autumn spawning salmonids were also detected at the ladder in all months of operation between 2011 and 2015 (Figure 3-14). Between 2011 and 2014, the majority of autumn spawning salmonids were recorded at the ladder in July, September, and October. The majority of the July autumn spawning fish represent brown trout whereas the September and October autumn spawning fish were primarily mountain whitefish, specifically the 253 mountain whitefish documented in 2014. In 2015, June was the peak month for autumn spawning salmonids recorded at the ladder. These fish were primarily brown trout. An autumn peak was also observed in October when mountain whitefish were ascending the ladder. Other autumn spawning salmonids that were less commonly recorded at the ladder include lake trout, brook trout, and bull trout. Between 2011 and 2015 these fish have shown variable movement patterns and timing at the ladder. Lake trout (n=9) were recorded in April, May, September, and October at the ladder. Brook trout (n=3) were recorded in May, July, and October at the ladder. Bull trout (n=12) were most frequently recorded at the ladder in April, May, and June, while one fish was documented in August. All of the bull trout were recorded during their normal upstream migratory period that typically extends from late spring to the fall.

3.8.3.2 Non-salmonid Seasonal Movement

Non-salmonids are represented by largescale suckers, longnose suckers, peamouth, northern pikeminnow, smallmouth bass, and walleye. All non-salmonids recorded at the ladder are spring spawners. However, not all non-salmonids recorded at the ladder were sexually mature fish (assessed by size of fish) and thus upstream migrations were not necessarily spawning related. The figures below show the frequency of spring spawning non-salmonids (Figure 3-15) between 2011 and 2014 compared to 2015. November movements were only recorded in 2015.

Figure 3-15: Frequency of spring spawning non-salmonids recorded at the ladder between 2011 and 2014 (n=12,526) and in 2015 (n=11,077).



Non-salmonids frequency appears to coincide with warmer water temperatures. Between 2011 and 2014, the peak frequency for non-salmonids at the ladder was in July in contrast to 2015 when the peak frequency of non-salmonids was in May and June. As discussed in Section 3.1, the water temperatures in 2015 warmed earlier than previous years (*refer to* Figure 3-3). Flow was also much lower and more consistent in May and June than observed in previous years (*refer to* Figure 3-1). These atypical physical river conditions may have influenced the seasonal shift in non-salmonid movement observed in in 2015 compared to previous years.

Seasonal movements for non-salmonids also varied by species in 2015. The majority of largescale suckers (68%) recorded at the ladder in 2015 ascended in May. Whereas, the majority (80%) of northern pikeminnow ascended the ladder in June and the frequency of smallmouth peaked (65%) in July. In addition, peamouth were recorded at the ladder for the first time since operations commenced in 2011 and were only observed in May and July. Although we lump several species into the group of non-salmonids, it is clear that the timing of upstream migration varies by species.

3.8.3.3 Summary Seasonal Movements

In general, the timing of upstream migration shifted in 2015 and occurred earlier compared to previous years.

As discussed in Section 3-1, spring flows in 2015 were less than 40,000 cfs (which is about 20,000 cfs less than the average, *refer to* Figure 3-1) and stream temperatures warmed much earlier in the year compared to previous years (*refer to* Figure 3-3). The combination of lower streamflows and warmer water temperatures in 2015 likely influenced fish to move during a time of year when the river is normally less conducive to upstream movements due to higher spring flows resulting in more turbulent, turbid, faster, and colder waters.

3.8.4 Diurnal Movements

Data collected from the remote antennas in the ladder between 2011 and 2015 were utilized to evaluate the time of day fish entered the ladder. Since 2011, 391 fish representing seven species and one hybrid were analyzed for time of entry into the ladder (Table 3-10). The species information for 11 individual fish detected via remote antenna in 2012 and in 2015 were not available. Consequently, these fish were identified as unknown (as shown in Table 3-10).

Table 3-10: Summary of the number of fish species detected in the ladder via remote antennas annually between 2011 and 2015.

Species	2011	2012	2013	2014	2015	Total
BULL	-	2	-	-	8	10
LL	1	3	15	26	36	81
LS SU	6	30	22	9	65	132
MWF	-	2	2	1	1	6
NPMN	-	1	1	-	-	2
RB	20	18	28	31	37	134
RBxWCT	1	-	1	1	4	7
WCT	-	1	3	2	2	8
Unknown	-	6	-	-	5	11
TOTAL	**28**	**63**	**72**	**70**	**158**	**391**

The timing of fish entry into the ladder was depicted by dividing a 24-hour period into 3-hour increments. The times of day that salmonids and non-salmonids were detected in the ladder for each year are shown in Figures 3-16 and 3-17, respectively.

Figure 3-16: Time of day that salmonids were detected in the ladder in 2011-2015.

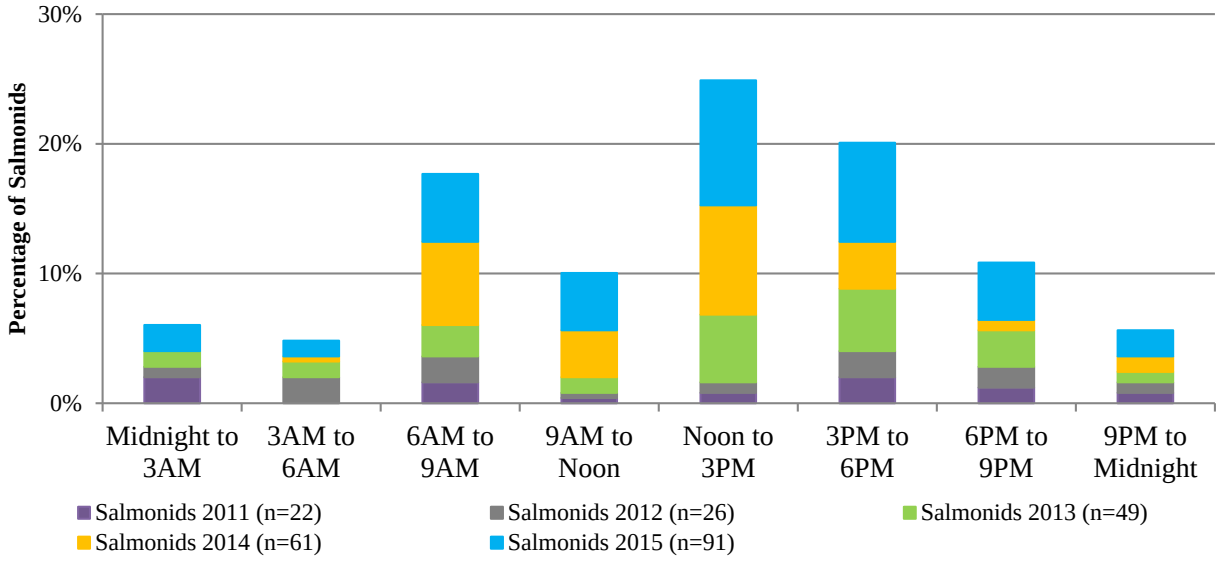
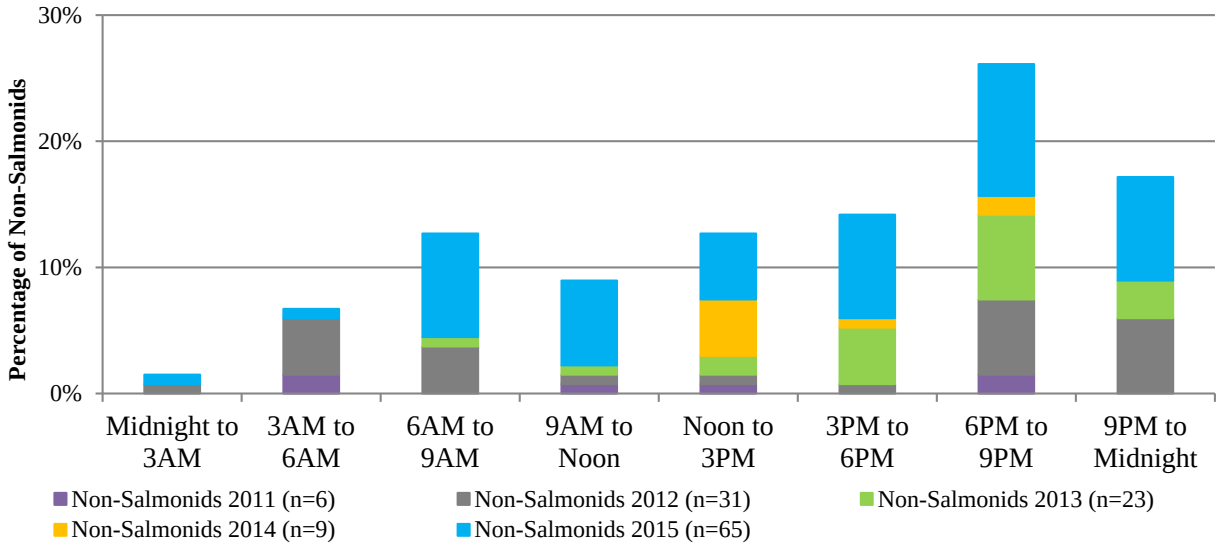


Figure 3-17: Time of day that non-salmonids were detected in the ladder in 2011-2015.



Between 2011 and 2015, 1,881 salmonids and 259 non-salmonids were PIT-tagged either at the ladder or below the dam. A total of 249 salmonids representing five species and one hybrid (Table 3-10) were detected by the remote antenna in the lower pool of the ladder and included in Figure 3-16. A total of 134 non-salmonids (132 largescale suckers and 2 northern pikeminnow) were detected by the remote antenna in the lower pool of the ladder and include in Figure 3-17.

The remote PIT tag array data collected from salmonids entering the ladder between 2011 and 2015 represent approximately 16 percent of salmonids (n=1,557) tagged at the ladder during the same time period. These data show salmonids are moving into the ladder at all hours and appear to be entering the ladder more often during the daytime (6:00 AM to 6:00 PM) *versus* nighttime (6:00 PM to 6:00 AM).

Non-salmonids were also detected entering the ladder at all hours and approximately 70 percent of the non-salmonids appeared to enter the ladder between noon and midnight (Figure 3-17). However, the timing of ladder entry and movement patterns of non-salmonids should be interpreted cautiously because the data only represent a fraction (less than 1%) of non-salmonids recorded at the ladder.

3.9 Tagged Fish Returning to the Ladder

Since 2011, 3,278 fish have been uniquely tagged (2,151 PIT and 1,127 Floy tags) either at the fish ladder or immediately downstream of Thompson Falls Dam. In 2015, fish were only tagged at the ladder and there was no surveying or tagging of fish downstream of Thompson Falls Dam by the Licensee. A summary of the tagging history at the fish ladder and downstream of the Thompson Falls Dam since 2011, as well as the number of returning fish to the ladder in subsequent years, is provided in the following subsection.

3.9.1 Fish Tagged at the Ladder

Since the fish ladder commenced operations in 2011, 2,674 fish (1,566 PIT and 1,108 Floy tags) were uniquely tagged at the ladder. These fish represent 10 species and one salmonid hybrid (Table 3-11). The total number of uniquely tagged fish represents nearly 75 percent of all salmonids recorded at the ladder and 4.7 percent of non-salmonids recorded at the ladder between 2011 and 2015. For the last 5 years, the majority of fish PIT-tagged at the ladder were salmonids with approximately 82 percent of the PIT-tagged salmonids represented by rainbow trout and brown trout. Non-salmonids have been primarily Floy-tagged with the majority of the tagged non-salmonids represented by smallmouth bass. The highest number of fish tagged in one operational season occurred in 2015 resulting in approximately 1,457 uniquely tagged fish (483 PIT and 974 Floy tags). The number of fish uniquely tagged and the number of individual fish returning to the ladder in each operational season (2011-2015) is summarized by species in Table 3-11. Because some fish return to the ladder in multiple years, the cumulative total of fish returning the ladder between 2011 and 2015 (using Table 3-11) does not represent unique individual fish.

Table 3-11: Summary of the number of fish, by species, with unique PIT or Floy tag implanted annually in fish at the Thompson Falls Ladder prior to release upstream between 2011 and 2015. Additional fish, including fallback, returning to the ladder are provided in parentheses (#).

Species	Tag Type	2011	2012	2013	2014	2015
BULL	PIT	2	(1)	4	1	2
EB	PIT				1	2
LL	PIT	27	40 (1)	97 (6)	67 (11)	153 (22)
RB	PIT	141 (12)	189 (10)	186 (23)	144 (37)	238 (33)
RBxWCT	PIT	9	7	12 (1)	11 (1)	1 (3)
WCT	PIT	20 (1)	20	45 (1)	34 (2)	33 (4)
MWF	PIT	17			(1)	54
N PMN	PIT	2				
N PMN	FLOY	1				
LN SU	PIT	1				
LS SU	PIT	6				
SMB	FLOY	73	30 (2)	7	23 (4)	974 (20)
Subtotal	**PIT**	225 (13)	256 (12)	344 (31)	258 (52)	**483 (62)**
Subtotal	**FLOY**	74	30 (2)	7	23 (4)	**974 (20)**
TOTAL	**All Tags**	299 (13)	286 (14)	351 (31)	281 (56)	**1,457 (82)**

In 2015, there were 62 salmonids and 20 non-salmonids identified as returning fish having already ascended the ladder one or more times (*see* Table 3-11). The majority of the salmonids were returning from previous year(s) while all twenty returning non-salmonids were classified as "fallback." Fallback is defined as a fish that ascends the ladder, receives a unique identification tag, is released upstream, and then is later recaptured either below the Thompson Falls Dam or at the ladder again that same year.

As mentioned previously, salmonids represented the majority of PIT-tagged fish at the ladder and subsequently the majority of fish recorded returning to the ladder annually. In 2015, there were 564 salmonids, excluding six lake trout, recorded at the ladder. Lake trout are not included in this total because they are not tagged at the ladder and they are not authorized by FWP to be released upstream and therefore have no potential of returning to the ladder. Of the 564 salmonids, approximately 62 fish were returning fish identified by a unique PIT tag. Approximately 11 percent of all salmonids ascending the ladder in 2015 were returning to the ladder (Table 3-12). The 2015 results were similar for brown trout, rainbow trout, and westslope cutthroat trout (*see* Table 3-12). Although the total number of each fish species returning to the ladder varied, the percentage of returning fish, by species, was similar (12.0% for rainbow trout, 11.7% for brown trout, and 10.8% westslope cutthroat trout).

Table 3-12: Summary of the number of salmonids ascending the ladder in 2015 and the percentage of those salmonids that were returning to the ladder. Lake trout excluded from calculations because they are not tagged or released upstream.

Species	# of Fish at Ladder in 2015	# of Fish Return to Ladder in 2015	% of 2015 Fish that were Returning to Ladder
BULL	2	-	-
EB	2	-	-
LL	184	22	12.0%
RB	281	33	11.7%
RBxWCT	4	3	75%
WCT	37	4	10.8%
MWF	54	-	-
Total Salmonids	**564**	**62**	**11.0%**

The returning fish identified in Tables 3-11 and 3-12 include "fallback" fish (more details on fallback fish in Section 3.10). Of the returning salmonids identified, five rainbow trout and two brown trout were classified as fallback. Four rainbow trout were only recorded at the ladder in 2015, making two trips each in the same year, while the fifth rainbow trout ascended the ladder in 2013 before making two trips to the ladder in 2015. For brown trout, two fish were fallbacks in 2015 with one having also ascended the ladder previously in 2013 and 2014, and the other only having ascended the ladder in 2015.

3.9.2 Fish Tagged Below the Dam

In 2011, 2012, and 2014, 604 fish (585 PIT-tagged, 19 Floy-tagged) representing 12 species and one hybrid were uniquely PIT or Floy-tagged during spring electrofishing efforts downstream of Thompson Falls Dam. No tagging efforts below the dam were implemented in 2013 or 2015. Details of the tagged fish and species are provided in last year's annual report (*refer to Table 3-14 in* NorthWestern, 2015).

Although no new fish were tagged downstream of the Thompson Falls Dam in 2015, there were four fish recorded at the fish ladder in 2015 that were initially tagged via electrofishing below the dam in previous years. These fish included two brown trout initially captured and tagged in spring 2012 and subsequently both fish were recorded at the ladder in 2013 and in 2015. There were also two rainbow trout that had been initially captured and tagged in April 2014 that were both recorded at the ladder in 2015. One of the rainbow trout was also detected via the remote PIT tag array in the mainstem of the Thompson River in July 2015.

3.9.3 Frequency of Ladder Visits

The frequency of ladder visits is often described as when a fish returns to the ladder or how many times a fish ascends the ladder over time. For this report, terms such as fish "returning" to the ladder and fish "ascending" the ladder assume a fish was handled at the work station, entered into the database, and released upstream (with the exception of lake trout and walleye). Unless

noted otherwise, returning fish or fish ascending the ladder assume a fish reached Pool 45, was processed at the work station and released upstream.

In last year's annual report (*refer to Section 3.2.8 in* NorthWestern, 2015), the timing of salmonids returning to the ladder was evaluated. Annual, biennial, and triennial movements to the ladder were noted. While some fish illustrated an annual movement pattern to the ladder, other fish movements to the ladder appeared more random or less predictable.

In 2015, the same type of variability in movement patterns to the ladder and timing of fish returning to the ladder was observed. Some fish returned to the ladder almost to the exact date, week, or month, while other fish movement patterns appeared less predictable. The less predictable movements observed include some salmonids entering the ladder at various times each year, or fish ascending the ladder every other year (e.g., 1 brown trout ascending in June 2013 and returning in September 2015), or fish ascending once in 2011 and a second time in 2015 (i.e., 1 rainbow trout; 1 brown trout), or fish ascending the ladder once and remaining upstream (e.g., 1 rainbow recorded at the ladder in 2012 and detected in the Thompson River in the autumn of 2014 and 2015). Between 2011 and 2015, 187 individual fish have been documented returning to the ladder one or more times. A summary of the number of times an individual fish has returned to the ladder (including fallback) since 2011 is provided in Table 3-13.

Table 3-13: Frequency of individual fish, by species, recorded at the ladder since 2011.

	# of Times an Individual Fish was Documented Ascending the Ladder			
Species	**Twice**	**Three Times**	**Four Times**	**Total #**
BULL	1			1
LL	34	3	1	38
RB	90	13	3	106
RBxWCT	5			5
WCT	6	1		7
MWF	1			1
SMB	28	1		29
Total	**165**	**18**	**4**	**187**

Between 2011 and 2015, 187 individual fish returned to the ladder, including one bull trout, one mountain whitefish, five rainbow trout x westslope cutthroat trout hybrids, seven westslope cutthroat trout, 29 smallmouth bass, 38 brown trout, and 106 rainbow trout. Of these fish the majority (88%) were only documented at the ladder twice (not necessarily in consecutive years), while 10 percent were documented at the ladder three times, and 2 percent were documented at the ladder four times (Table 3-13). Although no fish has been documented at the ladder in every

year of operation, two fish returning to the ladder in 2015 for the second time were initially tagged at the ladder in 2011 (1 brown trout and 1 rainbow trout).

Based on the total number of salmonids individually tagged at the ladder between 2011 and 2015 (1,557 fish), approximately 158 individuals have been recorded returning to the ladder one or more times (Table 3-13). These 158 returning fish represent approximately 10 percent of the salmonids tagged at the ladder (11% of tagged bull trout; 10% of tagged brown trout; 12% of tagged rainbow trout; 5% of rainbow x westslope cutthroat trout hybrid; 11% westslope cutthroat trout; 1% mountain whitefish). Approximately 3 percent of the 1,107 smallmouth bass individually Floy-tagged at the ladder since 2011 were documented returning to the ladder and these fish have all returned the same year in which the individual was tagged.

3.9.4 Fish Entering the Ladder and Not Recorded at the Work Station

Since 2011, 11 individual bull trout have been recorded ascending the ladder and released upstream. In 2015, two untagged bull trout were recorded at the ladder and released upstream while five other individually tagged bull trout were detected via the remote array entering the ladder (Pool 7/8), but were never recorded in the upper pool (Pool 45) or at the work station. Of the five tagged bull trout one bull trout was initially tagged at the ladder in May 2013, while the other four bull trout were initially tagged by Avista downstream of Thompson Falls Dam between 2008 and 2015. Details of the Avista tagged fish are provided in Section 4.0 (*see* Table 4-2).

After observing five individual bull trout enter the ladder in 2015 but not detected ascending to the holding pool, questions as to why these fish were entering the ladder but not ascending to the holding pool arose. Although a definitive answer as to why these bull trout did not ascend the ladder is unknown, data collected via the remote antennas in the lower and upper pools were evaluated to determine whether this was a trend or occurrence among other salmonid species. The salmonids evaluated included bull trout, brown trout, mountain whitefish, rainbow trout, rainbow x westslope cutthroat trout, and westslope cutthroat trout. The following text evaluates PIT tag data collected via the remote arrays in the entrance, also referred to as the lower pools (Pool 7/8), and the holding pool, also referred to as the upper pool (Pool 45), in the ladder between 2011 and 2015 to examine fish movements in the ladder. Details about the remote arrays are discussed in Section 3.7 of this report.

Between 2011 and 2015, a total of 213 tagged salmonids were detected via the remote array entering the ladder. Over half of the salmonids recorded entering the ladder were rainbow trout (n=125), followed by brown trout (n=59), westslope cutthroat trout (n=12), bull trout (n=7), rainbow x westslope cutthroat trout hybrids (n=6), and mountain whitefish (n=4). The majority of the fish detected entering the ladder were also recorded by the remote array in the upper pool and recorded at the work station prior to release upstream. Approximately 23 percent of the salmonids detected entering the ladder were not recorded entering the upper pool (or at the work station). The proportion of fish detected entering the ladder and not recorded in the upper pool or

at the work station between 2011 and 2015 varied by species. A summary of the number of individually PIT-tagged salmonids detected entering the ladder between 2011 and 2015 and the number of those fish not recorded in the upper pool or the work station is provided in Table 3-14.

Table 3-14: Summary of individual PIT-tagged salmonids detected in the ladder between 2011 and 2015 via the remote PIT tag arrays.

2011-2015 Fish	# of Individual Fish Detected Entering the Ladder	# of Individual Fish Not Recorded in the Upper Pool or at the Work Station
BULL	7	5
LL	59	14
MWF	4	3
RB	125	23
RBxWCT	6	2
WCT	12	2
Total	**213**	**49**

Annual detections of individual tagged salmonids entering the ladder has steadily increased from 25 fish in 2011, to 27 fish in 2012, to 45 fish in 2013, to 47 fish in 2014, and to 72 fish in 2015.The percentage of PIT-tagged salmonids entering the ladder and not ascending into the upper pool has varied annually from 50 percent in 2011, 23 percent in 2012, 7 percent in 2013, and 24 percent in 2014 and 2015.

In summary, the remote PIT tag arrays documented fish representing all five salmonid species and one salmonid hybrid recorded at the ladder since 2011 entering the ladder but not ascending in the upper pool between 2011 and 2015 (*see* Table 3-14). The proportion of individual fish detected in the lower pool(s) but not the upper pool has varied by species and year. Fish not detected in the upper pool (or at the work station) represented individuals that were either returning to the ladder from a previous year(s) or represented fish that were tagged downstream of the Thompson Falls Dam and were venturing into the ladder for the first time. The reason(s) for these fish not ascending the ladder is unknown but likely variable and influenced by a combination of factors such as, but not limited to species-specific behavior, physical river conditions (i.e., streamflow, water temperature, clarity, etc.), ladder operations, genetic assignment, and biological conditions (i.e., life history, foraging, migrating, etc.).

3.9.5 Angler Reports of Ladder Fish

During the 2015 season, smallmouth bass larger than 175 mm were inserted with a unique Floy tag at the ladder. Smallmouth bass were the only species receiving a Floy tag at the ladder in 2015. In 2015, 974 smallmouth bass were uniquely tagged out of the 1,244 smallmouth recorded at the ladder.

Anglers reported catching 10 smallmouth bass with a Floy tag identification number. All 10 fish were tagged at the ladder and released upstream in 2015. Two of the smallmouth bass were captured by anglers below Thompson Falls Dam near the high bridge while the other eight fish were all captured upstream of the dam (1 upstream of Thompson Falls Dam; 3 near Steamboat Island; 2 near Paradise; 1 near the confluence of the Thompson River with the Clark Fork River; 1 downstream of Kerr Dam). Smallmouth bass caught by anglers downstream of Thompson Falls Dam are included in the total number of fallback fish identified in Table 3-15, while the fish caught by anglers upstream of Thompson Falls Dam are included in Table 3-16 in Section 3.11.1.

3.10 Fallback

Fallback is defined as a fish that ascends the ladder, receives a PIT, Floy, or other unique identification tag, is released upstream, and then is later recaptured either below the Thompson Falls Dam or at the ladder again that same year. The objective of evaluating "fallback" is to assess whether these fish are moving through the turbines or over the spillway and if there are operational modifications that could improve fish movement upstream after released into the Thompson Falls Reservoir.

The combined capacity of the generating units at the Project is approximately 23,000 cfs. When river inflows exceed this capacity or there is a generating load rejection, spill is initiated at the Main Dam spillway. Therefore, when streamflows are less than 23,000 cfs, it is assumed that all downstream fish passage is through the turbines. When streamflows are above 23,000 cfs, fish can pass downstream through the turbines or over the spillway.

Between 2011 and 2015, 60 individual fish (34 salmonids; 26 non-salmonids) were identified as "fallback" (Table 3-16). These fallback fish include 26 smallmouth bass, 26 rainbow trout, four brown trout, two westslope cutthroat trout, one rainbow trout x westslope cutthroat trout hybrid, and one bull trout. The majority of the fish (n=53) returned to the ladder in the same year, while seven of the fish were detected downstream of Thompson Falls Dam.

The seven fallback fish detected downstream of Thompson Falls Dam included three rainbow trout, two smallmouth bass, one bull trout, and one westslope cutthroat trout. In 2011, two rainbow trout and one westslope cutthroat trout recorded at the ladder in April and May and were later detected downstream in Graves Creek in May and June of the same year via Avista's remote PIT tag array. In 2012 one rainbow trout recorded at the ladder in April was later detected via the remote PIT tag array entering the ladder in July of the same year, but never ascended to the top. In 2014 one bull trout was recorded at the ladder in May and was later recaptured in the Noxon Reservoir in October during FWP's annual gillnetting survey. Lastly, in 2015 two smallmouth bass recorded at the ladder in July were caught by anglers downstream of the Thompson Falls Dam in August and September.

The number of fish individually tagged (PIT or Floy tag) each year has varied between 286 and 1,457 fish. The corresponding percentage of the tagged fish identified as fallback in any given year has varied between 0.7 percent and 4.8 percent (Table 3-16). The percentage of fallback fish is calculated by taking the number of fallback fish recorded in a given year divided by the total number of individually tagged (PIT and Floy) fish in the same year.

Between 2011 and 2015, the number of salmonids identified as fallback annually has varied between 2 and 13 individual fish with the majority represented by rainbow trout. As for non-salmonids, only a fraction of non-salmonids recorded at the ladder have been uniquely tagged since 2011 (*see* Table 3-11), thus the frequency of fallbacks for non-salmonids is less well documented. In 2015, a concerted effort was made to Floy tag smallmouth bass at the ladder, resulting in 974 fish Floy-tagged. Of the 974 Floy-tagged smallmouth recorded at the ladder, 22 fish (2.3% of tagged smallmouth bass) were identified as fallback.

A summary of fallback fish between 2011 and 2015 is provided in Table 3-15. Details of individual fish categorized as fallback between 2011 and 2014 are provided in the 2014 annual report (NorthWestern, 2015).

Table 3-15: Summary of the number of "fallback" by fish in 2011-2015 either detected at the ladder or downstream of the Thompson Falls Dam.

Fish Species	Tagged in 2011 - Fallback in 2011	Tagged in 2012 - Fallback in 2012	Tagged in 2013 - Fallback in 2013	Tagged in 2014 - Fallback in 2014	Tagged in 2015 - Fallback in 2015
BULL	-	-	-	1	-
RB	11	2	3	5	5
RBxWCT	-	-	1	-	-
WCT	2	-	-		-
LL	-	-	-	2	2
MWF	-	-	-	-	-
LN SU	-	-	-	-	-
LS SU	-	-	-	-	-
N PMN	-	-	-	-	-
SMB – Floy Tag	-	-	-	1	22
SMB – Lower Caudal (LC) Punch	-	-	-	3	-
Total Number of Fallback	**13**	**2**	**4**	**12**	**29**
Total Number of SMB LC Punch in 2014 (% fallback)	-	-	-	471 (0.6%)	-
Total PIT/Floy-tagged Each Year	299	286	351	281	1,457
Percentage of Fish PIT/Floy-tagged Annually at the Ladder	**4.8%**	**0.7%**	**1.1%**	**4.3%**	**2.0%**

3.11 Upstream Fish Movement of the Ladder

Since 2011, approximately 10 percent of the fish released upstream of the dam were uniquely tagged at the ladder (1,566 PIT tags, 1,208 Floy tags).

Some of the fish tagged from the ladder have been detected upstream during baseline fish surveys, by anglers, and via a remote PIT tag array in the Thompson River. Details of these upstream movements and detections in the Clark Fork River and Thompson River drainage are described in the following subsections.

3.11.1 Clark Fork River

Between 2011 and 2015 detections of the PIT/Floy-tagged fish upstream of the Thompson Falls Dam in the Clark Fork River occurs through the baseline fisheries studies (*see* Section 2.0 of this report) that extend from the Thompson Falls Reservoir upstream to the town of Paradise, or via reports by other entities (e.g., CSKT, FWP, anglers) from studies completed upstream of the Project area.

Between 2011 and 2015, 15 fish including four rainbow trout, two brown trout, and nine smallmouth bass have been documented upstream of the Thompson Falls Dam and in the Clark Fork River (Table 3-16). Since 2011, two smallmouth bass have been recorded upstream near Kerr Dam, which is approximately 100 miles upstream from Thompson Falls Dam. The majority of the upstream sightings of smallmouth bass have been provided by anglers. Details of these fish are summarized in Table 3-16, including the species and tag identification, the date the fish ascended the ladder, the date it was recorded upstream, and the upstream location.

Table 3-16: Summary of 15 individual fish identified upstream of Thompson Falls Dam in the Clark Fork River between 2011 and 2015, listed in chronological order.

Species	PIT/FLOY Tag ID	Date Ascended Ladder	Date Located Upstream	Upstream Location
LL	985121021902518	14-Apr-11	12-Oct-12	Thompson Falls Reservoir (gillnet)
RB	985121021876549	11-Sep-11	12-Oct-12	Thompson Falls Reservoir (gillnet)
SMB	Y-16055	14-Jul-12	27-Sep-12	Lower Flathead River (near Buffalo Rapids Bridge)
RB	985121027357883	26-Aug-12	30-Oct-12	Clark Fork River (Plains-Paradise)
RB	985121010687782	16-Oct-14	21-Oct-14	Clark Fork River (Plains-Paradise)
SMB	Y-1262	9-Jun-15	12-Sep-15	Steamboat Island (angler)
SMB	Y-1267	10-Jun-15	12-Jul-15	Near the town of Paradise (angler)
SMB	Y-16575	29-Jun-15	10-Sep-15	Steamboat Island (angler)
SMB	Y-0787	8-Jul-15	28-Aug-15	Steamboat Island (angler)

Species	PIT/FLOY Tag ID	Date Ascended Ladder	Date Located Upstream	Upstream Location
SMB	Y-1541	13-Jul-15	7-Sep-15	Near the town of Paradise (angler)
SMB	Y-1522	13-Jul-15	12-Sep-15	Above TFalls Dam (angler)
SMB	Y-0389	16-Jul-15	23-Aug-15	Lower Flathead River (0.5 km downstream of Kerr Dam) (angler)
SMB	Y-0954	28-Jul-15	15-Aug-15	Below confluence with the Thompson River (angler)
RB	982000363519416	18-Sep-15	19-Oct-15	Above Islands (electrofishing)
LL	982000363519355	16-Oct-15	19-Oct-15	Above Islands (electrofishing)

3.11.2 Thompson River Drainage

In late September 2014, a remote PIT tag antenna array was installed in the mainstem of the Thompson River. Although the array cannot detect directionality of fish, the entry of fish into the drainage can be assumed by cross-referencing the release date upstream of the ladder and the first detection recorded in the Thompson River. Between September 26 and December 22, 2014, 43 fish (27 brown trout, 15 rainbow trout, and one westslope cutthroat trout) previously recorded at the Thompson Falls fish ladder between 2011 and 2014 were detected in the Thompson River. The detection system was closed for the winter (December 22, 2014) and resumed operation in February 2015. Details regarding the fish detected in 2014 were presented in the 2014 annual report (NorthWestern, 2015). For this report, data collected in 2015 (February through December) are summarized in this section. FWP continues to collect data from the remote array in the Thompson River, and these data will be summarized in next year's annual report.

Between 2011 and 2015, 298 fish (43 fish in 2014 and 255 fish in 2015) released upstream of the Thompson Falls fish ladder were detected the Thompson River via the remote PIT tag array between September 26, 2014 and December 31, 2015 (Table 3-17). A fish detection represents the first record of an individual fish in the Thompson River and is assumed to indicate entry into the Thompson River drainage. The tagged fish detected in the Thompson River represent six species and one salmonid hybrid, including brook trout, brown trout, rainbow trout, rainbow trout x westslope cutthroat trout, westslope cutthroat trout, mountain whitefish, and largescale sucker. Only fish that were recorded at the Thompson Falls fish ladder and released upstream between 2011 and 2015 are referenced in this report. Other tagged fish in the system (e.g., initially tagged in the Thompson River drainage, below Cabinet Gorge Dam, and transported to Region 4, etc.) that were detected by the remote array are not discussed in this report.

Table 3-17: Summary of the 298 fish (43 fish in 2014 and 255 fish in 2015) detected in the Thompson River in 2014 and 2015, including the year the fish were last recorded at the Thompson Falls fish ladder, and the year the fish were first detected in the Thompson River (2014 or 2015).

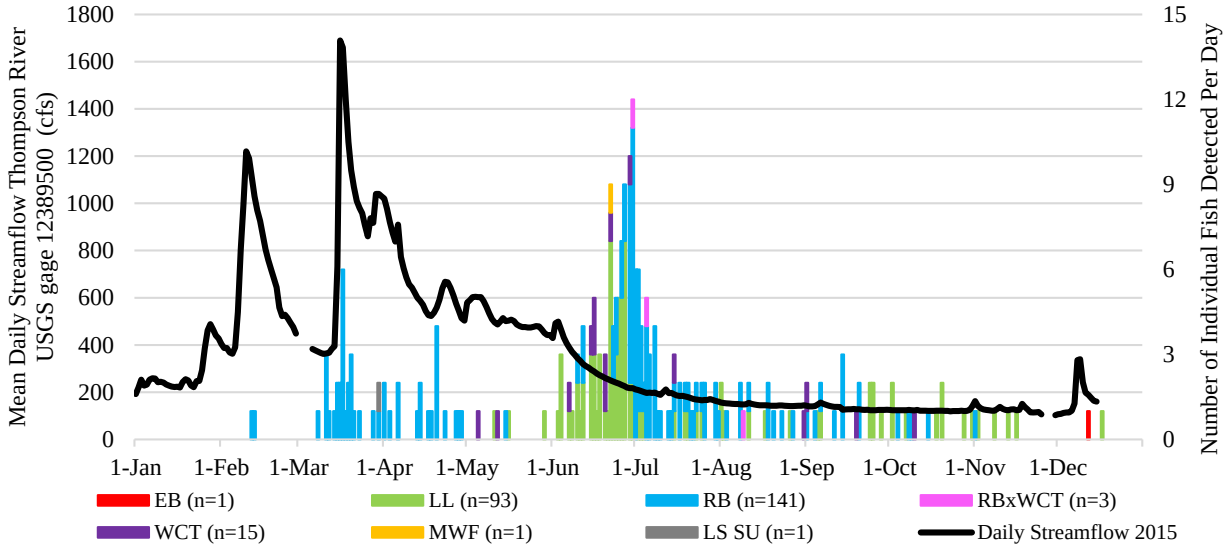
Year Fish Last Recorded at the Ladder	Thompson River	
	Detected in 2014	Detected in 2015
2011	0	1
2012	2	9
2013	2	14
2014	39	38
2015	-	192
Total	**43**	**254***

*Plus one LS SU detected in the Thompson River with an unknown year of passage at the fish ladder

3.11.2.1 Timing of the Ladder Fish Entering the Thompson River

The number of fish (by species) detected in the Thompson River per day and the mean daily streamflow in the Thompson River (USGS gage 12389500) in 2015 are depicted in Figure 3-18. Rainbow trout was the first species to be detected in the Thompson River in February, followed by one largescale sucker in March. The first tagged brown trout and westslope cutthroat trout were not detected in the Thompson River until May. The only mountain whitefish (released upstream of the fish ladder in October 2011) was detected in June and the only brook trout (released upstream of the ladder in October 2015) was detected in December. Approximately 37 percent of the 255 fish documented in the Thompson River in 2015 were detected in June, which coincided with higher than normal water temperatures in the Clark Fork River, approaching 25 ºC.

Figure 3-18: Summary of the first detections of individual fish (n=255), by species entering the Thompson River in 2015.



3.11.2.2 Travel Time between the Ladder and Thompson River

Four salmonids species and one salmonid hybrid represent the 192 fish released upstream of the ladder in 2015 and detected in the mainstem of the Thompson River in 2015. The species composition includes 91 rainbow trout, 87 brown trout, 11 westslope cutthroat trout, two rainbow trout x westslope cutthroat trout, and one brook trout. Travel time data for these fishes (estimated duration for a fish to move from the Thompson Falls Dam into the Thompson River) varied between a few hours to over 7 months (Table 3-18). Approximately 43 percent of the 192 fish (53 brown trout; 32 rainbow trout) traveled to the Thompson River in 1 day or less. Although the period of time for data collection in the Thompson River in 2014 was shorter than in 2015, similar results were observed with some fish taking hours and others taking months to reach the Thompson River from the fish ladder (NorthWestern, 2015).

Table 3-18: Summary of the approximate travel time for the 192 fish released upstream of the Thompson Falls fish ladder and detected in the Thompson River in 2015.

Species	# of Ladder Fish Released in 2015 and Detected in Thompson River 2015	Minimum Duration	Maximum Duration
EB	1	57 days	57 days
LL	87	Less than 1 day (5.5 hours)	178 days
RB	91	Less than 1 day (6.5 hours)	215 days
RBxWCT	2	25 days	85 days
WCT	11	1 day	76 days
Total	**192**	**Less than 1 day**	**215 days**

3.11.2.3 Percentage of Ladder Fish Detected in the Thompson River

In 2015, the remote array in the Thompson River collected data concurrent with the ladder's operational season and continued to collect data through the end of the calendar year. With these data, the percentage of fish PIT-tagged at the ladder in 2015 and the subsequent detection of the tagged fish in the Thompson River was evaluated. In 2015, 483 salmonids were PIT-tagged at the ladder (of the 558 salmonids released upstream of the dam). Of the 483 tagged fish, 158 individual fish (approximately one-third) were detected in the Thompson River. Details of the species and percentage of tagged salmonids at the ladder in 2015 detected in the Thompson River in 2015 is summarized in Table 3-19.

Table 3-19: Summary of the fish PIT-tagged at the Thompson Falls fish ladder in 2015 and detected via the remote array in the Thompson River in 2015.

Species	# PIT-tagged Fish at Ladder in 2015	# of 2015 Ladder Fish Detected in the Thompson River	% of 2015 Tagged Fish Detected in the Thompson River
BULL	2	*	*
EB	2	1	50%
LL	153	73	48%

Species	# PIT-tagged Fish at Ladder in 2015	# of 2015 Ladder Fish Detected in the Thompson River	% of 2015 Tagged Fish Detected in the Thompson River
RB	238	75	32%
RBxWCT	1	0	0%
WCT	33	9	27%
MWF	54	0	0%
Total	**483**	**158**	**33%**

*1 BULL recorded in the Thompson River via a FWP electrofishing survey, but not detected via remote array

As for bull trout, there were two bull trout tagged at the ladder in 2015, neither bull trout was detected via the remote array in the Thompson River in 2015. However, one of the bull trout (implanted with one HDX tag #982000363519407) recorded at the ladder on May 17 was later recaptured via electrofishing in the Big Hole section (upstream of the remote array) of the Thompson River on June 2. The other bull trout recorded at the ladder on June 3 (implanted with two HDX tags) was not detected upstream of the dam or upstream in the Thompson River in 2015.

3.11.2.4 Summary

As observed in 2014, the results from 2015 indicate some fish remain upstream of Thompson Falls Dam for multiple years following the release upstream of the fish ladder, while other individual fish repeat the cycle of ascending the fish ladder (annually or some other interval) before returning to the Thompson River.

No bull trout tagged at the ladder between 2011 and 2015 was detected via the remote array in the Thompson River. However, one bull trout recorded at the ladder in May 2015 was recaptured via electrofishing by FWP in the Thompson River upstream of the remote array in June 2015 and likely passed the remote array undetected. More details on bull trout in the Project area is summarized in Section 4.0.

3.12 Weir Modes: Notch vs. Orifice

During the annual TAC meeting held on December 5, 2012, the Licensee recommended and the TAC members (FWS, CSKT, and FWP) agreed that the ladder be set in orifice mode for the entire 2013 season. For the 2013, 2014, and 2015 seasons, the ladder has operated entirely in the orifice mode. NorthWestern proposes to alternate weir mode (orifice and v-notch) in 2016 when water temperatures are equal to and exceed 19 ºC for up to 4 weeks to evaluate whether weir mode influences smallmouth bass movement up the ladder. These results will be summarized in next year's annual report.

3.13 Attractant Flow

The auxiliary water system (AWS) routes water from the forebay to augment the ladder pool-to-pool flow and provides the majority of flow at the ladder entrance and into the tailrace to attract fish. The AWS system can add up to about 63 cfs (60 cfs through the stilling basin flows and 3 cfs through the holding pool) of additional water to the ladder to attract fish into the ladder entrance. The total discharge from Pool 1 of the ladder can be about 69 cfs.

Additionally, another 20 cfs can be discharged directly into the tailrace in the form of a high-velocity jet (also referred to as the HVJ or attractant flow). Its purpose is to improve fish attraction to the ladder, as needed. The HVJ is designed to discharge 20 cfs through control valve CV-1. The jet discharges through a 14-inch-diameter orifice, which produces a discharge jet velocity of approximately 19 feet per second into the tailrace. The HVJ is designed to operate during spill (occurs when streamflow exceeds 23,000 cfs), but can also be operated during non-spill periods. Other attraction alternatives during non-spill include partially opening an adjacent spillway lift gate near to the ladder entrance.

Observations of tailrace conditions downstream of the Thompson Falls Dam indicate that, during non-spill periods, additional flow is needed to allow fish to migrate upstream through the natural falls that are present downstream of the Main Channel Dam (L. Mabbott, NorthWestern, personal communication, 2014). For this reason, both the AWS and the HVJ were operated throughout the non-spill season in 2015 (as has been implemented since 2012) to allow fish to reach the entrance to the ladder. In addition, starting in the autumn of 2014, half of one panel (panel #4 in the first bay), located closest to the fish ladder was modified to allow an estimated additional 100 cfs streamflow over the dam. The half panel remained opened during the 2015 ladder season and NorthWestern proposes to continue having the half panel open during the 2016 season. The half panel reduces the issue of macrophytes occluding the traveling screen. The traveling screen protects and prevents large debris from entering the work station, the AWS, and the HVJ. If the traveling screen is occluded by macrophytic vegetation, flows may be reduced or even prevented from reaching the work station, the AWS, and the HVJ. The additional 100 cfs flow over the dam also appears to augment the attractant flow at the entrance of the ladder. NorthWestern proposes to continue to operate the attractant flow system in this manner in 2016 to ensure that there is sufficient flow downstream of the Project to allow fish to successfully transit the falls.

4.0 Bull Trout in the Project Area

Bull trout sampling in the Thompson Falls Hydroelectric Project (Project) area includes the following locations where the Licensee has completed various fish data collection efforts since 2011: 1) the Thompson Falls upstream fish passage facility (ladder), 2) the Clark Fork River section periodically sampled immediately downstream of the Thompson Falls Dam, 3) the upper and lower sections of the Thompson Falls Reservoir surveyed annually each autumn, 4) the Clark Fork River above islands section (upstream of the confluence with the Thompson River) surveyed annually each spring, and 5) the Clark Fork River section between Paradise and Plains surveyed every other year in the autumn. Bull trout surveyed and/or sampled in the Thompson River, are related to FWP sampling efforts and are reported by FWP and not considered part of the Project area. Only fish initially tagged by NorthWestern in the Project area and recaptured or observed in the Thompson River are described in this section.

Between 2011 and 2015, 27 individual bull trout were sampled by the Licensee in the Project area with four to six individual fish sampled annually (Table 4-1). Over half of these bull trout were genetically assigned to the Fishtrap Creek tributary (Thompson River drainage). Of the 27 bull trout, one bull trout ascended the ladder twice and during the second ascent in 2012, the bull trout jumped out of a pool and died (Table 4-1). This mortality has been the only occurrence in the Project area and subsequently, a cover was placed over the holding pool and a screen was installed around railing above the holding pool to mitigate the potential for this to occur again.

Genetic samples of bull trout collected in association with the Project, were submitted to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis. A summary of the bull trout sampling location, length, weight, PIT tag identification, and genetic assignment (as available) is provided in Table 4-1.

4.1 Bull Trout Sampling in 2015

In 2015, the Licensee sampled four bull trout in the Project area (two at the Thompson Falls ladder, one via electrofishing in the upper section of the Thompson Falls Reservoir, and one via electrofishing above the islands in the Clark Fork River). All four bull trout were released live. Details of each of the bull trout sampled by the Licensee in 2015 are provided in Table 4-1.

Two of the four bull trout sampled by the Licensee had more than one sighting in 2015. One bull trout, recorded on May 17 at the Thompson Falls fish ladder, was released upstream of the dam and then recaptured via electrofishing in the Big Hole section of the Thompson River by FWP on June 2, 2015 (also released alive). On April 14, 2015, Avista captured a bull trout below Cabinet Gorge Dam and transported the bull trout upstream to Region 4 where it was released in the Clark Fork River approximately 1 km downstream of the confluence with the Thompson River. This bull trout was later recaptured by NorthWestern and FWP during the annual autumn electrofishing survey in the Clark Fork River above the islands on October 20, 2015.

Table 4-1: Summary of bull trout genetics from the 27 individual bull trout sampled in the Project area between 2011 and 2015.

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
2011							
4/13/2011	365	364	985121023302169	TFalls Ladder	West Fork Thompson River (R4)	Upper Rock Creek (R4)	1,770
4/26/2011 5/21/2012	547 563	1438 1404	985121023464730	TFalls Ladder	Fishtrap Creek (R4)	Monture Creek (R4)	500,000
5/31/2011	482	966	985121021877906	Spring EF Below TFalls Dam	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
5/31/2011	180	50	985121021907887	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	11,040,300
5/31/2011	247	130	985121021914545	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Cooper Gulch (R3)	10,424,600
2012							
4/10/2012	272	150	985121027393272	Spring EF Below TFalls Dam	Graves Creek (R3)	Rock Creek (R2)	10,698,400
4/16/2012	222	76	985121027360192	Spring EF Lower Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	1,000,000
4/17/2012	260	140	985121027402995	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	17,920,300
5/15/2012	510	1172	985121021877906/ 982000357016269	TFalls Ladder	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
10/30/2012	472	800	982000357016135	Autumn EF Paradise – Plains	Monture Creek (R4)	Fish Creek (R4)	1.07
10/30/2012	444	678	982000357016066	Autumn EF Paradise – Plains	Fish Creek (R4)	Cooper Gulch (R3)	21.35
2013							
4/10/2013	260	108	982000357016097	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	200,000
4/30/2013	598	2306	982000357016065	TFalls Ladder	Fish Creek (R4)	Cooper Gulch (R3)	6.87

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
5/6/2013	576	1694	982000357016109	TFalls Ladder	Fishtrap Creek (R4)	EF Bull River (R2)	500,000
5/7/2013	478	978	982000357016155	TFalls Ladder	Fishtrap Creek (R4)	EF Bull River (R2)	3,000,000
6/7/2013	596	1926	HDX PIT tag not recorded	TFalls Ladder	Fishtrap Creek (R4)	Rock Creek (R2)	147,622,000
8/9/2013	482	1058	982000357016151	TFalls Ladder	Fishtrap Creek (R4)	Cooper Gulch (R3)	46,247,900
2014							
4/7/2014	520	1500	No PIT Tag (no genetics)	Spring EF Below TFalls Dam	NA	NA	NA
4/15/2014	577	1446	900226000035846	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Monture Creek (R4)	2,000,000
5/16/2014	523	1264	982000357016169	TFalls Ladder	Fish Creek (R4)	Rattlesnake Creek (R4)	343.3
5/28/2014	567	1640	985121021203256/ 982000357016106	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	200,000
6/3/2014	509	1224	982000357016241	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	26,000
10/28/2014	315	260	982000357016111	Autumn EF Paradise – Plains	NF Jocko (R4)	SF Jocko (R4)	6,000,000
2015							
4/13/2015	219	88	989001004067249 (118-093)	Spring EF Upper Section – TFalls Reservoir	Results Pending		
5/17/2015	519	1334	982000363519407 (118-081)	TFalls Ladder	Results Pending		
6/3/2015	520	1112	982000357016242 982000357016210 (118-050)	TFalls Ladder	Results Pending		
10/20/2015	651	1966	900226000730577	CFR – Above Islands	Fishtrap Ck (R4)	EF Bull River (R2)	135.2

**Note: Meadow Creek is a tributary to the Bitterroot River

4.2 Bull Trout Detected at the Fish Ladder 2011-2015

Since ladder operations commenced in 2011, several bull trout have ascended the ladder while others have only been detected entering the ladder (also discussed in Section 3.9.4 in this report). Between 2011 and 2015, 12 bull trout have been recorded ascending the ladder (representing 11 individual fish). In 2015, the remote antenna arrays detected eight bull trout entering the ladder (representing five individual bull trout). Of the five individual bull trout entering the ladder in 2015, one had been previously recorded ascending the ladder in May 2013. Details of all five bull trout and their initial tagging locations are summarized in Table 4-2. Additionally, the two bull trout that ascended the ladder in 2015 did not receive a PIT tag until recorded at the work station and released upstream; thus these two bull trout were not recorded by the remote antennas in the ladder.

Table 4-2: Summary of five bull trout detected entering the Thompson Falls fish ladder via the remote antennas, including PIT identification, most likely population of origin, previous detection(s), measurements from most recent detection, and other detections in ladder (if any). Note: L = length; Wt = weight.

Detected in Ladder 2015	PIT TAG (Genetic Assignment)	Previous Detection(s)	Last Recorded L (mm)	Last Recorded Wt (g)	Other detections in ladder (2015)
3-May	900226000035613 (Thompson River)	8/28/2012 Prospect Creek Weir (Avista); 8/5 – 9/14/2013 detected sporadically on the lower Prospect Creek PIT tag array station (Avista)	585	1,585	5/8 & 5/16
5-May	982000357016109 (Fishtrap Creek)	TFalls Ladder 5/6/2013; 9/21/2014 Prospect Creek (Avista)	576	1,694	5/13
16-May	900226000116250 (Thompson River)	9/14/2013 Twin Creek ID weir, transport and released to WF Thompson River 9/18/2013 (Avista)	616	2,466	9/11
15-Jun	900226000730558 (Graves Creek R3)	4/30/2015 captured below CGD - released into Graves Creek on 5/6/2015 (Avista)	651	3,232	-

Detected in Ladder 2015	PIT TAG (Genetic Assignment)	Previous Detection(s)	Last Recorded L (mm)	Last Recorded Wt (g)	Other detections in ladder (2015)
18-Jun	985120019650279 / 900226000570831 (Rock Creek R2)	8/22/2008 captured as juvenile in Prospect Creek and transported downstream to Idaho (by Avista); 8/28/2013 captured below CGD, released in Prospect Creek by Avista; 9/13/2013 captured in Prospect Creek weir; 7/28/2014 captured below CGD and transported to Prospect Creek(	718	2,778	-

Between 2011 and 2015, 20 bull trout were recorded via the remote arrays in the ladder or at the work station after ascending the ladder. Each day a bull trout was recorded at the ladder, the water temperature measured in the ladder and the mean daily streamflow in the Clark Fork River (recorded at the USGS gage station near Plains) were collected. All of these data were compiled to evaluate the frequency of bull trout in the ladder at various temperatures and streamflows (Figures 4-1 and 4-2, respectively).

Figure 4-1: Frequency of bull trout (n=20) either recorded at the work station after ascending the ladder or detected via the remote antennas in the lower pools (entering the ladder) at various water temperatures between 2011 and 2015.

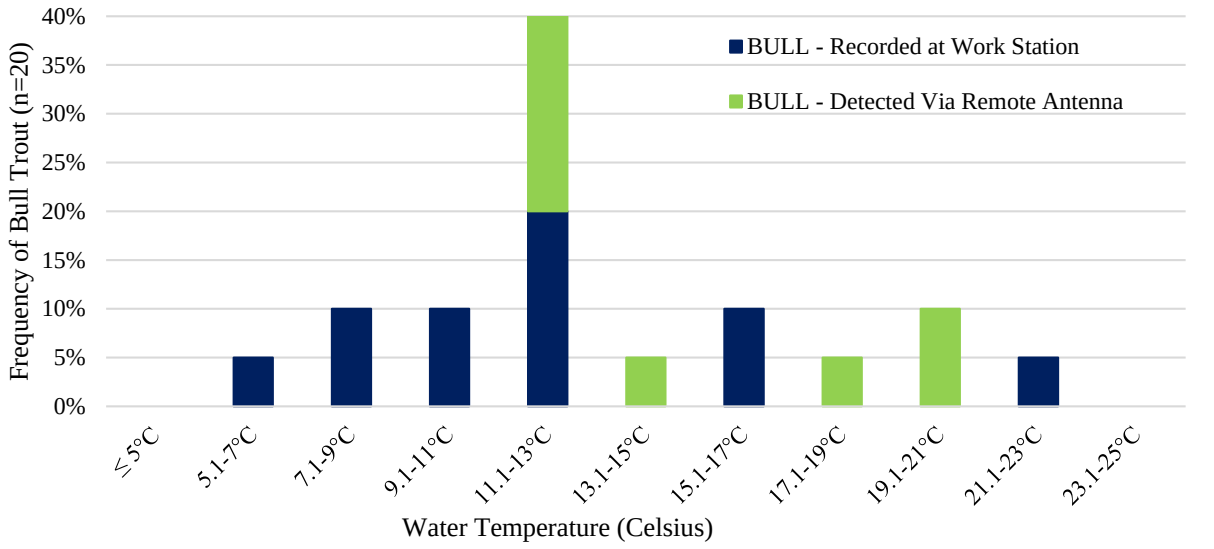
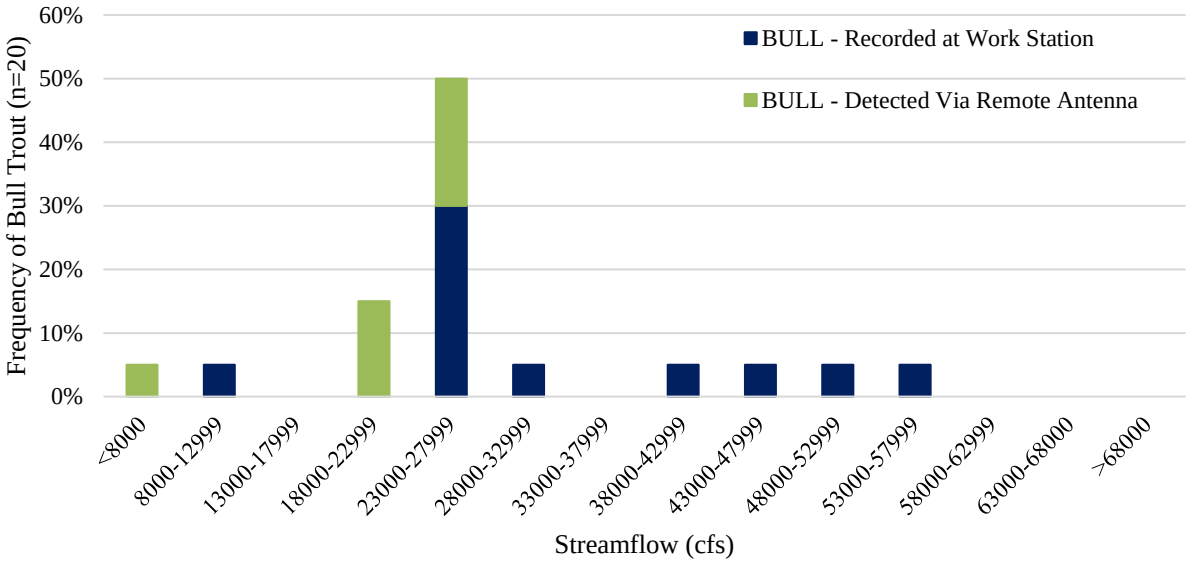


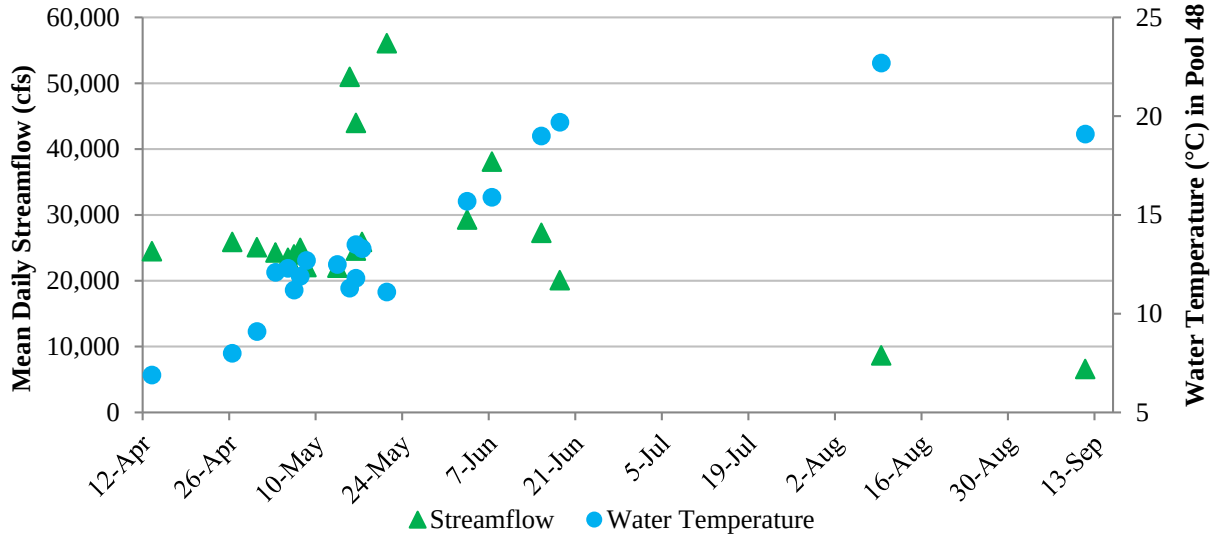
Figure 4-2: Frequency of bull trout (n=20) either recorded at the work station after ascending the ladder or detected via the remote antennas in the lower pools (entering the ladder) at various streamflows (cfs) between 2011 and 2015.



Bull trout were recorded in the ladder at various temperatures ranging between 6.9 ºC and 22.7 ºC, but the majority of bull trout (40%) were in the ladder when water temperatures were between 11.1 ºC and 13 ºC (Figure 4-1). Bull trout were also detected in the ladder at various streamflows ranging from approximately 6,600 cfs to 56,100 cfs since the ladder commenced operation in 2011. However, bull trout recorded at the Thompson Falls ladder were most common (65%) when streamflows ranged between 18,000 and 27,999 cfs (Figure 4-2).

The time of year bull trout either ascended the ladder or were detected entering the ladder between 2011 and 2015 is illustrated in Figure 4-3. The time of year bull trout were detected in the ladder (either in the lower pools or at the worker station) has also varied between April and September (Figure 4-3). The majority of bull trout appear to enter or ascend the ladder between April and June concurrent with the ascending limb of the hydrograph.

Figure 4-3: Summary of the time of year, including the mean daily streamflow (cfs) measured at the USGS station near Plains, Montana and water temperature (ºC) measured in Pool 48 when bull trout were either recorded at the work station after ascending the ladder (n=12) or detected (n=8) entering the ladder via the remote array between 2011 and 2015.



4.3 Bull Trout Length Frequency and Length-Weight Relationship

In past reports, fish metrics have included a summary of length and weight measurements as well as growth estimates. Fish growth reflected the change in size (mm or g) per year extrapolated by calculating the difference in size between an initial capture of a fish and subsequent capture of the same fish. However, the growth rate calculations were difficult to interpret with the high variability related to the small sample sizes with some fish increasing in size and others declining in size, likely related to factors such as, but not limited to potential weight loss due to spawning or mortality.

Due to the small sample size of recaptured bull trout in the Project area, other metrics instead of a growth rate were evaluated. A summary of length and weight of the two bull trout measured at the ladder in 2015 is provided in Table 3-6 in Section 3. For this section, an analysis of length frequency and length-weight relationship for bull trout sampled by the Licensee in the Project area between 2011 and 2015 was evaluated.

Between 2011 and 2015, the Licensee sampled 28 bull trout (representing 27 individuals, *refer to* Table 4-1) in the Project area, including seven bull trout captured via electrofishing immediately below Thompson Falls Dam, 12 bull trout recorded at the fish ladder, and nine bull trout recorded upstream of Thompson Falls Dam (four bull trout in the upper Reservoir section, one bull trout in the lower Reservoir section, one bull trout in the above islands section, and three bull trout in the Paradise to Plains section).

The frequency distribution for the total lengths (n=28) measured is presented in Figure 4-4. Bull trout sizes ranged between 180 mm and 651 mm in length with the majority of the bull trout measuring between 451 mm and 600 mm. The log length-weight relationship for the 28 bull trout sampled in the Project area between 2011 and 2015 is illustrated in Figure 4-5.

Figure 4-4. Frequency distribution of the total lengths (mm) measured for 28 bull trout sampled in the Thompson Falls Project area between 2011 and 2015.

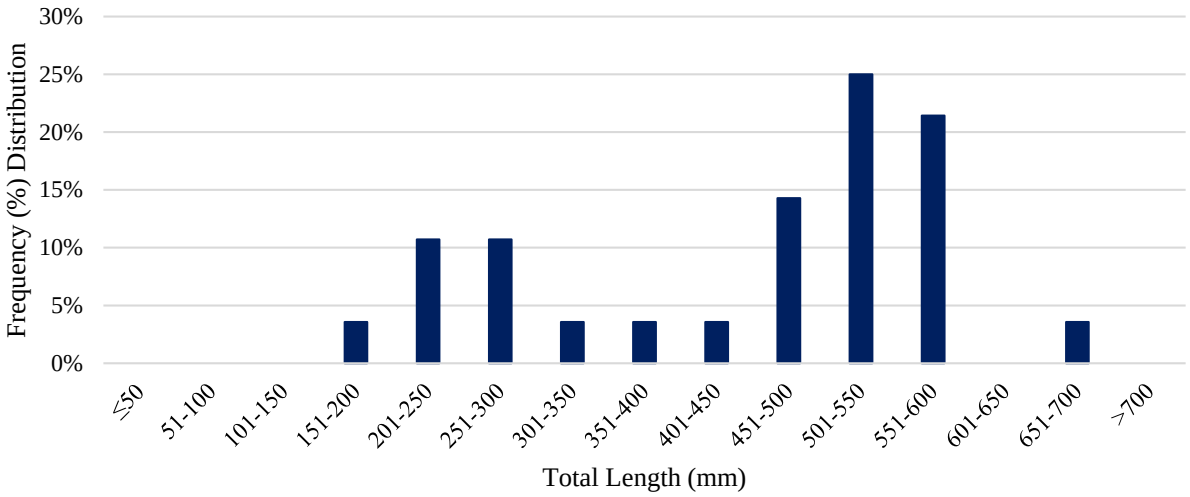
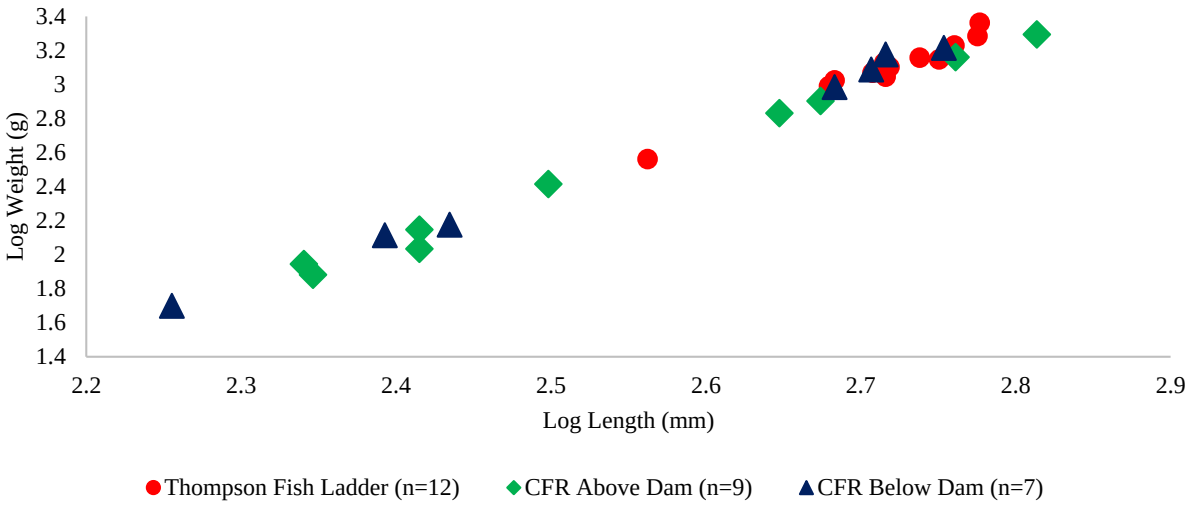


Figure 4-5. Log10 weight (g) vs. Log10 Length (mm) of bull trout data collected in the Project Area (n=28), including 12 bull trout at Thompson Falls fish ladder, nine bull trout in the Clark Fork River (CFR) upstream of Thompson Falls Dam, and seven bull trout in the CFR immediately downstream of Thompson Falls Dam between 2011 and 2015. Linear regression equation for all 28 samples: y = 3.1306x - 5.4192, r2 = 0.9906



5.0 Bull Trout Passage from Downstream Facilities

Avista continued their trap and haul upstream fish passage program in 2015. Bull trout captured downstream of Cabinet Gorge Hydroelectric Project were genetically tested using rapid response genetic identification methodology (DeHaan et al., in prep). The rapid response genetic testing provides population assignment within 24 hours after receipt of fish tissue samples. The analysis predicts, with varying degrees of confidence, the natal stream of origin of each bull trout. Bull trout are then either transported to their genetically assigned region of origin, or released downstream of Cabinet Gorge Hydroelectric Project. Bull trout with a genetic assignment upstream of the Thompson Falls Hydroelectric Project (Project) are referred to as "Region 4" fish.

A summary of the total number of bull trout captured annually since 2009 below Cabinet Gorge Dam, genetically assigned to Region 4, and transported to Region 4 (Thompson River drainage or other locations) is provided in Table 5-1. The number of individual bull trout recorded at the Thompson Falls Upstream Fish Passage Facility (ladder) between 2011 and 2015 is also provided in Table 5-1. Since 2009, Avista's bull trout transport program has moved 51 bull trout into the Thompson River drainage and 12 bull trout into other locations in Region 4.

Table 5-1. Summary of bull trout captured by Avista below Cabinet Gorge Dam, genetically assigned to Region 4 (R4), and transported to Region 4 (Thompson River drainage and other locations.

Year	# Below Cabinet Gorge Dam	# Genetically Assigned R4	# Transported to Thompson River Drainage	# Transported other R4 locations
2015	54	9	7	2
2014	75	12	10	2
2013	47	8	7	1
2012	40	8	8	-
2011	64	18	4	1*
2010	35	9	9	-
2009	47	12	6	6
Total	**362**	**76**	**51**	**12**

*11 bull trout assigned to Region 4 were transported to Region 3, released near Vermilion River

5.1 Avista's 2015 Upstream Fish Passage Program

In 2015, Avista captured 54 unique adult bull trout (≥ 350mm) downstream of Cabinet Gorge Hydroelectric Project. Of the 54 bull trout, there was one mortality, 14 fish were released downstream of Cabinet Gorge Dam, and 39 fish were transported and released upstream of Cabinet Gorge Dam in either Region 2 [Cabinet Gorge Reservoir (n=17)]; upstream to Region 3 [Noxon Reservoir (n=13)]; or upstream to Region 4 [upstream of Thompson Falls Dam (n=9)].

The nine bull trout transported upstream of the Thompson Falls Dam (Region 4) were genetically assigned to the Thompson River drainage (n=7), Fish Creek (n=1) and Little Joe Creek (n=1). Release locations were based on the genetic assignment. Of the seven bull trout assigned to the Thompson River, two bull trout were released approximately one kilometer downstream of the Thompson River confluence near the North Shore Boat Ramp (in the Clark Fork River) and five bull trout were released in the Thompson River approximately 1.6 kilometers upstream of the Clark Fork River confluence near the ACM Road Bridge. The release site in the Thompson River is upstream of the remote PIT tag array discussed earlier in Section 3.11.2.

A summary of the nine bull trout captured downstream of Cabinet Gorge Dam in 2015 by Avista that were assigned and transported to Region 4 as well as other bull trout captured, genetically assigned, and transported to Region 4 between 2009 and 2014 is provided in Table 5-2. A summary of Avista's Upstream Fish Passage Program from 2015 is available in Bernall and Duffy (in prep.).

Table 5-2: Summary of the bull trout captured below Cabinet Gorge Dam in 2015 as well as previous years (2009 through 2014) assigned to Region 4 and released in Region 4. Note: EF = electrofishing, LCFR = Lower Clark Fork River.

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
4/14/2015	LCFR-ID Night EF	900226000730577	653	3062	4/17/2015	1 km downstream of Thompson River confluence	Fishtrap Creek	East Fork Bull River	135.3
4/14/2015	LCFR-ID Night EF	900226000730599	558	2041	4/17/2015	1 km downstream of Thompson River confluence	Fishtrap Creek	Little Joe Creek	50,000
5/31/2015	LCFR-ID Night EF	900226000730509	604	2608	6/4/2015	Thompson River @ ACM road bridge 1 mile above mouth	West Fork Thompson River	Fishtrap Creek	239,783,000
6/11/2015	LCFR-ID Night EF	900226000592474	631	2863	6/17/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	Rock Creek	8,990
8/3/2015	LCFR-ID Night EF	900228000078399	557	1585	8/10/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	East Fork Bull River	658,402,000
8/6/2015	LCFR-ID Night EF	900226000570690	531	1446	8/10/2015	Thompson River @ ACM road bridge 1 mile above mouth	West Fork Thompson River	Upper Rock Creek	25.008
8/11/2015	LCFR-ID Night EF	982000357016301	616	2275	8/16/2015	St. Regis River (RM 0.25)	West Fork Fish Creek	Rattlesnake Creek	11.107
8/11/2015	LCFR-ID Night EF	982000357016316	637	2551	8/16/2015	St. Regis River (RM 0.25)	North Fork Little Joe Creek	Upper Rock Creek	1.131
8/27/2015	LCFR-ID Night EF	900228000078389	735	4082	8/31/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	Upper Rock Creek	16,708,300

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
4/20/2014	LCFR-ID Night EF	900226000501515	528	1304	4/23/2014	WF Thompson River	WF Thompson River	Cooper Gulch (R3)	1,060,820,000
4/22/2014	LCFR-ID Night EF	900226000113597	572	2126	4/25/2014	St. Regis	Little Joe Creek	MF East River (R1)	300,000
4/29/2014	LCFR-ID Night EF	900226000501522	525	1247	5/2/2014	WF Thompson River	WF Thompson River	Cooper Gulch (R3)	11,877,400,000
5/11/2104	LCFR-ID Night EF	900226000035849	718	3629	5/14/2014	Clark Fork River near Paradise	South Fork Jocko River	NF Jocko River (R4)	1.8
6/15/2014	LCFR-ID Night EF	900226000501561	540	1360	6/18/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	2,000,000
7/2/2014*	LCFR-ID Night EF	985121011605005/ 900226000501514	648	2523	7/3/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	248,402,000
7/13/2014	LCFR-ID Night EF	900226000592716	614	2211	7/16/2014	WF Thompson River	WF Thompson River	Fishtrap Creek (R4)	129,901,000,000
7/17/2014	LCFR-ID Night EF	900226000570596	532	1304	7/23/2014	WF Thompson River	WF Thompson River	Rock Creek (R2)	4,000,000
7/24/2014	LCFR-ID Night EF	900226000570799	566	1644	7/30/2014	Fishtrap Creek	Fishtrap Creek	WF Thompson River (R4)	6,393,510,000
9/6/2014	LCFR – ID Ladder	900226000570258	684	2721	9/10/2014	Fishtrap Creek	Fishtrap Creek	Upper Rock Creek (R4)	10,639,100
9/24/2014	LCFR – ID Ladder	900226000626007	614	2324	9/26/2014	Fishtrap Creek	Fishtrap Creek	Fish Creek (R4)	48,000

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
10/3/2014	LCFR – ID Twin Weir	900226000570921	570	1531	10/6/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	41,000
6/9/2013	LCFR-ID Night EF	900226000035846	567	2211	6/12/2013	Just downstream of confluence of Fishtrap Creek & Thompson River	Fishtrap Creek	Monture Creek	2,000,000
6/13/2013	LCFR-ID Night EF	900226000035886	607	2324	6/19/2013	Mouth of Fishtrap Creek	Fishtrap Creek	EF Bull River	29,000
6/19/2013	Hook-n-line sampling	900226000035877	606	2154.8	6/26/2013	Fishtrap Creek 100 m above mouth	Fishtrap Creek	EF Bull River	7,437,370,000
6/23/2013	LCFR-ID Night EF	900226000035863	651	2806	6/26/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Rattlesnake Creek	600,000
9/4/2013	LCFR-ID Ladder	900226000570790	554	1361	9/9/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Cooper Gulch	500 billion
9/14/2013	LCFR-ID Weir	900226000116250	616	2466	9/18/2013	~ 0.1 mile up WF Thompson River	WF Thompson River	Cooper Gulch	13,525,800,000
9/26/2013	LCFR-ID Ladder	900226000570690	475	851	9/30/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Upper Rock Creek	25.008
9/27/2013	LCFR-ID Twin Creek Ladder	985121001925944/ 900226000570887	744	4082	9/28/2013	In Fishtrap by campsite upstream from lower bridge	Fishtrap Creek	Rock Creek	254.1
4/26/2012	LCFR-ID Night EF	380180914261084	585	1928	5/2/2012	Fishtrap Creek	Fishtrap Creek	Cedar Creek	26,000
5/1/2012	LCFR-ID Night EF	900226000035832	616	2324	5/4/2012	Clark Fork River @ St. Regis boat ramp	Cedar Creek	North Fork Jocko River	18.7

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
5/13/2012	LCFR-ID Night EF	985121025905128, 900226000035851 (recap from 8/30/2011)	637	2154	5/14/2012	Fishtrap Creek	Fishtrap Creek	Vermilion River	2.5
5/13/2012	LCFR-ID Night EF	900226000035807	520	1190	5/17/2012	Fishtrap Creek	Fishtrap Creek	East Fork Bull River	16,000
5/13/2012	LCFR-ID Night EF	900226000035860	575	2211	5/17/2012	Fishtrap Creek	Fishtrap Creek	North Fork Jocko River	468.7
5/17/2012	LCFR-ID Night EF	985121021199577, 900226000035789 (recap from 4/29/2010)	620	2580	5/18/2012	Fishtrap Creek	Fishtrap Creek	East Fork Bull River	63,000
6/26/2012	LCFR-ID Night EF	900226000035803	815	6010	7/2/2012	Fishtrap Creek	Fishtrap Creek	Prospect Creek	2,830
6/28/2012	LCFR-ID Night EF	900226000035797	575	1870	7/5/2012	Thompson River below WF Thompson River	WF Thompson River	Upper Rock Creek	77,196,300
4/19/2011	LCFR-ID Night EF	985121021183536	586	2126	4/22/2011	Released upstream from Vermilion Bay (Region 3)	Meadow Creek	Fishtrap Creek	3.98
4/24/2011	LCFR-ID Night EF	985121021159735	627	2835	4/27/2011	Released upstream from Vermilion Bay (Region 3)	South Fork Jocko River	North Fork Jocko River	300,000
5/17/2011	LCFR-ID Night EF	985121021199621	530	1360	5/25/2011	Released upstream from Vermilion Bay (Region 3)	WF Thompson River	Upper Rock Creek	48,193,900
5/22/2011	LCFR-ID Night EF	985121021152977	710	3856	5/20/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	5.54

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
6/2/2011	LCFR-ID Night EF	985121021203256	500	1049	6/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	200,000
6/5/2011	LCFR-ID Night EF	985121001919071	585	1814	6/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	1,000,000
6/19/2011	LCFR-ID Night EF	985121021146823	570	1729	6/23/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	14,000
6/21/2011	LCFR-ID Night EF	985121021183908	701	3685	6/24/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	3,390
6/21/2011	LCFR-ID Night EF	985121021184737	462	907	6/24/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Cedar Creek	2.44
6/26/2011	LCFR-ID Night EF	985121021186461	470	907.3	6/29/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	4,250
7/3/2011	LCFR-ID Night EF	985120015892614	513	1191	7/5/2011	Bull River old bridge site downstream of EFBR (Region 2)	Upper Rock Creek	East Fork Bull river	1.09
7/5/2011	LCFR-ID Night EF	985121021157243	669	1948	7/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Prospect Creek	2.89
7/24/2011	LCFR-ID Night EF	985120029222140	496	1190	7/25/2011	Graves Creek just upstream of USFS bridge (Region 3)	Rattlesnake Creek	North Fork Jocko River	9.96
7/28/2011	LCFR-ID Night EF	985121021156804	516	1021	8/3/2011	One mile up Thompson River (Region 4)	Fishtrap Creek	Thompson River	55.196

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
8/30/2011	LCFR-ID Night EF	985121025905128	650	2892	9/2/2011	Fishtrap Creek, just up from mouth (Region 4)	Fishtrap Creek	Vermilion River	2.51
9/21/2011	Twin Creek Weir	985121001907073	613	2268	9/22/2011	Just upstream of the mouth of Thompson River (Region 4)	Fishtrap Creek	Grouse Creek	1,050
9/22/2011	Twin Creek Weir	985121025914593	592	1701	9/26/2011	Just upstream of the mouth of Thompson River (Region 4)	Fishtrap Creek	Rock Creek	10,000
9/22/2011	LCFR-ID Ladder	985121025758989	606	1871	9/26/2011	South Fork Jocko River, upstream of last diversion (Region 4)	South Fork Jocko River	Graves Creek	1.38
6/25/2010	LCFR-ID Night EF	985121021187084	535	1587	6/30/2010	Thompson River (Region 4)	Fishtrap Ck	Graves Creek	58.624
5/13/2010	LCFR-ID Night EF	985121016753895	621	2778	5/19/2010	Thompson River (Region 4)	Char Ck	Rattlesnake Creek	1.8
5/5/2010	LCFR-ID Hook-n-line sampling	985121016700474	534	1247	5/12/2010	Thompson River (Region 4)	Fishtrap Ck	Upper Rock Creek (R4)	2,640
5/16/2010	LCFR-ID Night EF	985121015963939	643	2665	5/19/2010	Thompson River (Region 4)	Fishtrap Ck	Copper Creek	2,000,000
4/29/2010	LCFR-ID Night EF	985121021199577	547	1389	5/5/2010	Thompson River (Region 4)	Fishtrap Ck	East Fork Bull River	63,000
7/6/2010	LCFR-ID Night EF	985121021185451	724	4366	7/13/2010	West Fork Thompson River (mouth)	Fishtrap Creek	Copper Creek	500,000

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
7/25/2010	LCFR-ID Night EF	985121001907073	598	2211.5	No Data	West Fork Thompson River (mouth)	Fishtrap Creek	Grouse Creek	1050
8/18/2010	LCFR-ID Night EF	985121021156358	535	1190	8/20/2010	Thompson River (ACM road bridge)	WF Thompson River	Rock Creek (R2)	57,173,700
8/31/2010	LCFR-ID Night EF	985121021141387	614	1842	9/3/2010	Thompson River (ACM road bridge)	WF Thompson River	Cooper Gulch	1,052,470,000
5/26/2009	LCFR-ID Night EF	985121001907962	516	1361	5/29/2009	Thompson River	Fishtrap Creek	Upper Rock Creek (R4)	3,000,000
6/7/2009	LCFR-ID Night EF	985121001829048	580	1616	6/10/2009	Paradise MT - LCFR	Monture Creek	Cedar Creek	7.93
6/11/2009	LCFR-ID Hook-n-line sampling	985120029215361	710	3686	6/15/2009	Thompson River	Fishtrap Creek	Copper Creek	18,731,200
6/11/2009	LCFR-ID Night EF	985121001869178	660	2722	6/15/2009	Thompson River	Fishtrap Creek	Upper Rock Creek (R4)	3,000,000
9/15/2009	LCFR-ID Fish Ladder	985121017314384	563	1815	9/18/2009	St. Regis	Cedar Creek	Morris Creek (R1)	1.14
9/21/2009	LCFR-ID Fish Ladder	985121015961762	600	1845	9/23/2009	St. Regis	Fish Creek	Rattlesnake Creek	2.21
9/21/2009	LCFR-ID Fish Ladder	985121017312262	610	2041	9/23/2009	St. Regis	Upper Rock Creek (R4)	Cedar Creek	22.95
9/21/2009	LCFR-ID Hook-n-line sampling	985121016754113	585	1701	9/23/2009	St. Regis	Rattlesnake Creek	Cedar Creek	1.83

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
9/22/2009	LCFR-ID Fish Ladder	985121015942027	646	2382	9/25/2009	Fishtrap Creek	Fishtrap Creek	Cooper Gulch	207,537,000
9/22/2009	LCFR-ID Hook-n-line sampling	985121015639163	490	964	9/25/2009	Fishtrap Creek	WF Thompson River	Cooper Gulch	2,000,000
9/23/2009	LCFR-ID Fish Ladder	985121001925944	592	2100	9/25/2009	Fishtrap Creek	Fishtrap Creek	Rock Creek (R2)	254.1
9/28/2009	LCFR-ID Fish Ladder	985121016755149	700	3289	9/30/2009	Clark Fork River ~ 400m below the mouth of St. Regis	Cedar Creek	Upper Rock Creek (R4)	1.3

***Initial capture in the West Fork Thompson River electrofishing on 7-28-2010 measuring 162 mm, 34 g (unpublished data, NorthWestern)**

6.0 Thompson Falls Reservoir Monitoring Plan

In 2010, the Licensee developed and submitted the *5-Year Reservoir Monitoring Plan, 2011-2015* (PPL Montana, 2010b) to the Commission in compliance with Term 5a of the FWS's BO TCs (*refer to* Section 9.5.1 for details). The Commission issued an Order on February 9, 2011 approving the 5-Year Reservoir Monitoring Plan, and the Licensee began implementation in 2011 and included annual progress updates in subsequent annual reports (PPL Montana 2012, 2013, 2014 and NorthWestern, 2015).

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile bull trout survivorship and evaluate the site specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS along with the proposed changes, were filed with the Commission on December 17, 2014. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement has been achieved through the annual reports since 2011. The development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" has been postponed until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of juvenile bull trout from the Thompson River.

The juvenile bull trout out-migration study was implemented by a Montana State University graduate student in 2014 and 2015. The results from 2014 are summarized in last year's annual report (NorthWestern Energy, 2015) and the results from 2015 are summarized in the following section. A detailed analysis of the results from the 2014 and 2015 field data collection are anticipated to be submitted to the TAC by December 31, 2016.

6.1 Juvenile Bull Trout Out-Migration Study

In 2015, the graduate student from Montana State University continued the multi-year study to evaluate the impact of Thompson Falls Reservoir on the out-migration habits of juvenile bull trout from the Thompson River. The primary objectives of the graduate project were aimed at assessing the outmigration characteristics and survival of subadult bull trout in the Thompson River Drainage and Thompson Falls Reservoir. Some of the key questions included:

- What time of year do subadult bull trout leave natal headwaters?
- How quickly do bull trout move through the Thompson River drainage?

- What is the estimated survival rate of subadult bull trout that transition into Thompson Falls Reservoir?

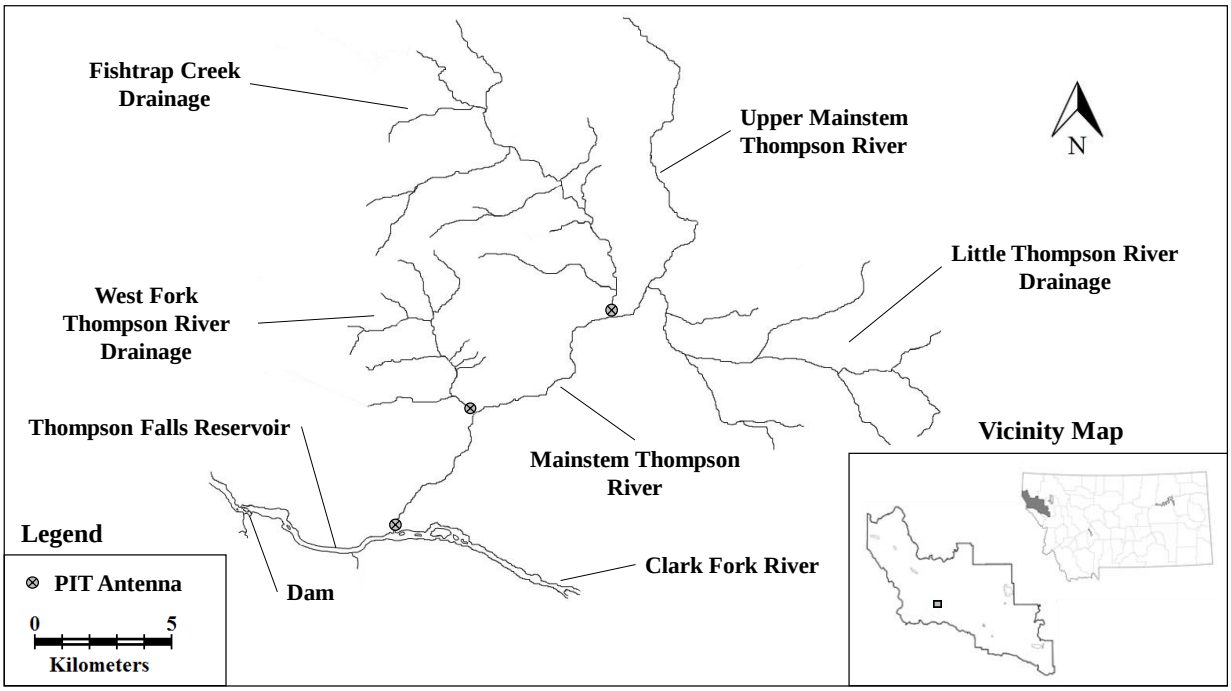
Results from 2014 (provided in NorthWestern Energy's 2014 Annual Report) indicated that, in addition to a broadened study area, a change in field methods was necessary to sample actively outmigrating subadult bull trout. As such, the 2015 study frame was expanded to incorporate the lower 7 km of the West Fork Thompson River as well as 14 km of Fishtrap Creek and its primary tributaries (West Fork Fishtrap Creek, Beatrice Creek, and Jungle Creek). Additionally, a summer electro-fishing sampling and an autumn weir trap operation were incorporated into the study.

In July and August of 2015, 36 sites were sampled by way of electrofishing within the Thompson River drainage tributaries. This sampling included 10 locations in the West Fork Thompson River and 26 locations in Fishtrap Creek and its tributaries. Cumulatively, 575 bull trout ≥ 100 mm were injected with a 12 mm FDX PIT tag: 151 in West Fork Thompson River; 140 in mainstem Fishtrap Creek; 138 in West Fork Fishtrap Creek; 107 in Beatrice Creek; and 39 in Jungle Creek.

In addition to the mainstem Thompson River PIT antenna array that was installed in 2014, two single-antenna PIT-tag readers were installed in July 2015 to assess the outmigration of PIT-tagged bull trout in the Thompson River drainage. One single-antenna PIT reader was installed in the West Fork Thompson River and one in Fishtrap Creek as the confluence with the mainstem Thompson River (Figure 6-1). Preliminary results from 2015 indicated that 59 of the 575 bull trout that were PIT-tagged in the summer tributary sampling outmigrated to the mainstem Thompson River: 9 from West Fork Thompson River and 50 from Fishtrap Creek. Detection efficiency testing was assessed in 2015 to be roughly 98 percent for each of the tributary PIT readers and 95 percent at the mainstem PIT antenna array. All PIT-tag antennas were operated continuously throughout the study period.

In order to capture actively outmigrating bull trout, directional weir traps were operated from late-September to early-November immediately downstream of the tributary PIT readers (Figure 6-1). All untagged bull trout ≥ 100 mm were injected with a 12 mm FDX PIT tag. A total of 43 weir-caught bull trout ≥ 180 mm (roughly ≥ 35 g) were surgically implanted with either a Lotek MAP-coded acoustic transmitter or a Lotek NTC 3-2 radio transmitter. Subsequently, 18 acoustic tags and 9 radio tags were implanted into bull trout outmigrating from Fishtrap Creek and 11 acoustic tags and 5 radio tags were implanted into bull trout outmigrating from the West Fork Thompson River. As of December 2015, there were two acoustically tagged bull trout (1 from West Fork Thompson River; 1 from Fishtrap Creek) and one radio-tagged bull trout (from West Fork Thompson River) that moved into Thompson Falls Reservoir. Of the 90 newly caught bull trout, 23 did not meet the size requirements for acoustic or radio tags and were detected moving into Thompson Falls Reservoir: 14 from West Fork Thompson River and nine from Fishtrap Creek.

Figure 6-1: Map of the Thompson River drainage (with major tributaries listed) and Thompson Falls Reservoir. Lamp symbols indicate locations of PIT tag antennas in Fishtrap Creek, West Fork Thompson River, and the Thompson River.



The use of radio-tags was added to the study because no acoustically tagged bull trout entered the Thompson Falls reservoir in 2014 and the tracking of acoustic tags in shallow river environments is rendered ineffective by entrained air, suspended sediment, and irregularly shaped substrate. Radio telemetered fish were relocated a minimum of three times per week throughout the autumn field season. Preliminary results from radio-telemetry indicated that outmigrating bull trout remain relatively stationary between incremental downstream movements. Interestingly, four out of 14 radio-tagged bull trout were killed in the mainstem Thompson River and only one outmigrated into Thompson Falls Reservoir during the course of the study. Mink predation was found to be the cause of three of these mortalities, with the fourth tag being weakly heard in the area near an active mink den but not located before its expiration. Confirmation of status (i.e. alive or dead) for the remaining nine bull trout was obtained at the end of the 2015 field season by intentionally disturbing all sedentary fish. Subsequently, all nine fish were discovered to be alive as of mid-December 2015.

Lastly, a mobile PIT-tag antenna (HPR Plus; BioMark) was used throughout the autumn to obtain redetections of PIT-tagged bull trout in the Thompson River tributaries. Between October and December 2015, 137 PIT tags were detected between October and December 2015. Information from these redetections will be used in a multi-state Barker model analysis to improve estimates of survival of juvenile and subadult bull trout in the Thompson River drainage.

7.0 Total Dissolved Gas Monitoring

In 2010, the *Total Dissolved Gas Control Plan* (PPL Montana, 2010d) (TDG Control Plan) for the Thompson Falls Hydroelectric Project (Project) was submitted to the MDEQ. With the TDG Control Plan, NorthWestern proposes to continue to collaborate with the MDEQ, Avista, FWP, and other entities with a long-term goal of reducing the overall systemic gas supersaturation levels in the Clark Fork River, occurring from a point downstream of the Project to below Albeni Falls Dam.

In 2015, the Licensee implemented the following protocol for TDG monitoring:

- Consult with the TAC agencies regarding monitoring TDG depending on the snowpack report on April 1.
- If the April 1 forecast is for runoff at or above 125 percent of normal, the Licensee will monitor for TDG.
- If the April 1 forecast is for runoff below the 125 percent of normal, the Licensee will not monitor for TDG.
- The final decision to be made by the FWS and MDEQ in consultation with the Licensee.

In April 2015, NorthWestern consulted with the TAC agencies and provided a summary of the snowpack data for the Lower Clark Fork basin, which indicated runoff forecasts were less than the 125 percent of normal. The snowpack in the Lower Clark Fork basin started in January 2015 with 90 percent of normal snowpack, but continually declined to 49 percent of normal by early April. March storms brought precipitation in the form of rain with very little or no snow accumulations. The April 1, 2015 runoff forecast for the Clark Fork River near Plains, Montana was 89 percent of normal. Therefore, due to the low runoff forecast, monitoring TDG and subsequent monitoring of gas bubble trauma in fish was not implemented in 2015.

NorthWestern Energy proposes to implement the protocol described above in 2016 for TDG monitoring.

8.0 TAC-Funded Projects in 2015

In 2015, three projects were funded by the TAC, including land acquisition in the Fish Creek drainage, bull trout genetics analysis, and continued support for a multi-year study in the Thompson River evaluating juvenile bull trout outmigration. Below is a brief progress report on each project.

8.1 Fish Creek Land Acquisition – Rehbein Property

In December 2014, the TAC approved $40,000 in funding to support FWP's acquisition of a 320-acre parcel on the West Fork of Fish Creek. FWP plans on incorporating the Rehbein property into the existing Wildlife Management Area. Funds for the acquisition would be a mix of private, state, and federal dollars. The land acquisition will permanently protect a significant reach of the West Fork of Fish Creek and the lower portions of two tributaries from habitat degradation. The acquisition will also facilitate enhancement activities along the stream corridor, which is all considered bull trout critical habitat. This stream system supports the largest fluvial bull trout population in the middle Clark Fork River drainage and typically contains more redds than the rest of the tributaries in this region combined. An intact migratory corridor, juvenile rearing habitat and connected nodal areas are vital to these bull trout and westslope cutthroat trout populations.

8.2 Bull Trout Genetic Sampling

During the annual TAC meeting in December 2014, the TAC approved $3,000 to support the analysis of 50 bull trout samples collected from Little Joe Creek. FWP submitted approximately 50 bull trout samples to Abernathy for analysis.

8.3 Evaluation of Juvenile Bull Trout Out-Migration in the Thompson Falls Reservoir

In 2013, the TAC authorized the allocation of $37,932 for purchasing equipment (e.g., transmitters, receiver, mobile tracking data logger, and hydrophone) and $50,405 for the first year (2014) of the study. The TAC also approved funding for subsequent years, allocating approximately $50,966 for 2015 and approximately $30,023 for 2016.

A progress report summarizing activities and results from 2015 is presented in Section 6.1 of this report. The graduate student will provide the TAC a final report (Master's thesis) that is scheduled to be submitted by December 31, 2016.

9.0 Compliance with the Terms and Conditions of the Biological Opinion

The sections below provide the seven TCs from the FWS's Biological Opinion (BO) followed by a statement describing the Licensee's (NorthWestern) actions of compliance. The language in the BO (USFWS, 2008) refers to PPL Montana, the Licensee at the time the BO was prepared. All references to PPL Montana and compliance requirements in the BO apply to NorthWestern. As of November 18, 2014, NorthWestern is the Licensee of the Thompson Falls Hydroelectric Project (FERC No. 1869) (Project) and is responsible for compliance with the TCs in the BO as outlined below.

9.1 Term and Condition TC1 – Upstream Passage

9.1.1 Requirement

The Biological Opinion states that:

> a. During 2009 and 2010, PPL Montana will construct a fish passage facility (permanent fishway) to provide timely and efficient upstream passage at the right abutment of the main dam, as agreed to by the Service and through oversight of the TAC (as provided for in the interagency Thompson Falls MOU).
>
> b. During construction and cleanup, PPL Montana will follow permit procedures as required by the Service, the State of Montana, and U.S. Army Corps of Engineers so that minimal impacts to downstream aquatic resources occur during construction.
>
> c. PPL Montana will determine operational procedures for the passage facility and develop a written operation and procedure manual (SOP) by the end of 2010, with input from the TAC and approval by the Service, updated as needed.
>
> d. For the remaining term of the license (expiring December 31, 2025), PPL Montana will ensure that operation of the fish passage facility is adequately funded and conducted in compliance with the approved SOP; including activities such as biological studies, transport of bull trout (as needed), and assessment of ladder efficiency.
>
> e. During the Phase 2 evaluation period (2010 through 2020), PPL Montana will provide adequate funding for genetic testing to determine the likely natal tributary of origin of all adult bull trout which ascend the fishway and enter the sample loop, as well as those otherwise captured at

the base of Thompson Falls Hydroelectric Project. In order to positively identify natal origin of bull trout at the project, PPL Montana will institute a permanent fish tagging system for all bull trout handled during monitoring and for other fisheries investigation activities in the Project area.

f. During the Phase 2 evaluation period (2010 through 2020), PPL Montana will make a fish transport vehicle available, and provide staff to transport any adult bull trout that is captured at Thompson Falls Hydroelectric Project and determined by the SOP to require transport to upstream waters.

g. In consultation with the TAC, PPL Montana will prepare by January 1, 2011, for Service approval, an action plan for Phase 2 of the evaluation period (2010 through 2020) to evaluate efficiency of the upstream passage facility. The goal will be to assess how effective the ladder is at passing bull trout, the potential length of any delay, the amount of fallback, and the optimal operational procedures to achieve the highest efficiency. During this Phase 2 evaluation period (2010 through 2020) a routine feedback loop will be established and used, as agreed to by the Service, to fine tune operations and will be combined with a variety of experimental and evaluative studies. It may be necessary to conduct research on surrogate species (e.g., rainbow trout) at the discretion of the TAC, in order to facilitate certain of these evaluations. At a minimum, for the remaining term of the license (through 2025), PPL Montana will support a sampling method to annually estimate the total numbers of all species passing through the ladder and adequately characterize the timing of such movements.

h. During the entire Phase 2 evaluation period (2010-2020), the TAC, subject to approval of the Service and with PPL Montana support, will provide adequate oversight of scientific aspects, surveys, studies, and protocols associated with the fish passage aspects of the Project. At the end of the Phase 2 evaluation period (2010-2020), and upon completion and adequate distribution and consideration of a comprehensive ten-year report (due December 31, 2020), PPL Montana will convene a structured scientific review of the project, guided by the TAC. This scientific review will be completed by April 1, 2021 and will develop a set of recommendations to be submitted to the Service for evaluation, modification, and approval; including specific conclusions as to whether the fishway is functioning as intended and whether major operational or structural modifications of the fishway are needed. The review process will culminate, by December 31, 2021, in a revised operating plan for the

> fishway during the remainder of the existing term of the FERC license (2022 through 2025).

9.1.2 Compliance

The Licensee has completed Project activities in compliance with TC1 (a, b, c). The Licensee obtained the necessary permits for construction of the ladder and completed construction of the Thompson Falls Upstream Fish Passage Facility (ladder) by autumn 2010 (TC1 [a, b]). The FERC approved the Licensee's *Thompson Falls Fish Ladder – Fishway Operations Manual 1.0* (SOP) in an Order issued on June 17, 2011.

NorthWestern will continue to stay in compliance with TC1d for the term of the License. NorthWestern will continue funding for the ladder and operate the facility in conformance with the approved SOP.

The Licensee developed and submitted the FWS-approved *Fish Passage Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) to the FERC on October 14, 2010. The FERC issued an Order approving the Fish Passage Evaluation Plan on June 9, 2011. Between 2011 and 2015, the Licensee implemented the Fish Passage Evaluation Plan, which complies with TC1 (e, f, g, and h). NorthWestern will continue to implement the Fish Passage Evaluation Plan through 2020.

9.2 TC2 – Downstream Passage

9.2.1 Requirement

The Biological Opinion states that:

> PPL Montana will provide annual funding to the TAC, as approved by the Service and specified in the Thompson Falls MOU, to conduct offsite habitat restoration or acquisition in important upstream bull trout spawning and rearing tributaries. The purpose is to boost recruitment of juvenile bull trout. This funding is provided to partially mitigate for incidental take of bull trout caused by downstream passage through the turbines and spillways. The annual $100,000 contribution specified for the first term of the MOU (2009-2013) is subject to renegotiation during succeeding terms of the MOU to run from 2014-2020.

9.2.2 Compliance

On November 11, 2013, the Licensee electronically filed the renewed 7-year (effective January 1, 2014 through December 31, 2020) MOU, dated September 20, 2013, for the Project to the Commission. The renewed MOU received approval from FWS, FWP, CSKT, and the Licensee and was filed in compliance with the FWS BO TC2 and FERC Order issued on February 12, 2009.

The terms of the renewed MOU (2014-2020) are similar to the first term of the MOU (2009-2013). The AMFA started with $150,000 on January 1, 2014. The Licensee will provide $100,000 annually for 7 years and allow a maximum of $250,000 to accrue in the account from unspent or transferred annual TAC funds. The AMFA is designated for implementation of downstream passage minimization measures in addition to License-required studies, monitoring activities, reports, upstream fish passage minimization measures, gas abatement monitoring, predator control measures, and other means to reducing impacts on bull trout caused by operation of the Project.

During the annual TAC meeting, held on December 17, 2015, NorthWestern approved three proposals requesting funding for projects scheduled for implementation in 2016 and 2017. The details of the proposals are provided in Section 10.0 of this report. NorthWestern will continue to collaborate and coordinate with agencies and other entities to support projects in compliance with TC 2a. As proposals are submitted, NorthWestern will distribute the information to the TAC for review and approval.

9.3 TC3 – Gas Supersaturation

9.3.1 Requirement

The Biological Opinion states that:

> a. For the remainder of the license (through 2025), in consultation with the TAC and subject to Service approval, PPL Montana will develop and implement operational procedures to reduce or minimize the total dissolved gas production at Thompson Falls Dams during periods of spill. Future modifications to prescribed operations may be determined from ongoing evaluations, as necessary and determined appropriate by Montana Department of Environmental Quality (MDEQ).
>
> b. For the remainder of the license (through 2025), in consultation with the TAC and subject to Service approval, PPL Montana will continue to collaborate with MDEQ, Avista, FWP, and other entities toward reducing the overall systemic gas supersaturation levels in the Clark Fork River, occurring from a point downstream of Thompson Falls Dam to below Albeni Falls Dam.
>
> c. For the remainder of the license (through 2025), all bull trout detained through the sampling loop at the Thompson Falls Fish Ladder will routinely be examined for signs of gas bubble trauma; with results of such observations permanently recorded. Should GBT symptoms be discovered, then PPL Montana will consult the TAC on the need for immediate corrective actions and subsequently implement any new studies

or potential operational changes (to the ladder or the dam) which may be required by the Service and MDEQ, in order to mitigate GBT concerns.

9.3.2 Compliance

The Licensee prepared a *Total Dissolved Gas Control Plan* (PPL Montana, 2010d) (TDG Control Plan) in collaboration with the TAC in October 2010, and submitted the TDG Control Plan to the MDEQ. The TDG Control Plan recommends continued monitoring of TDG at the Project, and also recommends a spillway operating plan for the Main Dam Spillway. The recommended spillway operating plan for the Main Dam Spillway has been implemented annually since 2011.

The Licensee has collected TDG and GBT data between 2008 and 2014. TDG levels appear to level off once flows exceed 60,000 cfs. Monitoring efforts for signs of GBT in fish below Thompson Falls Dam have been implemented during variable flow conditions (57,700-104,000 cfs) that cover a wide range of TDG levels, including the higher TDG levels, recorded in the Project area. Past GBT monitoring in the Project area has resulted in limited findings of fish with symptoms indicating GBT. Bull trout recorded at the ladder or downstream of the Thompson Falls Dam annually between 2011 and 2014 have not shown any external symptoms of GBT. The TAC agreed that continuing GBT monitoring provided minimal gains and the existing dataset (2008-2014) was adequate and no additional GBT monitoring was implemented in 2015 or proposed for 2016. TDG monitoring will be implemented when the spring forecast is for runoff at or above 125 percent (conditions outlined in Section 10.4.1). In 2015, the forecast for spring runoff was below 125 percent, thus no TDG monitoring was implemented. In 2016, NorthWestern will monitor TDG, if appropriate, based on the protocol provided in Section 10.4.1.

NorthWestern will continue to collaborate with the MDEQ, Avista, FWP, and other entities toward reducing the overall systemic gas supersaturation levels in the Clark Fork River.

9.4 TC4 – MOU and TAC

9.4.1 Requirement

The Biological Opinion states that:

> a. Upon completion of construction of the Thompson Falls Fish Ladder (currently scheduled for 2010) and concurrent with initiation of the Phase 2 review period (mid-2010 through 2020) PPL Montana will review the Thompson Falls MOU and collaborate with the signatory agencies as to the need to revise and restructure the MOU. Any such revision should be developed around the 2010-2020 Phase 2 evaluation period and may include appropriate changes to the TAC and its operation. Subsequent

revision may occur again in 2021, or as needed based on adaptive principles and subject to approval of the Service and PPL Montana.

9.4.2 Compliance

The current MOU expires on December 31, 2020 (Section 9.2.2). NorthWestern will coordinate with the TAC and FWS to revisit the terms of the MOU in 2020, prior to the expiration of the current agreement.

9.5 TC5 – Thompson Falls Reservoir

9.5.1 Requirement

The Biological Opinion states that:

> a. During the first five years of the Phase 2 evaluation (2010 through 2015) PPL Montana, with TAC involvement and Service approval, will conduct a prioritized 5-year evaluation of factors contributing to the potential loss or enhancement of migratory bull trout passage through Thompson Falls Reservoir. Goals and objectives for this assessment and scientifically-based methodology will be developed through the TAC and approved by the Service no later than the end of 2010 and will focus at a minimum on better understanding temperature and water current gradients through the reservoir; travel time, residence time, and pathways that juvenile and subadult bull trout select in moving through the reservoir; and an assessment of impacts of predatory nonnative fish species on juvenile and subadult bull trout residing in or passing through the reservoir. The initial findings will be summarized and supported with scientifically based conclusions, no later than the end of 2015, with a goal of adaptively improving survival of juvenile bull trout in Thompson Falls Reservoir as they pass downstream or reside in the system. A second, more comprehensive summary of conclusions and recommendations regarding reservoir impacts will be submitted as part of the scientific review package by the end of 2020 (*see* TC1h).
>
> b. Based on the interim Thompson Falls Reservoir Assessment (a., above), a timely evaluation of the site specific need for a nonnative species control program in Thompson Falls Reservoir will be conducted by PPL Montana, in collaboration with the TAC agencies (*see* TC7b., below), no later than the end of 2015, with final recommendations to be approved by the Service.

9.5.2 Compliance

In compliance with TC 5a, the Licensee collaborated with TAC members and prepared the 5-Year Reservoir Monitoring Plan, which was approved by FWS and submitted to the FERC on June 17, 2010. FERC issued an Order approving the 5-Year Reservoir Monitoring Plan on February 9, 2011. The objectives identified in the 5-Year Reservoir Monitoring Plan for the next 5 years (2010-2015) include:

1. Characterization of bull trout in the Thompson River drainage.
2. Characterization of the affect that Thompson Falls Reservoir has on bull trout emigrating from the Thompson River drainage (or elsewhere upstream, as these are not necessarily separable) and migrating downstream in the Clark Fork River.

In 2015, the Licensee was originally scheduled to submit a comprehensive report to FWS by December 31, 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile bull trout survivorship and evaluate the site specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts has been modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS, along with the proposed changes, was filed with the Commission on December 17, 2014. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement has been achieved through the annual reports since 2011 and postponing the development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" from the end of 2015 until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of juvenile bull trout from the Thompson River.

An update on the 2015 activities implemented as part of the multi-year juvenile bull trout out-migration study is provided in Section 6.1 of this report. A final report summarizing the 2014 and 2015 data is scheduled for submittal to the TAC by December 31, 2016. Upon the conclusion of the juvenile bull trout out-migration study, NorthWestern will complete an evaluation of the site specific need for a nonnative species control program in the Thompson Falls Reservoir in compliance with TC 5b and submit a formal filling to the Commission by December 31, 2020.

9.6 TC6 – System-wide Monitoring

9.6.1 Requirement

The Biological Opinion states that:

> a. For the remainder of the license (through 2025), PPL Montana will ensure that actions at the Thompson Falls Fish Ladder, including tagging,

transport, and any tracking of fish movement, are adequately funded and fully coordinated with the Avista project and the management agencies FWP, CSKT, and the Service. This coordination will include routine communications through the TAC and may require participation in special meetings or discussions to ensure that there is a single seamless fish passage effort for the lower Clark Fork projects.

b. For the remainder of the license (through 2025) PPL Montana will contribute a proportional amount of funding to ensure that fish sampled at the Thompson Falls Fish Passage Facility are processed, analyzed, and integrated into annual updates of the system wide Clark Fork River genetic database.

c. In consultation with the TAC and with approval of the Service, for the remainder of the license (through 2025), PPL Montana will fund the technology required to track transmittered fish that pass the project as they move through the system. This may include an integrated PIT-Tag scanner at the fishway, mobile PIT-Tag scanning capabilities (wand(s) for use in the field), and radio implantation and tracking of bull trout that move through the sample loop in the ladder. Obligations for tracking transmittered fish by PPL Montana will include at a minimum the portions of the Lower Clark Fork Core Area upstream of Thompson Falls Dam (i.e., mainstem Clark Fork River from Thompson Falls Dam to the confluence of the Flathead River, including tributaries such as the Thompson River) Note: in the lower Flathead River, Jocko River, and other Flathead Reservation waters primary responsibility for tracking is assumed by the CSKT, but close coordination with the Tribes will be maintained by PPL Montana. Broader tracking needs upstream will be determined through cooperation with other entities in the basin (as in TC6a, above).

9.6.2 Compliance

The Licensee will comply with these requirements by holding necessary TAC meetings (and sub-committee meetings) in 2016 to ensure compliance and to aggressively address the adaptive needs of the operations of the ladder. With the construction of the fish ladder, three remote antennas were installed on the weirs that detect HDX and FDX PIT-tagged fish. These remote antennas detect PIT tags as fish move through the ladder. NorthWestern will also continue to collaborate and coordinate with local biologists regarding the need to conduct radio telemetry studies. NorthWestern continues to support bull trout genetic sampling efforts in the Clark Fork River drainage with funding approved by the TAC during the 2015 annual meeting in support of genetic analysis of bull trout samples.

9.7 TC7 – Reporting

9.7.1 Requirement

The Biological Opinion states that:

> a. Annually, by April 1 of each year for the remainder of the license (expires 2025), PPL Montana will prepare and submit to the Service for approval a report of the previous year's activities, fish passage totals, and next year's proposed activities and other fisheries monitoring that may result in intentional as well as incidental take of bull trout. The report will quantify the number of bull trout proposed to be incidentally taken by each activity and summarize the cumulative extent of incidental take from all previous year activities.
>
> b. By December 31, 2015, after the first five years of the Phase 2 evaluation period (as described per TC1g., above), PPL Montana will present to the TAC and the Service a comprehensive written assessment of the first five years of fishway operation. This report is partially for the purpose of assessing the need for major mid-Phase 2 modifications to the facility and its operations as well as for consideration of the need for supporting additional bull trout passage or transport above the dam.
>
> c. Annually, by April 1 of each year beginning in 2010 and for the remainder of the license (expires 2025), PPL Montana will archive electronic versions of all biological progress reports (described in TC 1 through TC 7 and dating back to 2005) generated through the Thompson Falls Project. PPL Montana will provide to TAC agencies at no cost, upon request, updated CDs or web-based access to those reports.
>
> d. For the remainder of the license (expires 2025), upon locating dead, injured, or sick bull trout, or upon observing destruction of redds, notification must be made within 24 hours to the Service's Division of Law Enforcement Special Agent (Richard Branzell, P.O. Box 7488, Missoula, MT, 59807-7488; (406) 329-3000). Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Dead, injured, or sick bull trout should also be reported to the Service's Kalispell Field Office (406-758-6882).
>
> e. For the remainder of the license (expires 2025), during project implementation the FERC or applicant shall promptly notify the Service of any emergency or unanticipated situations arising that may be detrimental for bull trout relative to the proposed activity.

9.7.2 Compliance

NorthWestern complied with TC 7a requirements by preparing this annual report for the work completed in 2015. NorthWestern will continue to submit annual reports of the previous year's activities, fish passage totals, next year's proposed activities, and other fisheries monitoring that may result in intentional as well as incidental take of bull trout. The annual reports will be approved by the TAC and submitted to the FERC by April 1 of each year for the remainder of the License.

NorthWestern proposes to continue to provide the following information in future annual reports. The Licensee will summarize annual activities associated with the evaluation of the ladder, including, as available, the following information:

- Total number of fish and species ascending the ladder
- Total number of fish and species passed to Thompson Falls Reservoir
- Most active period(s) for fish and various species ascending the ladder
- Bull trout genetic sampling and tributary assignment

In 2014, NorthWestern consulted with FWS to review the needs of a 5-year comprehensive report of the ladder's performance in compliance with TC 7b. FWS and NorthWestern concurred that the annual reports have provided sufficient and on-going comprehensive summaries that negate the need for a separate 5-year report. NorthWestern filed a letter, with FWS's support, to the Commission on December 17, 2014 proposing TC 7b no longer be required because the comprehensive reporting that has been continually provided in the annual reports.

In compliance with TC 7c, NorthWestern will archive electronic versions of all biological progress reports (dating back to 2005) annually by April 1. Sections d and e will be addressed as these situations occur.

9.7.3 Bull Trout Incidental Take Summary 2011-2015

In compliance with TC 7a, this section provides a summary of the cumulative extent of incidental take from previous years' activities (2009-2015) in support of the upstream fish passage at the Project (Table 9-1). Between 2009 and 2015, 29 individual bull trout have been sampled by the Licensee. Since operations at the ladder commenced in 2011, 27 individual bull trout have been sampled annually by the Licensee in the Project area with approximately five to seven individual bull trout sampled annually. In 2015, the Licensee sampled four bull trout (2 at the Thompson Falls ladder; 1 via electrofishing in the upper section of the Thompson Falls Reservoir; 1 via electrofishing above the islands in the Clark Fork River), all of which were released live.

Sampling has included collecting bull trout via electrofishing efforts above and below Thompson Falls Dam as well as bull trout recorded at the Thompson Falls fish ladder. Since 2011, 12 bull trout, representing 11 individual fish have been recorded at the Thompson Falls fish ladder. One

bull trout ascended the ladder twice and during the second ascent in 2012, the bull trout jumped out of one of the pools and died. This mortality has been the only occurrence in the Project area and subsequently, a cover was placed over the holding pool to mitigate the potential for this to occur again. In 2014, the bull trout that ascended the ladder was released alive upstream of the dam, but was later captured downstream of Thompson Falls Dam and the Project area during the annual reservoir monitoring activities led by FWP in Noxon Reservoir. The bull trout was captured via gillnet on October 13, 2014 resulting in a mortality. Additional details regarding bull trout sampled by the Licensee between 2011 and 2015 are provided in Section 4.0.

Table 9-1: Cumulative incidental "take" of bull trout for the Thompson Falls Project area located in the Lower Clark Fork River drainage, since January 1, 2009. Note: 2015 fish are listed in bold; EF = electrofishing; L = length; Wt = weight.

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/1/09	Gillnet	TFalls Reservoir	Long-term Population Monitoring	Licensee	271	174	98512009494278	Fishtrap Creek (R4)	Alive
10/12/10	EF	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee	325	240	N/A	SF Jocko River (R4)	Alive
4/13/11	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	365	364	985121023302169	Thompson River (R4)	Alive
4/26/11	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	547	1438	985121023464730	Fishtrap Creek (R4)	Alive
5/31/11	EF	Below TFalls Ladder	Fish Passage Studies	Licensee FWP	482	966	985121021877906	Meadow Creek (R4)	Alive
5/31/11	EF	Below TFalls Ladder	Fish Passage Studies	Licensee FWP	180	50	985121021907887	Fishtrap Creek (R4)	Alive
5/31/11	EF	Below TFalls Ladder	Fish Passage Studies	Licensee FWP	247	130	985121021914545	Fishtrap Creek (R4)	Alive
4/10/12	EF	Below TFalls Ladder	Fish Passage Studies	Licensee FWP	272	150	985121027393272	Graves Creek (R3)	Alive
4/16/12	EF	TFalls Reservoir (Lower Section)	Fish Passage Studies	Licensee FWP	222	76	985121027360192	Fishtrap Creek (R4)	Alive
4/17/12	EF	TFalls Reservoir (Upper Section)	Fish Passage Studies	Licensee FWP	260	140	985121027402995	Fishtrap Creek (R4)	Alive
5/15/12	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	510	1172	985121021877906 982000357016269	Meadow Creek (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/21/12	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	563	1404	985121023464730	Fishtrap Creek (R4)	Mortality – Jumped out of Pool at Ladder
10/30/12	EF	Paradise-Plains	Fish Passage Studies	Licensee FWP	472	800	982000357016135	Monture Creek (R4)	Alive
10/30/12	EF	Paradise-Plains	Fish Passage Studies	Licensee FWP	444	678	982000357016066	Fish Creek (R4)	Alive
4/10/13	EF	Upper TFalls Reservoir (CFR)	Fish Passage Studies	Licensee FWP	260	108	982000357016097	Fishtrap Creek (R4)	Alive
4/30/13	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	598	2306	982000357016065	Fish Creek (R4)	Alive
5/6/13	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	576	1694	982000357016109	Fishtrap Creek (R4)	Alive
5/7/13	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	478	978	982000357016155	Fishtrap Creek (R4)	Alive
6/7/13	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	596	1926	HDX tag not recorded (Genetics 118-073)	Fishtrap Creek (R4)	Alive
8/9/13	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	482	1058	982000357016151	Fishtrap Creek (R4)	Alive
4/7/14	EF	Below TFalls Dam	Fish Passage Studies	Licensee FWP	520	1500	No tag implanted/ no genetic sample taken	NA	Alive
4/15/14	EF	Upper TFalls Reservoir (CFR)	Fish Passage Studies	Licensee FWP	577	1446	900226000035846	Fishtrap Creek (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/16/14	TFalls Ladder	TFalls Ladder	Fish Passage Studies	Licensee FWP	523	1264	982000357016169	Fish Creek (R4)	Alive (later captured via gillnet in Noxon Reservoir resulting in a mortality)
5/28/14	EF	Below TFalls Dam	Fish Passage Studies	Licensee FWP	567	1640	985121021203256 982000357016106	Fishtrap Creek (R4)	Alive
6/3/14	EF	Below TFalls Dam	Fish Passage Studies	Licensee FWP	509	1224	982000357016241	Fishtrap Creek (R4)	Alive
10/28/14	EF	Paradise-Plains	Fish Passage Studies	Licensee FWP	315	260	982000357016111	NF Jocko (R4)	Alive
4/13/15	**EF**	**Upper TFalls Reservoir (CFR)**	**Fish Passage Studies**	**Licensee FWP**	**219**	**88**	**989001004067249**	**118-093**	**Alive**
5/17/15	**TFalls Ladder**	**TFalls Ladder**	**Fish Passage Studies**	**Licensee FWP**	**519**	**1334**	**982000363519407**	**118-081**	**Alive**
6/3/15	**TFalls Ladder**	**TFalls Ladder**	**Fish Passage Studies**	**Licensee FWP**	**520**	**1112**	**982000357016242 982000357016210**	**118-050**	**Alive**
10/20/15	**EF**	**Clark Fork River, upstream of Island Complex**	**Fish Passage Studies**	**Licensee FWP**	**651**	**1966**	**900226000730577**	**Fishtrap Creek (R4)**	**Alive**

10.0 Proposed Activities for 2016

10.1 Baseline Fisheries Data Collection

In 2016, NorthWestern will continue to collect annual baseline fisheries data as presented in Section 2.0 of this report with the addition of the Paradise to Plains autumn electrofishing reach, which is scheduled to be completed every other year (2016, 2018, etc.). Baseline fisheries data will include spring and autumn electrofishing and autumn gillnetting at the designated sites. Data collected in 2016 will be summarized and presented in next year's annual report. Based on prior year's sampling in the Clark Fork River and Thompson Falls Reservoir it is conservatively estimated that incidental take of bull trout during 2016 baseline fisheries studies will be no more than 10 bull trout. Any fish evaluations in the Thompson River drainage will be managed by FWP, thus any incidental take of bull trout will be reported by FWP.

10.2 Upstream Adult Fish Passage Studies

In 2016, NorthWestern will continue to implement 10-year *Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) that was developed and submitted to the FERC on October 18, 2010 and approved on June 9, 2011. NorthWestern will collect biological and operational data during ladder operations in 2016. NorthWestern will summarize the following information, as available, for next year's annual report:

- Total number of fish and species ascending the ladder
- Total number of fish and species passed to Thompson Falls Reservoir
- Most active period(s) for fish and various species ascending the ladder
- Number of bull trout that fallback after passing the Thompson Falls Dam
- Bull trout genetic sampling and tributary assignment

In 2016, NorthWestern proposes to check the ladder at a minimum of once a day when and if water temperatures reach or exceed 23 ºC. NorthWestern also proposes to start the 2016 season with the ladder operating in orifice mode and begin to alternate weir mode (orifice and v-notch) weekly when water temperatures are equal to and exceed 19 ºC for up to 4 weeks to evaluate whether weir mode influences movement of smallmouth bass or other species into or up the ladder. These results will be summarized in next year's annual report. The fisheries data collected at the ladder in 2016 will be evaluated and presented during the annual TAC meeting to determine whether additional weir mode studies may be beneficial or continuing operations in orifice mode is most beneficial for facilitating upstream fish passage.

Several studies outlined in the Fish Passage Evaluation Plan will occur over multiple years (2011-2020). A list of the studies and their respective schedule is provided in Table 10 1. Based on prior year's sampling in the Thompson Falls tailrace it is conservatively estimated that incidental take of bull trout during 2016 upstream adult fish passage studies will be no more than 10 bull trout.

Table 10-1: Summary of the objectives, studies, and reporting requirements for the Fish Passage Evaluation Plan (2011-2020). Annual activities are indicated by an "x." A dash (-) indicates no action will be taken for the year. TBD = "to be determined." (Table was modified from the *Fish Passage Evaluation Plan*, 2010.)

Objective	Study	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Effectiveness of the Ladder	Annual Fish Passage	x	x	x	x	x	x	x	x	x	x
	Annual Movement Patterns (timing)	x	x	x	x	x	x	x	x	x	x
	Bull Trout Genetic Testing	x	x	x	x	x	x	x	x	x	x
Operational Procedures for Effectiveness	Weir Modes Notch *vs.* Orifice	x	x	Orifice Mode – No additional weir study			Orifice; then alternating modes when water > 19 °C	-	-	-	-
	Attractant Flow (AF) & Radio Telemetry (RT)	x (no RT)	x (no RT)	x (max AF, no RT)					TBD	TBD	TBD
Length of Delay	Upstream Movement Patterns, Timing & Behavior (Delay)	x	x	x	x	x	x	x	x	x	x
Fallback	Fallback	x	x	x	x	x	x	x	x	x	x
Reporting Requirements	Annual Reporting (April 1 – FERC Submittal)	x	x	x	x	x	x	x	x	x	x
	5-year Fish Passage Evaluation Plan Report	Accomplished through Annual Reports – No Longer a Separate Requirement for 2015[3]					-	-	-	-	-
	10-year Fish Passage Evaluation Plan Report (Dec 31, 2020 – TAC/FWS Submittal)	-	-	-	-	-	-	-	-	-	x

[3] NorthWestern and FWS concur that the 5-year Fish Passage Evaluation Plan, per TC 7b and scheduled for submittal in 2015, was not necessary due to the comprehensive annual reporting. NorthWestern filed a letter to the Commission on December 17, 2014 summarizing the modifications that FWS and NorthWestern discussed and agreed to implement with regards to the upstream fish passage terms and conditions described in the BO.

10.2.1 Effectiveness of the Ladder and Operations

Effectiveness of the ladder will continue to be evaluated based on annual fish passage. The biological data collected at the ladder's work station will be used to summarize overall upstream fish passage, including enumeration of fish using the facility; the species using the facility; range, average size, and weight of species using the facility; and the timing of movement and passage by each species.

The ladder was initially designed to operate with flows up to 48,000 cfs. Subsequently, the ladder has operated with streamflows exceeding 75,000 cfs and the ladder has also recorded fish ascending the ladder when flows were approximately 69,000 cfs. However, efficacy to attract fish appears to decline when streamflows exceed 43,000 cfs. Ladder operation during spring flows is primarily dependent on debris and sediment loading. As in previous years, the ladder will be operated in 2016 during the spill season for as long as operationally practicable, and data collected on fish movements into the ladder through this range of flow.

Effectiveness of the operational procedures of the ladder to pass fish upstream has been evaluated based on studies of notch *versus* orifice mode and optimal attractant flow. The notch *versus* orifice study was implemented in 2011 and 2012. The results from 2011 and 2012 (PPL Montana 2012, 2013) indicate fish ascend the ladder in both modes, but more fish and a greater variety of species are likely to pass more efficiently during orifice mode. During the 2013, 2014, and 2015 seasons, the ladder operated in orifice mode with a greater number of fish ascending annually. In 2016, NorthWestern proposes to start the season with the ladder operating in orifice mode and begin to alternate weir mode (orifice and v-notch) weekly when water temperatures are equal to and exceed 19 ºC for up to 4 weeks. NorthWestern will evaluate whether weir mode appears to influence smallmouth bass movement into the ladder and determine if any additional studies regarding weir mode operations at the ladder are recommended.

The attractant flow study began in 2011. The Licensee originally proposed to use the first 3 years of ladder operations (2011-2013) to test variable attraction flows and learn operations. Based on observations in the first 2 years of study, the Licensee has concluded that during non-spill time periods, the HVJ and AWS should be operated at maximum capacity (50 cfs to stilling basin) in order to provide sufficient flow to allow fish to migrate upstream through the natural falls which is present downstream of the Main Channel Dam. As was done in 2013, 2014, and 2015, NorthWestern proposes to continue to use near maximum attractant flow during 2016 operations.

10.2.2 Evaluation of Fish Movement Patterns, Timing, and Behavior

Fish movement patterns, timing, and behavior are evaluated through biological data collected at the ladder and radio telemetry data, when available. Bull trout captured in 2015 downstream of Avista's Cabinet Gorge and Noxon Rapids dams that are genetically tested and assigned to Region 4 (upstream of Thompson Falls Hydroelectric Project [Project]) will be PIT-tagged (but

will not be radio tagged) and released in Region 4; Region 3 fish will be released in Region 3, accordingly.

In 2014, there was a substantial influx of smallmouth bass and mountain whitefish recorded at the Thompson Falls fish ladder. During the annual TAC meeting, the TAC agreed that NorthWestern will PIT tag mountain whitefish and Floy tag smallmouth bass (equal or greater than 275 mm) recorded at the ladder in 2015. The tagging efforts in 2015, resulted in 1,107 smallmouth bass Floy-tagged and 54 mountain whitefish PIT-tagged at the ladder. In 2015, the TAC agreed to discontinue Floy tagging smallmouth bass in 2016, but continue PIT tagging mountain whitefish in 2016.

The TAC has concluded that no radio telemetry studies will be conducted by NorthWestern in 2016. Therefore, assessment of fish movement patterns, timing, and behavior will be conducted by monitoring fish tagged with PIT tags and Floy tags at the ladder and monitoring PIT tag detections via the remote PIT tag array in the mainstem of the Thompson River. These studies will allow for an assessment of the length of time for bull trout to ascend the ladder, and upstream and downstream migration patterns. In addition, no electrofishing or tagging of fish below Thompson Falls Dam is proposed for 2016.

10.2.3 Evaluation of Fallback

The potential fallback of bull trout after ascending the ladder and moving into the Thompson Falls Reservoir will be evaluated on an annual basis. Bull trout will be monitored for fallback using PIT tags to monitor the movement of bull trout studies.

10.3 5-Year Reservoir Monitoring Plan

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile bull trout survivorship and evaluate the site specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS along with the proposed changes, were filed with the Commission on December 17, 2014. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement has been achieved through the annual reports since 2011 and postponing the development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" from the end of 2015 until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of juvenile bull trout from the Thompson River. A detailed

analysis of the results from the 2014 and 2015 field data collection are anticipated to be submitted to the TAC by December 31, 2016 in the form of a Master's of Science (M.S.) thesis.

Any fish evaluations in the Thompson River drainage will be managed by FWP, thus any incidental take of bull trout will be reported by FWP.

10.4 Total Dissolved Gas Control Plan and Gas Bubble Trauma Monitoring

10.4.1 TDG Control Plan

In 2010, the *Total Dissolved Gas Control Plan* (PPL Montana, 2010d) (TDG Control Plan) for the Project was submitted to the MDEQ. With the TDG Control Plan, NorthWestern proposes to continue to collaborate with the MDEQ, Avista, FWP, and other entities with a long-term goal of reducing the overall systemic gas supersaturation levels in the Clark Fork River, occurring from a point downstream of the Project to below Albeni Falls Dam.

In 2016, the Licensee will implement the following protocol for TDG monitoring:

- Will consult with the TAC agencies regarding monitoring TDG depending on the snowpack report on April 1.
- If the April 1 forecast is for runoff at or above 125% of normal, the Licensee will monitor for TDG.
- If the April 1 forecast is for runoff below the 125% of normal, the Licensee will not monitor for TDG.
- The final decision to be made by the FWS and MDEQ in consultation with the Licensee.

In 2016, NorthWestern will monitor TDG, if appropriate, based on the above protocol. GBT monitoring is not proposed for 2016 (refer to next section for details). In addition, NorthWestern will operate the spillways in accordance with the TDG Control Plan. Minor modifications of the spillway operating schedule may be made to enhance fish attraction to the fish ladder during the low flow season.

10.4.2 Gas Bubble Trauma (GBT) Monitoring

Monitoring efforts for signs of GBT in fish below Thompson Falls Dam have been implemented during variable flow conditions (57,700-104,000 cfs) that cover a wide range of TDG levels, including the higher TDG levels, recorded in the Project area. In addition, TDG levels appear to level off once flows exceed 60,000 cfs. Past GBT monitoring (2008-2014) in the Project area has resulted in limited findings of fish with symptoms indicating GBT. Therefore, the TAC agreed that continuing GBT monitoring provided minimal gains and the existing dataset (2008-2014) was adequate and no additional GBT monitoring was implemented in 2015 or proposed for 2016.

Therefore, no GBT monitoring in fish downstream of Thompson Falls Hydroelectric Project is proposed for 2016.

10.5 TAC Proposals for 2016 Funding

During the Thompson Falls Project annual meeting held on December 17, 2015 and subsequent email correspondence, the TAC authorized/allocated funds totaling approximately $88,794 in support of the following projects:

- Cedar Creek Phase 2 Road Relocation and LWD Enhancement Project ($30,000)
- Beartrap Fork Culvert Removal Project ($11,000)
- Rattlesnake Creek Fish Screen Project, Phase I ($13,125)
- Bull Trout Genetics Analysis ($10,000)
- Final Year of Thompson Falls Reservoir Study of Juvenile Bull Trout Out-Migration ($24,669)

The proposals submitted and reviewed by the TAC are presented in the following subsections. Funding for the Thompson Falls Reservoir study is a continuation of a multi-year study and the associated funding was previously approved by the TAC, thus no proposal is included in this report. The progress report for 2015 of the juvenile bull trout outmigration study is available in Sections 6.2.

10.5.1 Cedar Creek Phase 2 Road Relocation and LWD Enhancement

Project Title: Cedar Creek Phase 2 Road Relocation and LWD Enhancement
Proposal Submitted by: Trout Unlimited and Lolo National Forest- Paul Parson, Jon Hanson
Location: Project located on Cedar Creek, just upstream of confluence of Cedar Creek and Oregon Gulch. Forest Road 320
Total Project Cost: $74,500
TAC Funds Requested: $30,000

10.5.1.1 Introduction

Cedar Creek flows northeast from the Idaho/Montana state line for approximately 20 miles before flowing into the middle Clark Fork River. The high elevation and abundant precipitation in the headwaters maintain cold stream temperatures throughout the summer and autumn, a key component for resident and fluvial bull trout. The stream has a long history of placer mining, and as a result, much of the riparian corridor is in a disturbed state. In conjunction with placer mining a stream adjacent railroad was constructed to facilitate transport of goods, and then riparian bottom roads were constructed and remain actively used. Habitat within this drainage has been heavily impacted by these activities causing confinement of the stream channel, limiting its natural ability to meander, as well as increased sedimentation, lack of large woody debris that creates fish habitat, and loss of riparian vegetation that stabilizes streambanks and provides shade to cool water temperatures.

Cedar Creek is listed as a Priority Bull Trout Watershed by the Forest Service and was designated as core bull trout habitat by the Montana Bull Trout Scientific Group. The Conservation Strategy for Bull Trout on USFS lands in Western Montana (2013) and the USFWS Bull Trout Recovery Plan (2015) points out that removing riparian roads, improving pool conditions, and restoring mining claims are important activities to improve populations.

10.5.1.2 Fish Population

Fish populations within Cedar Creek include primarily native westslope cutthroat trout and bull trout. Mountain whitefish (*Prosopium williamsoni*) have also been documented along with a handful of brown trout (*Salmo trutta*) in lower Cedar Creek, and eastern brook trout (*Salvelinus fontinalis*) found in upper Oregon Gulch. Within the Middle Clark Fork, Cedar Creek is unusual in that native bull trout and westslope cutthroat dominate the population and nonnative species are rare in abundance and distribution throughout the watershed. The lack of nonnative competition and overlap with brook trout and brown trout is a noteworthy advantage for bull trout long-term viability.

In addition to electrofishing samples bull trout redd counts have been completed in Cedar Creek from 2002 to 2007, and then again in 2014. Redds are difficult to located due to lack of substrate sorting and a primarily resident life form. Counts are annually low and vary from one to four observed in reference sections. Redd and electrofishing surveys indicate primarily a resident population of bull trout, although there is evidence of a limited fluvial bull trout component.

In the summer of 2015 phase 1 of the project accomplished realigning 1 mile of stream adjacent road and placing 111 large wood structures in a two-mile reach of Cedar Creek. Work was completed between the mouth of Cayuse Creek and Oregon Gulch where over 10,000 cubic yards of material was moved off the floodplain and 312 trees were utilized in LWD jams. Realigning the road reactivated large portions of the floodplain and created buffer strips between the road and stream. Anchored large wood structures will create pools, substrate sorting, complexity, and add meander to the straightened channel over time. Primary benefits in the form of overwintering, spawning, and rearing habitat along with a connected floodplain are expected. Phase 1 project costs were provided by USFS in the amounts of $365,000 and Trout Unlimited for $90,600. The entirety of this funding was provided by USFS and Trout Unlimited.

Phase I example. Pre-implementation photo on the left; post implementation photo on the right.

Phase I example of LWD structures.

10.5.1.3 Objectives and Methods

This proposal for phase II includes rerouting a 0.18 section of road away from Cedar Creek and installing LWD in that section of stream to connect with work completed in 2015. The existing road alignment would be moved up against the hillside and the entire existing road prism and associated rip-rap would be removed down to floodplain and terrace elevations. This section was identified in the original assessment as an opportunity but sufficient funds were not secured for 2015 work. This reroute section would be one of the largest within the project area and further reduce sediment and provide for properly functioning channel and floodplain processes. Approximately 5-10 LWD structures would be augmented within this area to provide habitat, promote stream meandering and substrate sorting.

10.5.1.4 Schedule

Securing funding for the project has begun as well as preliminary design. NEPA is expected to occur in 2016 through use of a Categorical Exclusion. Project implementation is planned for summer of 2017 jointly with Trout Unlimited and Lolo National Forest.

10.5.1.5 Personnel

Paul Parson from Trout Unlimited (Middle Clark Fork Restoration Coordinator), Jon Hanson from Lolo NF (Fisheries biologist), and Nate Kegel (USFS engineer).

10.5.1.6 Budget

Cedar Creek Road Relocation Phase II	Amount	Status
Road relocation contract and LWD	$65,000	
Survey/design	$7,000	TU & USFS secured
NEPA/permitting	$2,500	USFS secured
Total Costs	$74,500	
Thompson Falls TAC Request	**$30,000**	
Future Fisheries (to be requested)	$20,000	
USFS (to be requested)	$15,000	

Project overview of existing Forest Road, Cedar Creek and proposed reroute as yellow path.

10.5.2 Beartrap Fork Creek Culvert Removal

Project Title: Beartrap Fork culvert removal
Proposal Submitted by: Lolo National Forest- Jon Hanson
Location: Project located on Beartrap Fork Creek a tributary to Fishtrap Creek in the Thompson River drainage. Partial barrier within ½ mile of confluence with Fishtrap Creek.
Total Project Cost: $ 25,400
TAC Funds Requested: $ 11,000

10.5.2.1 Introduction

Beartrap Fork is a large tributary to Radio Creek which flows into Fishtrap Creek in the Thompson River drainage. It is located approximately 2.5 miles upstream of the confluence of WF Fishtrap and Fishtrap Creek. WF Fishtrap is an important spawning tributary and accounts for a substantial amount of reproduction within the drainage. Electrofishing surveys in Fishtrap Creek in 2011 estimated bull trout abundance between 4.7 and 11.7 per 100m in three sites in the upper Fishtrap mainstem. A reach in lower Beartrap Creek was also sampled where 44 bull trout were captured (46.4/100m), and a reach one mile above site 1 observed no bull trout. Bull trout observed in lower Beartrap Creek appeared to be from the same cohort as they all ranged between 97 and 135mm. Repeat sampling in 2014 did not find bull trout in Beartrap Creek. The importance of the drainage in terms of bull trout is not entirely clear, but some occasional use clearly occurs in the lower sections below the culvert barrier. Westslope cutthroat are abundant throughout Beartrap.

Summer temperatures are <15˚C (GEI and Steigers 2013) in Radio Creek/Beartrap Fork. In 2012 at the confluence of Beartrap and Fishtrap the maximum weekly maximum temperature (MWMT) was 12.5˚C whereas the headwaters of Fishtrap Creek exceeded 17˚C. The coolwater inputs from Beartrap illustrate the importance to Fishtrap mainstem and the potential for Beartrap to at least provide thermal refuge to bull trout.

10.5.2.2 Objectives and Methods

The Forest Service signed a NEPA decision in 2005 in the Fishtrap area that included a variety of forest management activities and watershed restoration work. Since that time the majority of both the forest (harvest, weed spraying, planting) and watershed (LWD additions, BMP work, CMP replacements) work has been completed. The culvert on Beartrap Fork was identified as a partial fish barrier at higher flows, and possibly at low summer/autumn flows. Harvest beyond this culvert was identified as a combination of helicopter units and skyline logging. Skyline logging has been completed and reforestation and burning is planned in the future, given the cost of helicopter logging it is unlikely to occur. The road system above this culvert is also slated for decommissioning.

The Forest Service is proposing to remove the culvert and place a temporary bridge at the crossing until reforestation is completed. This would allow immediate fish passage without

having to wait ~5 years for the burning and reforestation to occur. Culvert and all fill would be removed and the stream channel reconstructed with natural channel simulation techniques, revegetation would also occur at the site. Approximately 5 miles of stream would be opened to fish passage. The alternative would be to wait till all forest activities are completed in the drainage and pull the culvert at this time.

10.5.2.3 Schedule

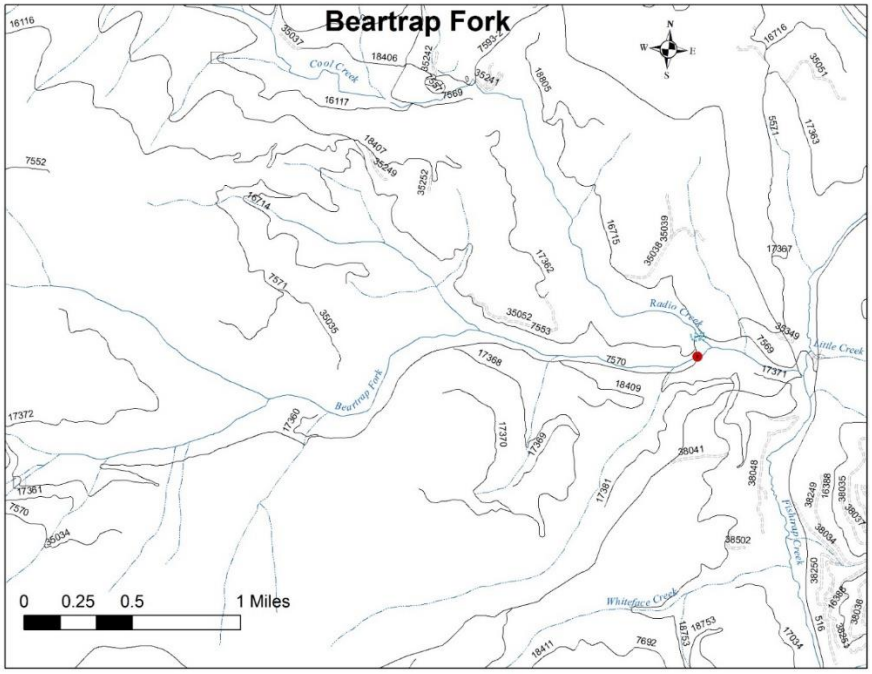
Project implementation is planned for summer of 2016.

10.5.2.4 Personnel

Jon Hanson from Lolo NF (Fisheries biologist), and Nate Kegel (USFS engineer).

10.5.2.5 Budget

Culvert and fill removal	$11,000
Temporary bridge installation	$14,500
Total Costs	$25,500
Thompson Falls TAC Request	**$11,000**
USFS ($7,500 secured)	$14,500



10.5.3 Rattlesnake Creek Fish Screen Project

Project Title: Rattlesnake Creek Fish Screen Project, Phase I
Proposal Submitted by: Rob Roberts, Trout Unlimited and Ladd Knotek, Montana FWP
Location of Proposed Project: Rattlesnake Creek, Missoula County, Montana
Total Project Cost: $26,625
TAC Funds (Cost-Share) Requested: $13,125

10.5.3.1 Introduction

Rattlesnake Creek flows for 26 miles, beginning in the Rattlesnake Wilderness north of Missoula, Montana and ending at its confluence with the Clark Fork River. Rattlesnake Creek is one of the major sources of trout recruitment for the middle Clark Fork River, a 100-mile reach of river located between Missoula and the Flathead River confluence. It supports a significant population of migratory bull trout and is one of only six major tributaries in the area known to support fluvial spawning. The creek also supports populations of native westslope cutthroat trout, mountain whitefish and sculpin, as well as wild rainbow trout, brown trout, and brook trout.

Within the lower five miles of Rattlesnake Creek, there are six irrigation ditches that divert water and could potentially entrain migratory and/or juvenile trout (see attached map and photos). Initial surveys and annual electrofishing (2000-2005) indicated that fish entrainment losses (including bull trout) were high in several of these diversions.

Four of the lower Rattlesnake Creek ditches were screened in the early 2000s by Montana FWP, the Lolo National Forest and partners. The Quast Ditch screen, a flat plate/paddle wheel design, has since been updated by the USFS and functions properly. In addition, a new diversion structure and Coanda fish screen were installed by Trout Unlimited on the Fredline Ditch in 2015. The three remaining screened diversions (Williams, Hamilton Day and Cobban) still have the original 'Brencail', manually cleaned, trough screens that were originally installed. These screens have reached end of their intended 10-year functional life and no longer adequately prevent fish entrainment. The Hollenbeck Ditch has never been screened.

Recently, stakeholders in the Rattlesnake Creek watershed (Trout Unlimited, Montana FWP, Lolo National Forest, etc.) met to discuss future activities and priorities for fisheries and riparian restoration. Fish screen and fish passage enhancements were identified as priorities. Therefore, Trout Unlimited plans to work with water users on the Williams, Hamilton Day and Cobban ditches to replace the outdated Brencail screens and possibly install a new fish screen on the Hollenbeck ditch. Phase I of this project will include a topographic survey of the four ditches and diversion structures, engineered screen designs and stakeholder negotiations.

This proposal requests partial 'seed' funds for survey and design on the four irrigation diversions that do not currently have functional fish screens. We anticipate installing flat plate, Coanda or other contemporary designs once the projects are fully developed. These funds are critical as

support for survey and design is a common bottleneck in implementing fisheries enhancement projects - most funding sources will only fund project implementation and many irrigators will not agree to projects unless they know what design would be installed. Once project designs and irrigator consent are obtained, we will secure implementation funds from the numerous available funding sources.

10.5.3.2 Objectives

The Rattlesnake Creek Fish Screen project was developed to protect native fish by ensuring safe upstream and downstream passage through the lower five miles of Rattlesnake Creek. Therefore, objectives for the project include:

- Improve fish passage for all life stages
- Prevent entrainment of salmonids at irrigation diversion sites
- Allow better control and lawful use of diverted water

10.5.3.3 Methods

The Williams, Hamilton Day, Cobban and Hollenbeck ditches are small diversions that each deliver approximately 2 CFS (or less) and are generally managed by individual or small groups of water users that hold legal water rights. The following table details the water right for each diversion and observed flows during the irrigation diversion survey:

Ditch	Water Right (cfs)	Avg Flow (cfs)	Max Flow (cfs)	Min Flow (cfs)
Williams Ditch	0.70	1.36	3.18	0.53
Hamilton-Day Ditch	1.00	1.51	1.75	1.28
Cobban Ditch	1.57	1.53	1.84	1.11
Hollenbeck Ditch	1.12	0.70	0.91	0.53

TU has already identified the water users with valid water rights for the four irrigation ditches. That table is attached as an appendix to this document. The land ownership for the four points of diversion are as follows:

- Williams Ditch – Lolo National Forest
- Hamilton Ditch – City of Missoula

- Cobban Ditch – City of Missoula
- Hollenbeck Ditch – Todd and Sabrina Donahue

Trout Unlimited anticipates the following steps in the planning and design of the diversion improvement and screen installation process:

- Contact land owners for permission to access the diversion sites
- Completed topographic survey of diversion sites
- Work with the qualified engineering firm to produce conceptual design for diversion structure and fish screen that delivers legally allocated water right and provides for instream fish passage at all flow levels
- Incorporate feedback from water users into final design
- Produce final design drawings and engineer's cost estimate
- Fundraising and permitting for project implementation

10.5.3.4 Anticipated Schedule

The following is a timeline for activities for Rattlesnake Creek Fish Screen Project in the 2016 season:

Feb – March 2016: Landowner/water user coordination
April – May 2016: Topographic surveys
May – June 2016: Conceptual designs
May – June 2016: Final designs
June – August 2016: Fundraising for project implementation
Fall 2016 - 2017 Project implementation

10.5.3.5 Personnel

Trout Unlimited will primarily be responsible for project development, contracting, grant reporting and project implementation. Montana FWP is involved in all aspects of planning as well as technical oversight. The following are the project staff for each organization that will be involved in the project:

Rob Roberts, Trout Unlimited – Rob is the project leader and primarily responsible for project planning and coordination with project partners. Rob is a full time staff person for TU and has

15 years experience working on mine reclamation and native fish habitat restoration in the Clark Fork River basin.

Casey Hackathorn, Trout Unlimited – Casey is the Upper Clark Fork coordinator for TU and has experience working on fish passage and fish screens on Harvey Creek, Silver Bow Creek, Browns Gulch, Cottonwood Creek and Rattlesnake Creek. Casey will also work on project planning and coordination for TU.

Ladd Knotek, Montana Fish, Wildlife and Parks – Ladd is the Montana FWP Region 2 Fisheries Biologist. Ladd is responsible for various aspects of fisheries and aquatic management on Rattlesnake Creek, including long term monitoring, fishing regulations, and stream permitting.

Shane Hendrickson, Lolo NF – Shane is the Fish Biologist for the Lolo National Forest covering Ninemile, Missoula and Seeley Lake Ranger Districts. Shane will serve as the project contact for the Lolo National Forest and advise on technical issues.

10.5.3.6 Budget for Phase I – Survey and Design

Item	NWE Cost	Match Cost	Total Cost
Direct Labor - Topographic Survey Crew (4 sites x $2,000 per) Design Engineer (4 sites x $4,500 per)	$ 12,500	$ 13,500 (Trout Unlimited)	$ 26,000
Direct Overhead - 5%	$ 625	$-	$ 625
Travel and Living	$-	$-	$-
Material and Equipment	$-	$-	$-
Totals	$ 13,125	$ 13,500	$ 26,625

Phase II will primarily involve installation of new screens and implementation of maintenance agreements with water users. Cost of Phase II is expected to be ~ $100,000, which will be requested from Future Fisheries Improvement Program and other funding sources.

10.5.3.7 Deliverables

Deliverables resulting from this project will include the completion of final engineering drawings and cost estimates for the fabrication and installation of four fish screens and associated diversions on the Williams, Hamilton Day, Cobban and Hollenbeck ditches on lower Rattlesnake Creek. The success of the project will be monitored through long-term tracking of fish entrainment in the ditches as compared to historical MFWP data.

10.5.3.8 Cultural Resources

This phase of the project does not involve any land-disturbing activity or the modification, renovation or removal of any building or structures. Cultural, permitting and other considerations will be incorporated into each project at the implementation phase.

10.5.4 Bull Trout Genetic Sampling and Analysis

During the annual TAC meeting in December 2015, the TAC approved $10,000 funding be made available to support the analysis of bull trout samples from the lower Clark Fork River. This funding will assist with the continued need for collecting DNA data to update bull trout mapping in the Clark Fork River. This funding will be used to generate or update that bull trout DNA database.

Project Title: Genetics sampling of Bull Trout
Proposal Submitted by: T Falls TAC
Location of Proposed Project: tributaries above Thompson Falls Dam
Total Project Cost: $10,000
TAC Funds (Cost-Share) Requested: $10,000

10.5.4.1 Introduction

Genetics are used for the mapping of unique Bull Trout populations in tributaries above Thompson Falls Dam. These unique populations must be genetically re-evaluated on a 5- to 10-year basis. This funding will be used for this re-evaluation.

10.5.4.2 Objectives

To keep a current data bank on genetics of Bull Trout populations above Thompson Falls Dam.

10.5.4.3 Methods

Biologists, with the approval of the TAC, will determine locations and timing of sampling of Bull Trout populations. They will also be required to collect and submit samples of targeted populations.

10.5.4.4 Schedule

Scheduling will be determined by regional biologists and approved by the TAC.

10.5.4.5 Personnel

Local biologists

10.5.4.6 Budget

Direct Expenses $10,000 cost of working samples

10.5.4.7 Deliverables

Reports of locations of samples will be submitted and included in annual report.

10.5.4.8 Cultural Resources

Cultural Resource Management (CRM) requirements for any activity related to this proposal must be completed and documented to NorthWestern Energy as a condition of any TAC grant. TAC funds may not be used for any land-disturbing activity, or the modification, renovation, or removal of any buildings or structures until the CRM consultation process has been completed. Agency applicants must submit a copy of the proposed project to a designated Cultural Resource Specialist for their agency. Private parties or non-governmental organizations are encouraged to submit a copy of their proposed project to a CRM consultant they may have employed. Private parties and non-governmental organizations may also contact the PPL Montana representative for further information or assistance. Applications submitted without this section completed, will be held by the TAC, without any action, until the information has been submitted.

Summarize below how you will complete requirements for Cultural Resource Management:

No disturbance will occur with the work.

11.0 Acknowledgements

This report was prepared by Kristi Webb, New Wave Environmental Consulting, and Ginger Gillin, GEI Consultants for NorthWestern Energy. The report was developed in coordination with stakeholder groups representing NorthWestern Energy, FWP, FWS, CSKT, USFS, MDEQ, Avista Corporation, and Plum Creek Timber Company. We would like to thank everyone and their organizations for their time and dedication with regards to their collaborative efforts in monitoring and reporting findings in support of improving fish passage in the lower Clark Fork River. Previous annual reports prepared in support of the Thompson Falls Project are available on the Thompson Falls Project website at http://thompsonfallsfishpassage.com/. Please contact NorthWestern Energy in Butte, Montana for any data requests.

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