PPL Montana, 45 Basin Creek Road, Butte, Montana 59701

PPLM-TFalls-3147

PPL MONTANA, LLC

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

March 20, 2014

RE: Filing 2013 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 the 2013 Annual Activity, Fish Passage and Bull Trout Take Report for the Thompson Falls Project which PPL Montana has 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. USFWS signature of approval (under their Section 7 Terms and Conditions Authority) for this report and Commission filing is included on page 2.

Sincerely,

Jon Jourdonnais
Manager Hydro Regulatory and Environmental Compliance

cc: Wade Fredenberg, USFWS
Tim Bodurtha, USFWS
Craig Barfoot, CSKT
Randy Apfelbeck, MDEQ
Kenneth Breidinger, MFWP
Jim Darling, MFWP
Brent Mabbott, PPLM
Andrew Welch, PPLM
Gordon Criswell, PPLM
Dave Kinnard, PPLM
Carrie Harris, PPLM
Ginger Gillin, GEI Consultants, Inc.
Kristi Webb, NewWave Environmental Consulting
Erich Gaedeke, FERC Portland

The USFWS has reviewed, and by signature below, approves this Thompson Falls Project 2013 Annual Activity, Fish Passage and Bull Trout Take Report filing with the Commission.

Timothy S Bodurtha
Name

Supervisor, Kalispell Sub-Office
USFWS Position

3/19/2014
Date

2013 Annual Report
Fish Passage Project
Thompson Falls Hydroelectric Project
FERC Project Number 1869

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

Submitted by:
PPL Montana, LLC
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 2014

Table of Contents

List of Tables

List of Figures

Acronyms

Adaptive management funding account	AMFA
Auxiliary water system	AWS
Avista Corporation	Avista
Biological Opinion	BO
Brook trout	EB
Brown trout	LL
Bull trout	BULL
Bullhead	BL BH
Catch per unit effort	CPUE
Celsius	C
Confederated Salish and Kootenai Tribes of the Flathead Nation	CSKT
Creek	Ck
Cubic feet per second	cfs
Degree	°
Electrofishing	EF
Federal Energy Regulatory Commission	FERC or Commission
Full-duplex	FDX
Gas Bubble Trauma	GBT
Global positioning system	GPS
Grams	g
Half-duplex	HDX
High-velocity jet	HVJ
Hours	hrs
Kilogram	kg
Lake trout	LT
Lake whitefish	L WF
Largemouth bass	LMB
Largescale sucker	LS SU
Length	L
Longnose dace	LN DC
Longnose sucker	LN SU
Memorandum of Understanding	MOU
Meter	m
Millimeter	mm
Montana Department of Environmental Quality	MDEQ
Montana Fish, Wildlife and Parks	FWP
Mountain whitefish	MWF
North	N
Northern pike	NP
Northern pikeminnow	N PMN
Number	n

Passive integrated transponder	PIT
Peamouth	PEA
Percent	%
Post meridiem	PM
PPL Montana, LLC	PPL Montana
Pumpkinseed	PUMP
Rainbow trout	RB
Rainbow x Westslope cutthroat trout	RBxWCT
Redside shiner	RS SH
Smallmouth bass	SMB
Technical Advisory Committee	TAC
Terms and Conditions	TCs
Thompson Falls	TFalls
Thompson Falls Hydroelectric Project	Project
Thompson Falls Upstream Fish Passage Facility	ladder
Total Dissolved Gas	TDG
U.S. Fish and Wildlife Service	FWS or Service
U.S. Geological Survey	USGS
Walleye	WE
Weight	Wt
West	W
West Fork	WFk
Westslope cutthroat trout	WCT
Year	yr
Yellow perch	YP

Plan Abbreviations

5-Year Reservoir Monitoring Plan, 2011-2015	5-Year Reservoir Plan
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

PPL Montana, LLC (PPL Montana) 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 (now PPL Montana) 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. PPL Montana conducted 5 years of studies and filed a Biological Evaluation with the Commission on April 7, 2008 discussing the effects of the Thompson Falls Hydroelectric Project (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) on May 1, 2008. On November 4, 2008 the FWS filed with the Commission a Biological Opinion (FWS, 2008) and an associated Incidental Take Statement, which includes reasonable and prudent measures, and Terms and Conditions 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 (FERC, 2009). This Order included the reasonable and prudent measures, Terms and Conditions, and conservation recommendations from the Biological Opinion. The FERC agreed with the FWS's conclusion that the Project is currently adversely affecting bull trout and PPL Montana's proposed conservation measures will reduce, but not totally eliminate, adverse impacts of the Project.

The FERC Order required PPL Montana 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 Terms and Conditions. In addition to the requirements stipulated in Term 7a, the annual report shall also address the Licensee's compliance with the FWS's Terms and Conditions.

This report is intended to fulfill the annual reporting requirement, as specified in Term 7a of the Biological Opinion and the requirements of the FERC Order. This report summarizes PPL Montana's 2013 activities (Sections 2.0 through 7.0), PPL Montana's compliance with the FWS's Terms and Conditions of the Biological Opinion (Section 8.0), and PPL Montana's proposed actions in 2014 (Section 9.0).

Baseline Fisheries Studies

In 2013, PPL Montana continued to collect baseline fisheries data as presented in Section 2.0 of this report. Baseline fisheries data includes spring electrofishing the Thompson Falls Reservoir;

fall electrofishing in Thompson Falls Reservoir above the Island Complex; and fall gillnetting in Thompson Falls Reservoir.

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

In 2011, FERC issued two Orders, one on June 9, 2011 approving PPL Montana'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 PPL Montana's *Final Thompson Falls Fish Ladder – Fishway Operations Manual 1.0* (PPL Montana, 2010a). The Thompson Falls Upstream Fish Passage Facility (ladder) became operational in 2011. PPL Montana implemented the third year of studies as outlined in the Fish Passage Evaluation Plan and the 2013 data are presented in Section 3.0.

In 2013, the ladder commenced operation on March 13, 2013 (first check for fish was completed on March 14) and was winterized on October 15, 2013. There were two 7-day operational closures in mid-March and in mid-April due to mechanical issues. Unlike 2011 and 2012, there were no ladder closures due to high spring flows.

During ladder operations in 2013, the ladder operated in orifice mode for the entire season. Approximately 3,830 fish representing nine species and one hybrid, including five bull trout ascended the ladder. There were a total of 12 fish mortalities (5 largescale suckers; 4 brown trout 2 rainbow trout; and 1 smallmouth bass) at the ladder and/or shortly after the release of fish upstream. As in previous years, lake trout and walleye were not authorized by Montana Fish, Wildlife and Parks (FWP) for release upstream if captured in the ladder. In 2013, no lake trout or walleye ascended the ladder. Additional details summarizing the number and size of fish and species, timing of fish ascending the ladder, recaptures, fallback, movement patterns, etc., are provided in Section 3.0.

Avista Bull Trout Passage and Monitoring

In 2013 Avista transported 40 bull trout from downstream of Cabinet Gorge Hydroelectric Project to Cabinet Gorge Reservoir (n = 16); Noxon Reservoir (n = 16); and upstream of the Project (n = 8). The eight bull trout transported upstream of the Project were passive integrated transponder (PIT) tagged (not radio tagged) and released in the Thompson River drainage.

Total Dissolved Gas and Gas Bubble Trauma Monitoring

In 2012, the Thompson Falls Fisheries Technical Advisory Committee (TAC) agreed to initiate total dissolved gas and gas bubble trauma monitoring when and if streamflows reached or exceeded 75,000 cubic feet per second (cfs). In 2013, mean daily streamflows taken from the U.S. Geological Survey (USGS) gage station (#12389000) in the Clark Fork River near Plains, Montana peaked at approximately 62,600 cfs on May 15. Because the streamflows did not reach or exceed 75,000 cfs in 2013, no total dissolved gas or gas bubble trauma monitoring was completed below Thompson Falls Dam.

Thompson River Drainage (5-Year Reservoir Plan)

In 2010, PPL Montana developed and submitted the *5-Year Reservoir Monitoring Plan*, 2011-2015 (PPL Montana, 2010b) (5-Year Reservoir Plan) to the Commission in compliance with Term 5a of the FWS's Biological Opinion Terms and Conditions. The Commission issued an Order on February 9, 2011 approving the 5-Year Reservoir Plan, and PPL Montana began implementation in 2011.

The overall goal of the 5-Year Reservoir Plan is to gather information that will assist in developing recommendations to *maximize survival of out-migrant juvenile and adult bull trout through Thompson Falls Reservoir and Dam* (PPL Montana, 2010b). In order to address this goal, two objectives were identified including the:

1. Characterization of bull trout in the Thompson River drainage.
2. Characterization of the effects of Thompson Falls Reservoir on bull trout emigrating from the Thompson River drainage and migrating downstream in the Clark Fork River.

Activities that have been completed since 2010 and are proposed in 2014 in support of the 5-Year Reservoir Plan include the following:

- A fish survey was completed in West Fork Thompson River in 2010 (PPL Montana, 2012).
- A fish survey was completed in Fishtrap Creek in 2011 (PPL Montana, 2012).
- A Thompson River Drainage database documenting available records from 1973 through 2011 was completed in 2012 (PPL Montana, 2012).
- *Thompson River Bull Trout Enhancement and Recovery Plan* (GEI Consultants, Inc. and Steigers Corporation, 2013) was prepared in 2012 (PPL Montana, 2013).
- Fish surveys were completed in four tributaries in the Thompson River, including Lazier Creek, Indian Creek, Twin Lakes Creek, and Big Rock Creek in 2013. The 2013 efforts were funded by the TAC (Sections 5.1 and 7.1.1).
- Fish surveys in Thompson River tributaries Mudd Creek, Murr Creek, and Alder Creek are proposed for 2014.
- A juvenile bull trout out-migration study is scheduled to start in 2014 and end in 2016 in the Thompson Falls Reservoir (Section 9.5.1).

Bull Trout Incidental "Take"

In 2013, PPL Montana collected a total of six bull trout (1 via electrofishing above Thompson Falls Dam; 5 at the ladder), all of which were released live. In 2012, PPL Montana collected a total of seven bull trout (4 via electrofishing above the dam; 1 electrofishing below the dam; 2 at the ladder), of which six individuals were released live and one bull trout died. In 2011, PPL Montana collected a total of five bull trout (3 via electrofishing below the dam; 2 at the ladder),

all of which were released live. A summary of bull trout collected by PPL Montana in 2013 is provided in the table below.

Date	# of Bull Trout	PIT Tag	Length (mm)	Location	Status (Alive/Dead)	Genetic Assignment
4/10/2013	1	982000357016097	260	Upper Section, TFalls Reservoir	Alive	Fishtrap Ck (R4)
4/30/2013	1	982000357016065	598	TFalls Ladder	Alive	Fish Ck (R4)
5/6/2013	1	982000357016109	576	TFalls Ladder	Alive	Fishtrap Ck (R4)
5/7/2013	1	982000357016155	478	TFalls Ladder	Alive	Fishtrap Ck (R4)
6/7/2013	1	HDX PIT tag implanted, but number was not recorded	596	TFalls Ladder	Alive	Fishtrap Ck (R4)
8/9/2013	1	982000357016151	482	TFalls Ladder	Alive	Fishtrap Ck (R4)

TAC-Funded Projects

In 2013, PPL Montana renewed the Memorandum of Understanding (MOU) 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 PPL Montana.

The terms of the renewed MOU (2014-2020) are similar to the first term of the MOU (2009-2013). The adaptive management funding account (AMFA) will start with $150,000 on January 1, 2014. PPL Montana 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 2013, PPL Montana, through the TAC, allocated funds for bull trout protection, mitigation, or enhancement either in whole or in partnership to the following projects:

- Thompson River tributary fish surveys
- Spatially explicit decision support modeling in support of strategic prioritization of native trout restoration in the lower Clark Fork River
- Improvement of the bull trout genetic baseline database
- Funding approved for the 3-year (2014-2016) Thompson Falls Reservoir study of juvenile bull trout out-migration and purchase of supporting equipment (e.g., transmitters, receive, mobile tracking data logger and hydrophone)

Summary reports for the projects listed above that were completed in 2013, in addition to two projects that received funding in 2012 but were not implemented until 2013, are presented in Section 7.0. The projects funded in 2012 included the PIT tag array reader for deployment in Prospect Creek to monitor bull trout movement and the genetics study to identify a bull trout sex identification marker.

During the 2013 annual meeting, the Thompson Falls Fisheries TAC authorized funding for continued improvement of the bull trout genetic baseline database in 2014. Progress reports and results related to the Thompson Falls Reservoir study of juvenile bull trout out-migration and bull trout genetics sampling and analysis planned for 2014 will be provided in the 2014 Annual Report.

1.0 Introduction

1.1 Background

PPL Montana, LLC (PPL Montana) 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 (now PPL Montana) 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). 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 Thompson Falls Hydroelectric Project (Project) and submitted to FWS and FERC in 2003.

After 5 years of studies, PPL Montana 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. PPL Montana's 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, PPL Montana 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 PPL Montana, the Confederated Salish and Kootenai Tribes of the Flathead Nation (CSKT), Montana Fish, Wildlife and Parks (FWP), and FWS (MOU, 2008). In 2013, PPL Montana filed the renewed MOU with the Commission on November 11, 2013. The renewed MOU was developed in consultation with CSKT, FWP, and FWS and will be 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 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.

[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.

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 PPL Montana'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 BO.

1.2 Compliance with the FERC Order

The FERC Order required PPL Montana 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, PPL Montana 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[2] of the FWS's TCs. In addition to the requirements stipulated in Term 7a the report should 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 PPL Montana's 2013 activities in Sections 2.0 through 7.0, PPL Montana's compliance with the FWS's TCs of the BO (Section 8.0), and PPL Montana's proposed actions in 2014 (Section 9.0).

[2] Term 7a states,

> Annually, by April 1 of each year for the remainder of the License (expires 2025), PPL Montana will prepare and submit to the Service [FWS] 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.

2.0 Baseline Fisheries Studies

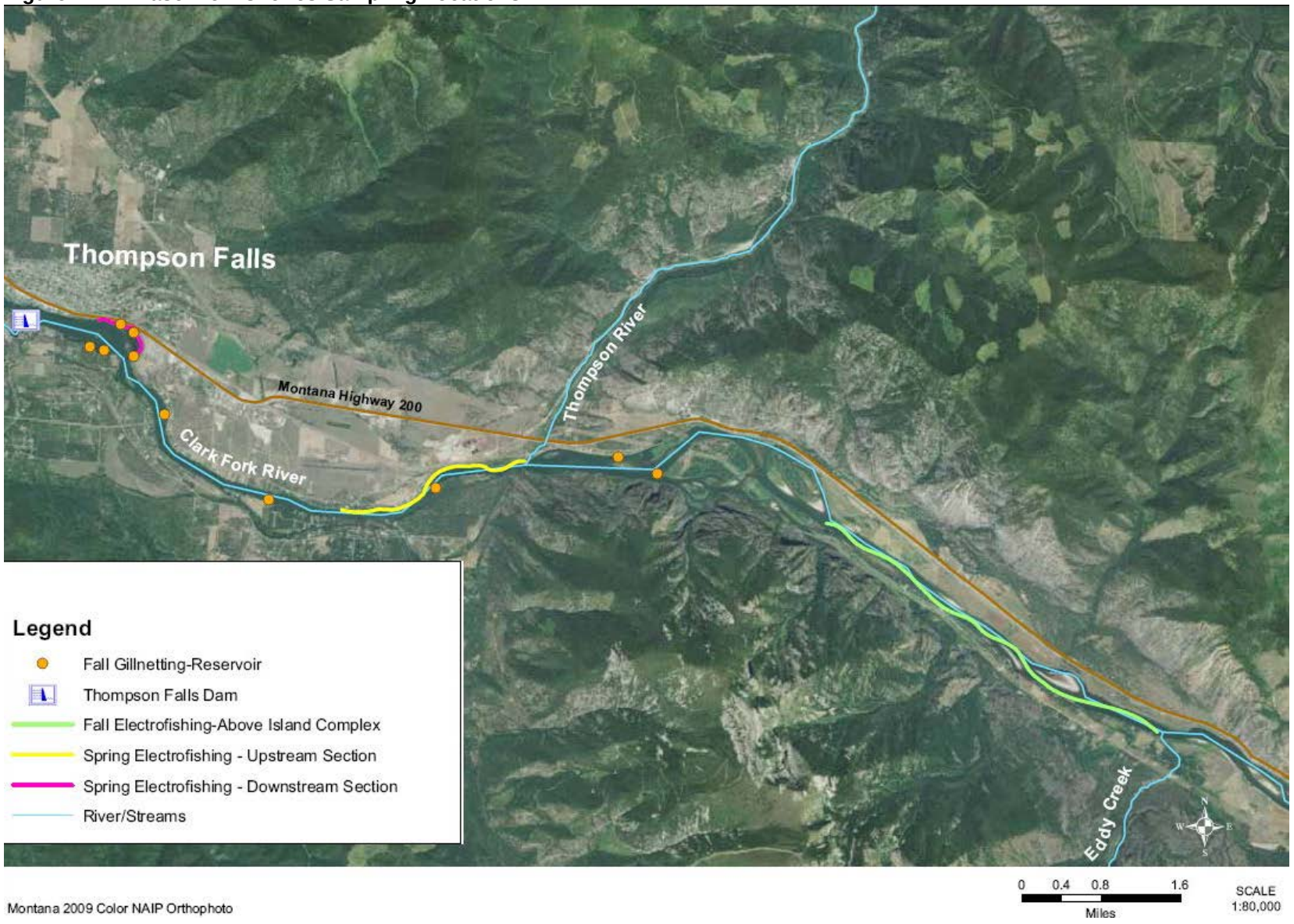
Fisheries monitoring of the Thompson Falls Reservoir using gillnets and electrofishing has been conducted annually, within the same general time frame, since 2004. The locations for fall and spring electrofishing and fall gillnetting completed in 2013 are displayed in Figure 2-1. In 2010, PPL Montana 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 electrofished in the fall of 2010, 2011, and 2012. In 2012, PPL Montana proposed and the TAC agreed to continue sampling the Plains to Paradise reach of the Clark Fork River every other year, with the next survey scheduled for fall 2014.

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 newly constructed 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.

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*
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*
RBxWCT	Rainbow x Westslope cutthroat hybrid	*Oncorhynchus clarkii lewisi x 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*

Figure 2-1: Baseline Fisheries Sampling Locations.



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.

In 2013 sampling occurred on April 10 and 11, which was similar to the sampling dates from previous years as shown in Table 2-2. The water temperature and duration of electrofishing in the lower and upper sections each year from 2009 to 2013 is also summarized in Table 2-2.

Table 2-2: Summary of electrofishing efforts completed in the lower and upper sections of the Thompson Falls Reservoir, including date, water temperature, and duration of electrofishing effort between 2009 and 2013.

Lower Section			Upper Section		
Date	**Temperature ºC**	**Duration of Electrofishing (hrs)**	**Date**	**Temperature ºC**	**Duration of Electrofishing (hrs)**
April 20, 2009	10	0.6	April 21, 2009	10.5	0.6
April 28, 2010	9	0.9	April 29, 2010	7.5	2.1
April 13, 2011	5.8	1.0	April 14, 2011	5.1	1.9
April 16, 2012	7.4	0.8	April 17, 2012	7.2	1.9
April 11, 2013	**7.0**	**0.9**	**April 10, 2013**	**7.0**	**1.9**

Summaries from 2009 to 2013 catch per unit effort (CPUE, fish per hour) are provided in Tables 2-3 and 2-4 for the lower and upper sections, respectively.

2.1.1 Lower Section

In 2013, spring electrofishing in the lower section captured a total of 91 fish representing seven species of which, there were two salmonid species. The species included 46 yellow perch, 30 northern pike, six rainbow trout, three northern pikeminnow, two largemouth bass, two brown trout, and two largescale suckers (Table 2-3).

Between 34 and 97 individual fish representing seven to 15 species were recorded during each annual spring electrofishing survey from 2009 to 2013 in the lower section. The representation of

species was relatively consistent between 2009 and 2011 (8 to 9 species), increased to 15 species in 2012, and then declined to seven species in 2013. In 2012, the largest number of salmonid species (n=5) and largest grand total of individual salmonids (n=17) were recorded in the lower section. In 2013, two salmonid species were observed, which was consistent with observations in 2009, 2010, and 2011. However, in contrast to 2009, 2010, and 2011 sampling events, there were more individual salmonids observed in 2013 (n=8) and in 2012 (n=17). In 2009, 2010, and 2011 there were only one to two salmonids observed annually.

In 2013, CPUE in the lower section appeared to increase for northern pike, yellow perch, and rainbow trout while showing a decline for other species such as brown trout, largemouth bass, largescale sucker, and northern pikeminnow compared to previous years (Table 2-3). In contrast to some previous years, black bullhead, bull trout, longnose sucker, peamouth, pumpkinseed, smallmouth bass, and westslope cutthroat trout were not observed during sampling in the lower section in 2013.

2.1.2 Upper Section

The 2013 sampling of the upper section resulted in 229 fish captured representing nine species, including five species of salmonid and one salmonid hybrid (Table 2-4). These species included 72 largescale sucker, 44 rainbow trout, one rainbow x westslope cutthroat hybrid, 29 northern pikeminnow, 27 brown trout, 21 westslope cutthroat trout, 21 mountain whitefish, 11 northern pike, one smallmouth bass, one redside shiner, and one bull trout (260 millimeters [mm] and 108 grams [g]). A passive integrated transponder (PIT) tag (#982000357016097) was inserted into the one bull trout collected and the fish was released live. A genetics sample was also taken and the results indicate the most likely population of origin for the bull trout is Fishtrap Creek, a tributary to the Thompson River (Section 3.2.10).

Between 66 and 253 individual fish representing nine to 11 species were recorded during each annual spring electrofishing survey from 2009 to 2013 in the upper section. The representation of species has been relatively consistent through the years with the highest number of species (n=11) observed in 2012; the second highest number of species (n=10) observed in 2009; and nine species observed annually in 2010, 2011, and 2013. Overall, the total number of fish recorded in 2013 (n=229) was slightly lower than in 2012 (n=253), but remained greater than the total number of fish recorded in 2009 (n=79), 2010 (n=63), and 2011 (n=148). The overall CPUE in 2013 was 120.4, lower than in 2009 and 2012, however the CPUE for salmonids (60.4) was the highest for the period of record. The total number of individual salmonids also continued to increase (to 115 salmonids) in 2013.

In 2013, CPUE in the upper section appeared to increase for brown trout, mountain whitefish, northern pike, and westslope cutthroat trout while CPUE for largescale suckers, northern pikeminnow, rainbow trout (and hybrids), and smallmouth bass appeared to decline compared to 2012. The CPUE for westslope cutthroat trout (11.0) in 2013 far exceeded previous years.

Table 2-3: Summary of spring electrofishing results in the Thompson Falls Reservoir lower section, including number of species and CPUE (catch per hour) from 2009-2013.

Species	Lower Section 2009		Lower Section 2010		Lower Section 2011		Lower Section 2012		Lower Section 2013	
	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE
BL BH	2	3.4	1	1.1	0	0	1	1.2	**0**	**0**
BULL	0	0	0	0	0	0	1	1.2	**0**	**0**
LL	0	0	0	0	0	0	9	10.9	**2**	**2.2**
LMB	20	34	3	3.3	7	6.9	8	9.7	**2**	**2.2**
LN SU	0	0	0	0	0	0	6	7.3	**0**	**0**
LS SU	11	18.7	3	3.3	1	1	23	27.9	**2**	**2.2**
MWF	0	0	0	0	0	0	1	1.2	**0**	**0**
NP	10	17	14	15.2	17	16.8	10	12.1	**30**	**33.6**
N PMN	7	12	1	1.1	1	1	17	20.6	**3**	**3.4**
PEA	0	0	0	0	0	0	1	1.2	**0**	**0**
PUMP	2	3.4	2	2.2	5	4.9	2	2.4	**0**	**0**
RB	0	0	0	0	1	1	4	4.8	**6**	**6.7**
RS SH	1	1.7	0	0	0	0	0	0	**0**	**0**
SMB	0	0	0	0	0	0	1	1.2	**0**	**0**
WCT	1	1.7	1	1.1	1	1	2	2.4	**0**	**0**
YP	3	5.1	25	27.2	1	1	11	13.3	**46**	**51.6**
Subtotal Salmonids	1	1.7	1	1.1	2	2	17	33.9	**8**	**9.0**
TOTAL FISH	**57**	**97**	**50**	**54.5**	**34**	**33.6**	**97**	**117.4**	**91**	**102.1**

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 of species and CPUE (catch per hour) from 2009-2013.

Species	Upper Section 2009		Upper Section 2010		Upper Section 2011		Upper Section 2012		Upper Section 2013	
	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE
BL BH	2	3.4	0	0	0	0	0	0	**0**	**0**
BULL	0	0	0	0	0	0	1	0.5	**1**	**0.5**
LL	2	3.4	5	2.4	8	4.2	21	11.2	**27**	**14.2**
LN SU	0	0	1	0.5	0	0	0	0	**0**	**0**
LS SU	51	86.2	15	7.2	61	32.1	119	63.6	**72**	**37.8**
LT	1	1.7	0	0	0	0	0	0	**0**	**0**
MWF	1	1.7	1	0.5	12	6.3	19	10.1	**21**	**11.0**
NP	6	10.1	8	3.9	8	4.2	4	2.1	**11**	**5.8**
N PMN	6	10.1	3	1.4	17	8.9	35	18.7	**29**	**15.2**
RB	6	10.1	26	12.6	31	16.3	47	26.1	**44**	**23.1**
RBxWCT	0	0	0	0	0	0	2	1.1	**1**	**0.5**
RS SH	2	3.4	0	0	0	0	1	0.5	**1**	**0.5**
SMB	2	3.4	0	0	1	0.5	2	1.1	**1**	**0.5**
WCT	0	0	3	1.4	3	1.6	2	1.1	**21**	**11.0**
YP	0	0	1	0.5	7	3.7	0	0	**0**	**0**
Subtotal Salmonids	10	16.9	35	17	54	28.4	92	49.1	**115**	**60.4**
TOTAL FISH	**79**	**133.5**	**63**	**30.4**	**148**	**77.8**	**253**	**135.1**	**229**	**120.4**

2.1.3 Summary

In 2013, a total of 229 fish were observed in the upper section compared to 91 fish in the lower section. Species composition varied greatly between sections (Figure 2-2). Northern pike and yellow perch dominated the species composition in the lower section while several species including largescale suckers, rainbow trout, northern pikeminnow, brown trout, mountain whitefish, and westslope cutthroat trout dominated the species composition in the upper section. In 2013, salmonids were more abundant in the upper section (n=115) *versus* the lower section (n=8) and several species such as bull trout, mountain whitefish, rainbow x westslope cutthroat hybrids, redside shiner, smallmouth bass, and westslope cutthroat were observed in the upper section but not in the lower section.

Collectively between 2009 and 2013, there were a total of 16 species detected in the lower section compared to 15 species in the upper section. Although a similar number of species was detected in both sections, total CPUE has generally been greater in the upper section *versus* the lower section (with the exception of the 2010 spring survey) (Figure 2-3).

In 2013, species diversity and the number of salmonids was greater in the upper section compared to the lower section. Similar results were also observed in 2009, 2010, and 2011. The only exception was in 2012 when species diversity was greater in the lower section *versus* the upper 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 compared to the lower sampling section, which is closer to the dam.

Figure 2-2: Summary of CPUE by species during spring electrofishing in the lower and upper sections of the Thompson Falls Reservoir in 2013.

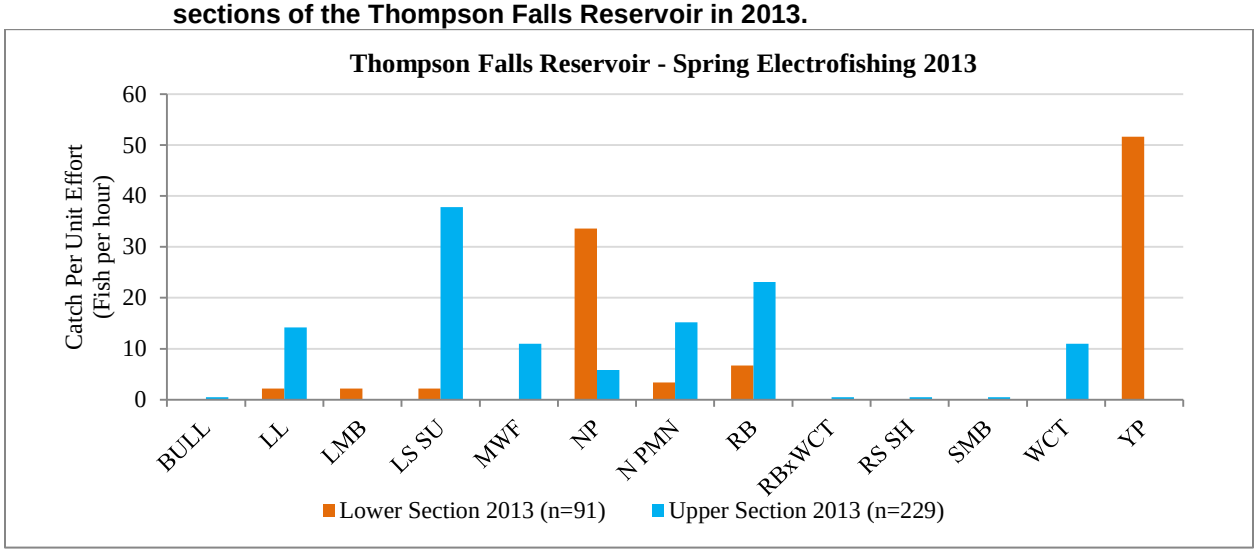
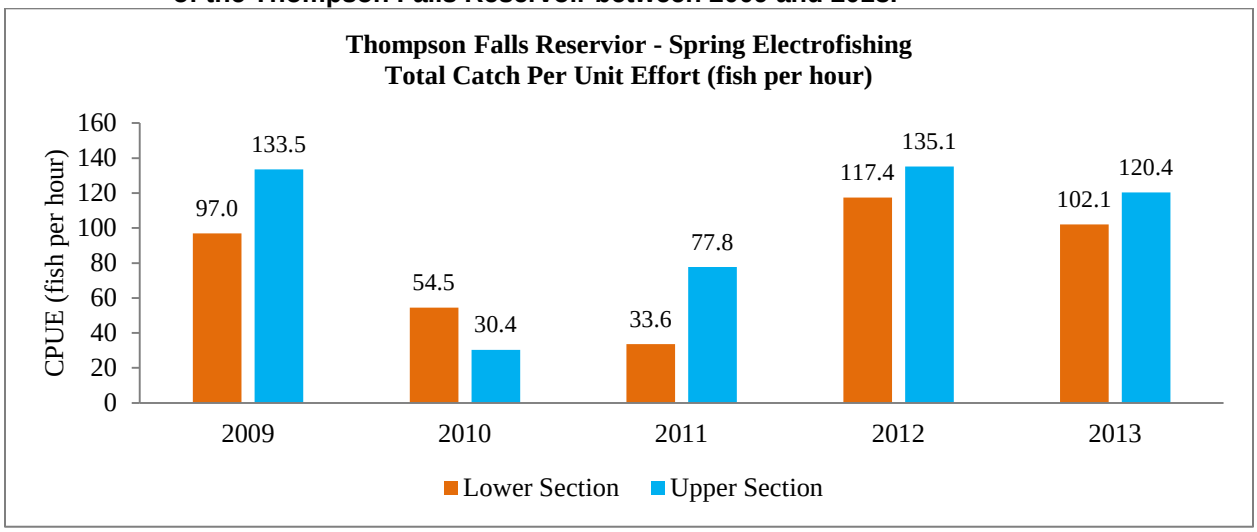


Figure 2-3: Summary of total CPUE during spring electrofishing in the lower and upper sections of the Thompson Falls Reservoir between 2009 and 2013.



2.2 Fall Electrofishing

2.2.1 Electrofishing above the Island Complex

In 2013 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 fall electrofishing section (Eddy Creek to the Island Complex) is characterized as riverine habitat. The 2013 survey covered the same length of reach surveyed in 2012, 2011, and 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 2009.

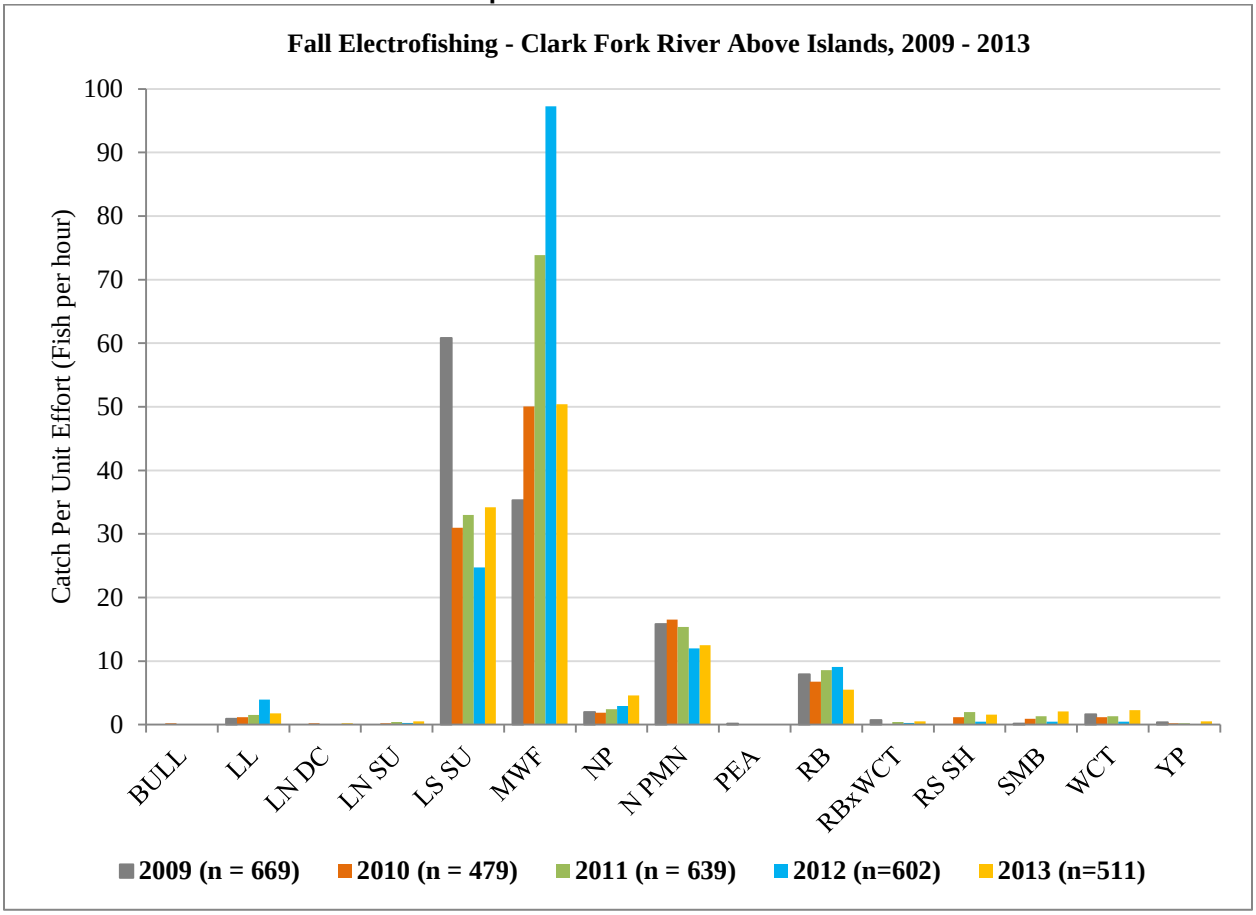
In 2013, river left was electrofished the night of October 22 and river right was electrofished the night of October 23. A summary of the CPUE for river left and right combined is provided for each year of sampling from 2009 through 2013 in Table 2-5. The CPUE are displayed by species for each year. The duration of the electrofishing was approximately 5.6 hours in 2009; 4.3 hours in 2010; 4.6 hours in 2011; 4.1 hours in 2012; and 4.4 hours in 2013.

Table 2-5: Fall electrofishing CPUE in the Clark Fork River Above the Island Complex from 2009 to 2013. CPUE represents river right and river left combined.

Species	2009		2010		2011		2012		2013	
	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE	Number	CPUE
BULL	0	0	1	0.2	0	0.0	0	0.0	0	0.0
LL	5	0.9	5	1.2	7	1.5	16	3.9	8	1.8
LN DC	0	0.0	1	0.2	0	0.0	0	0.0	1	0.2
LN SU	0	0.0	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
MWF	196	35.3	215	50.1	336	73.8	397	97.3	221	50.4
NP	11	2.0	8	1.9	11	2.4	12	2.9	20	4.6
N PMN	88	15.8	71	16.5	70	15.4	49	12.0	55	12.5
PEA	1	0.2	0	0.0	0	0.0	0	0.0	0	0.0
RB	44	7.9	29	6.8	39	8.6	37	9.1	24	5.5
RBxWCT	4	0.7	0	0.0	2	0.4	1	0.2	2	0.5
RS SH	0	0.0	5	1.2	9	2.0	2	0.5	7	1.6
SMB	1	0.2	4	0.9	6	1.3	2	0.5	9	2.1
WCT	9	1.6	5	1.2	6	1.3	2	0.5	10	2.3
YP	2	0.4	1	0.2	1	0.2	0	0.0	2	0.5
Subtotal Salmonids	258	46.4	255	59.4	390	85.7	453	111.0	265	60.4
TOTAL FISH	**699**	**125.8**	**479**	**111.6**	**639**	**140.4**	**620**	**151.9**	**511**	**116.5**

The 2013 electrofishing collected 511 fish (right and left banks combined) representing 12 species and one hybrid, of which four species and one hybrid were salmonids (brown trout, mountain whitefish, rainbow trout, rainbow x westslope cutthroat trout, and westslope cutthroat trout). The results from 2013, including species composition and CPUE were similar to previous years. Between 2009 and 2013, the total number of fish collected varied between 479 fish in 2010 to 669 fish in 2009 with approximately 10 to 12 species represented each sample year. CPUE has varied from 111.6 in 2009 to 151.9 in 2012. Mountain whitefish appear to show the greatest variability in CPUE over the years with the highest CPUE in 2012 (97.3 fish per hour) and the lowest CPUE in 2009 (35.3 fish per hour). Although the number of fish has varied, the CPUE for the fish species (excluding largescale suckers in 2009 and mountain whitefish) show relatively consistent CPUE from year to year (Figure 2-4).

Figure 2-4: Summary of total catch per unit effort (CPUE, fish per hour) during fall electrofishing in the above islands complex in the Clark Fork River between 2009 and 2013.



2.3 Fall Gillnetting

Fall gillnetting in the Thompson Falls Reservoir has been performed in designated locations since (Figure 2-1) 2004. Fall gillnetting occurs each year in October, in which 10 gillnets are set (with the exception of the 2004 sampling year where only 6 nets were set) (Table 2-6).

Table 2-6: Summary of gillnetting dates, number of nets set, total number of fish captured, and total number of species represented during gillnetting activities in Thompson Falls Reservoir from 2004 to 2013.

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**

The 2013 annual fall gillnet monitoring of the Thompson Falls Reservoir began on October 22 by setting a 125-foot-long by 6-foot-wide variable mesh net at each of the 10 established locations in the Thompson Falls Reservoir (Figure 2-1). Nets were set for approximately 21 to 22 hours and pulled on October 23. The mean catch per net has varied widely by species and between years (Table 2-7).

In 2013, a total of 40 fish representing six species were captured during gillnetting efforts. Northern pike were the dominant species (n=21) followed by largescale suckers (n=6), northern pikeminnow (n=6), yellow perch (n=5), smallmouth bass (n=1), and black bullhead (n=1).

Since 2004, the number of species represented in the annual gillnetting efforts has ranged from six species in 2009 and 2013 to as many as nine species in 2007, 2010, and 2011. The total number of fish captured has also varied between 33 fish in 2011 to 122 fish in 2007.

Between 2004 and 2007 black bullheads were the predominant fish caught gillnetting. Although black bullhead were still present in 2008, the most dominant species were pumpkinseed, followed by northern pike and largescale suckers. Since 2009, only one black bullhead (in 2013) has been recorded via gillnetting in the Thompson Falls Reservoir. From 2009 to 2013, northern pike have been the predominant species caught gillnetting. In addition between 2009 and 2012, three salmonid species (rainbow, westslope cutthroat, and brown trout) were recorded gillnetting. Variability in the annual number of fish captured and species composition may have been influenced by drawdown activities that occurred in fall 2008 and summer 2011. The drawdown of the Thompson Falls Reservoir often results in a short-term reduction in the lacustrine habitat typically available at full pool.

Table 2-7: Mean catch per net, by species, during annual October gillnetting series on Thompson Falls Reservoir from 2004 to 2013. 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
BL BH	2.8	3.4	8.3	6	0.6	-	-	-	-	0.1
LL	-	-	-	-	-	-	-	-	0.2	-
LMB	0.2	-	-	0.3	-	-	-	0.1	-	-
LN SU	0	-	-	-	-	-	0.1	0.5	-	-
LS SU	0.7	1.3	0.7	1	0.8	1.2	0.8	0.6	1.3	0.6
NP	1.3	1.8	1.7	2	1.3	3.1	2.4	1.0	2.4	2.1
N PMN	0.2	0	0.5	0.5	0.2	0.8	0.3	0.3	0.3	0.6
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	-	-	-
RB	-	-	-	-	-	0.2	0.2	-	0.4	-
SMB	0.3	0.1	-	0.5	0.1	-	0.1	0.1	0.3	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

3.0 Upstream Fish Passage

3.1 2013 Upstream Fish Passage Facility Evaluation

The FERC issued an Order on June 9, 2011 approving PPL Montana'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 three full seasons (2011, 2012, and 2013). PPL Montana has implemented the first 3 years of studies outlined in the Fish Passage Evaluation Plan.

3.2 Effectiveness of Fish Passage

The following sections summarize the results from the ladder from 2013. The data were collected to evaluate the effectiveness of the ladder. The ladder results provided in this report include the following:

- Total number of days the ladder was in operation
- Clark Fork River hydrology
- Total number of fish and species ascending the ladder
- Total number of fish and species passed to the Thompson Falls Reservoir
- Number of fish recaptures at the Thompson Falls Dam
- Number of fish which fallback after passing the Thompson Falls Dam
- Most active period(s) for fish and various species ascending the ladder
- Time it took for fish to ascend the ladder
- Results from the weir mode (notch *vs.* orifice) study and attraction flow studies
- Bull trout genetic sampling and tributary assignment

3.2.1 Ladder Operations

The opening and closing dates for the ladder operations were the same in 2013 as they were in 2012. The ladder was operational for 202 days in 2013. The ladder opened on March 13, 2013 and closed for the year (winterized) on October 15, 2013. The ladder operated in orifice mode for the entire season. During the 2013 season, the holding pool at the top of the ladder was typically checked once a day (morning) for fish, for a total of 147 ladder checks. Below is a table summarizing periods of time the ladder was in operation (Table 3-1).

Table 3-1: Summary of when the ladder was in operation and the number of days the ladder was checked for fish in 2013.

Date Open in 2013	Date Closed in 2013	# of Days Ladder In Operation	# Times the Ladder Checked for Fish
March 13	March 19	6	4
March 26	April 12	17	13
April 19	October 15	179	130
Total		**202**	**147**

In 2012, the ladder was in operation for 194 days between March 13 and October 15 and the ladder was checked 168 times. In 2011, the ladder was in operation for 132 days between March 17 and October 17 and the ladder was checked 160 times. Details of the 2012 and 2011 operations are provided in the 2011 and 2012 Annual Reports, respectively (PPL Montana, 2012 and 2013).

The ladder was closed twice in spring 2013, each time for a 7-day period, due to mechanical issues. The first closure occurred between March 19 and 25; the second closure occurred between April 12 and 19.

After the 2011 season, PPL Montana proposed to operate the ladder when streamflows were equal or less than 50,000 cubic feet per second (cfs). In 2012, ladder operations were not practicable during the initial spring freshet (end of April 2012) when streamflows exceeded 70,000 cfs; however, ladder operations were able to continue when streamflows exceeded 60,000 cfs. In 2013, the ladder was able to operate throughout the spring with peak flows exceeding 62,000 cfs at the Thompson Falls Dam.

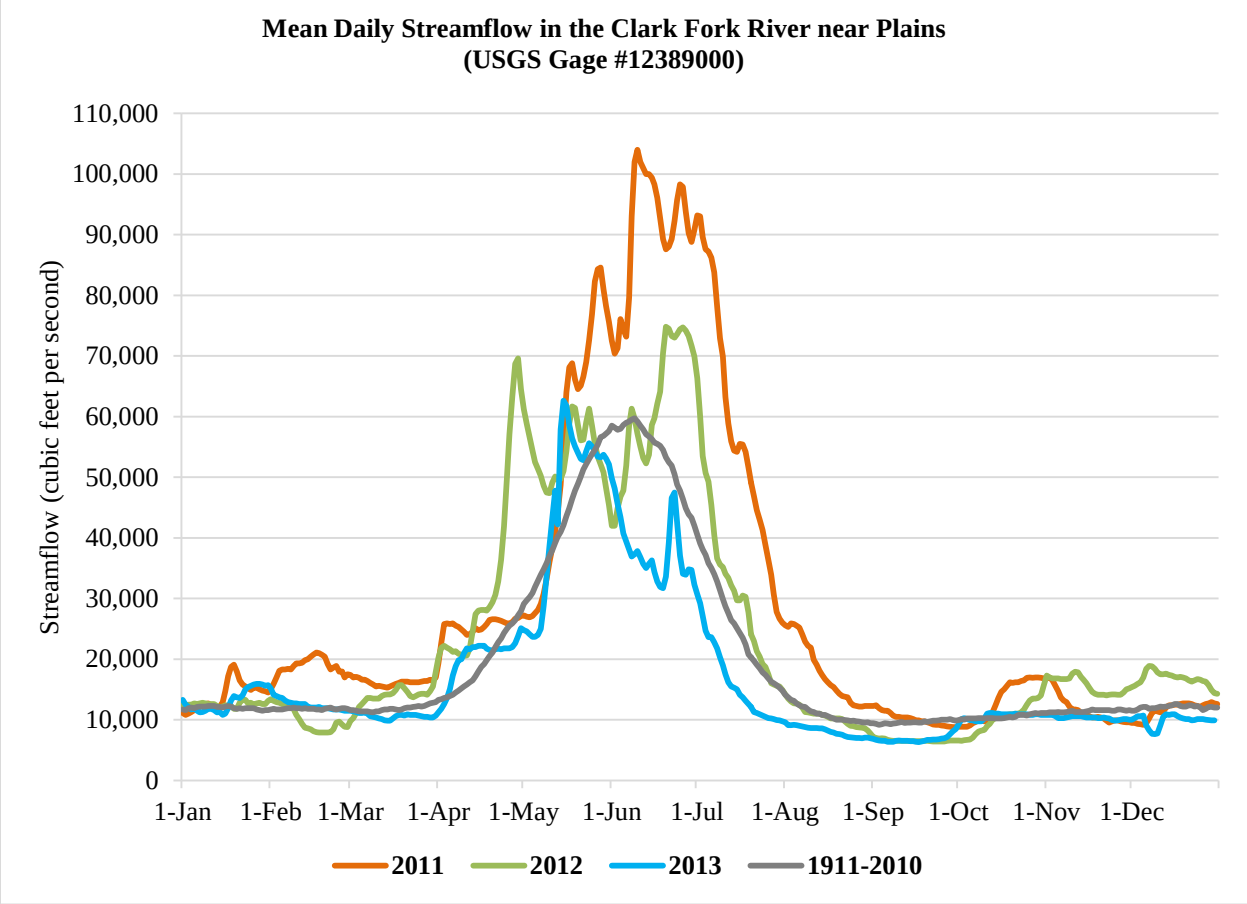
3.2.2 Clark Fork River Conditions

Mean daily streamflow data is collected by the U.S. Geological Survey (USGS) gage station #12390000 on the Clark Fork River near Plains, Montana (approximately 30 miles upstream of Thompson Falls Dam). The hydrographs shown in Figure 3-1 represent the mean daily streamflows for 2011, 2012, and 2013, as well as the mean daily streamflows for the period from 1911 through 2010.

The hydrograph for each year of ladder operations has varied greatly (Figure 3-1). During the first year of ladder operations (2011), the peak mean daily streamflow at the USGS gaging station exceeded 100,000 cfs in early June, which was much higher than an average year (approximately 60,000 cfs). In 2012, the hydrograph depicted a bimodal peak. The first peak occurred on April 28 and 29, 2012 with mean daily streamflows between 68,700 and 69,600 cfs. The second peak streamflow occurred between June 20 and June 27, 2012 with mean daily streamflows between 73,000 and 74,800 cfs. In 2013, the peak mean daily streamflow was the lowest of all 3 years measuring approximately 62,600 cfs on May 15. The ascent of the hydrograph in 2013 occurred later in the spring than what was observed in 2012, but followed the same timing as was observed in 2011. However, in 2013, peak streamflows were

approximately 60 percent of the peak streamflows observed in 2011 and the duration of spring flows in 2013 was much shorter than those observed in 2011 or in 2012. Following the spring freshet, the hydrograph declined rapidly in 2013 and summer flows were much lower than an average year.

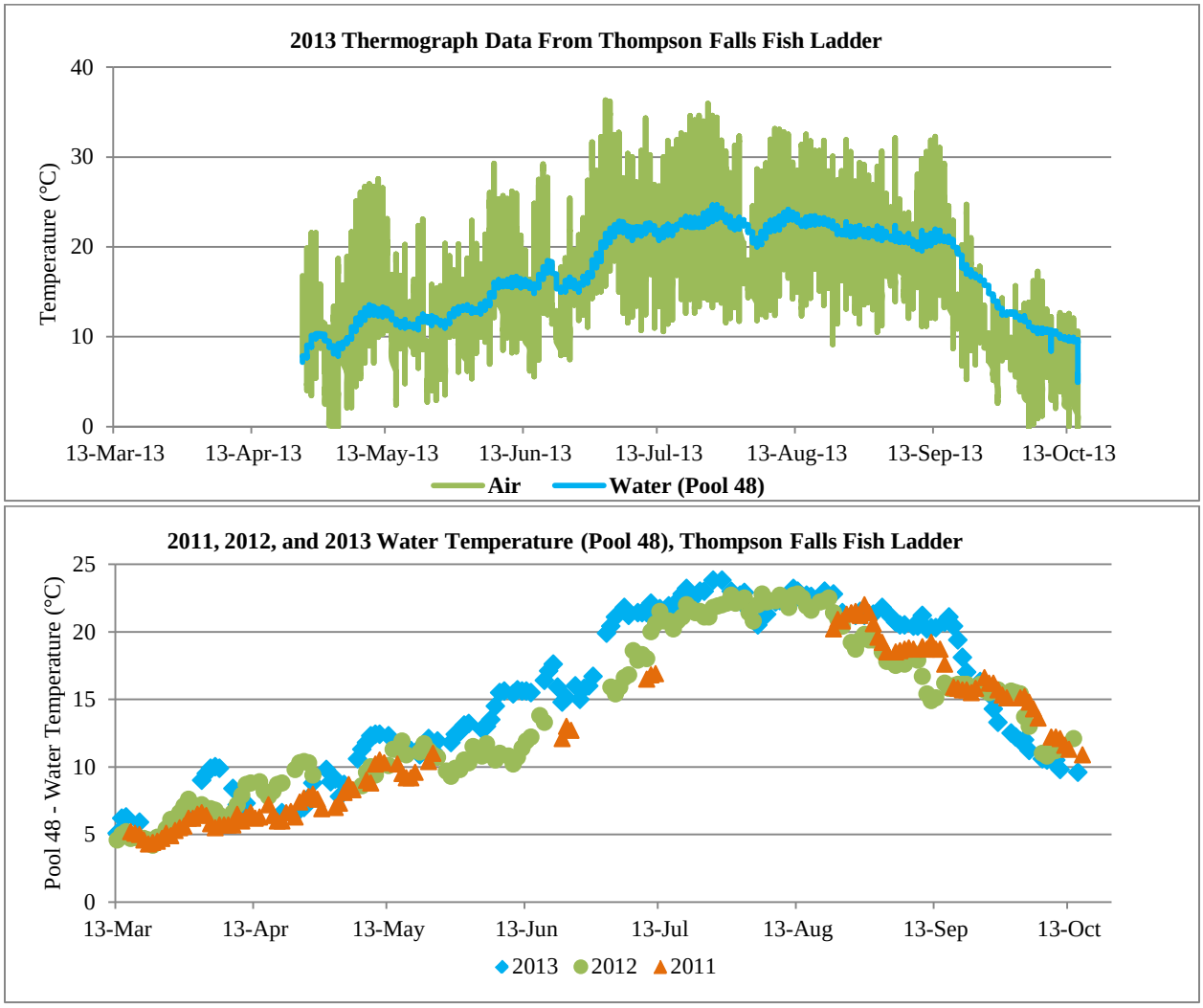
Figure 3-1: Hydrograph for the Clark Fork River near Plains, Montana from USGS gage 12389000. Hydrographs represent daily mean streamflows for the first 2 years of ladder operation (2011, 2012) and the average between 1911 and 2010.



During each ladder 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. In 2011, a continuous recording thermograph was installed in Pool 7, in Pool 48, and at the top of the fish ladder. The thermograph in Pools 7 and 48 recorded water temperatures and the thermograph at the top of the ladder recorded ambient air temperature (in 15-minute intervals). Due to some operational interruptions and maintenance activities resulting in periods of ladder closure (between May 25 and August 22, 2011), the ladder was not always flowing with water. 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. In 2013, a continuous recording thermograph was installed in Pool 48 and at the top of the ladder, providing continuous water temperature and ambient air temperature (Figure 3-2, top graph).

The 2013 air and water temperatures collected via the continuous thermographs (April 24 through October 15, 2013) are presented in the top graph in Figure 3-2. To provide water data for the entire duration of each ladder season and maintain a consistent data type for comparison of water temperatures, the water temperature (in Pool 48) collected during each ladder check in 2011, 2012, and 2013 was used in this analysis and is shown in the bottom graph in Figure 3-2. Overall, water temperature warmed up earlier in the season in 2013 than in 2011 or 2012, and also stayed warmer longer into September than in 2011 or 2012 (Figure 3-2).

Figure 3-2: Continuous ambient air and water temperatures (Pool 48) at the fish ladder in 2013 (top graph). Water temperature measurements (Pool 48) from mid-March to mid-October in 2011, 2012, and 2013 (bottom graph). Data from 2011, 2012, and 2013 in the bottom graph represent a single measurement coinciding with each ladder check.



3.2.3 Summary of Fish and Species

In 2013, approximately 3,830 fish representing nine species and one hybrid, including five bull trout ascended the ladder. The total number of fish recorded at the ladder has increased from 1,805 in 2011 to 3,830 in 2013. The increase in the number of fish is likely related to the total number of days the ladder is open each year, as well as the peak and duration of spring flows. In 2011, the ladder was open for a total of 132 days and the peak and duration of spring flows exceeded an average year (Figure 3-1). In 2012, the ladder was open for 194 days. Although peak spring flows were less than those recorded in 2011, spring flows still remained above average in 2012. In 2013, the ladder was open for 202 days and peak spring flows were less than previous years and shorter in duration (Figure 3-1).

As in 2011 and 2012, the FWP authorized the release of all species upstream into the Thompson Falls Reservoir with the exception of lake trout and walleye. During the last 3 years of operations (2011, 2012, and 2013), no walleye have ascended the ladder. One lake trout ascended the ladder each year in 2011 and in 2012, but none were recorded in 2013. Most salmonids ascending the ladder that were released upstream were measured for total length and weight, as well as marked via fin clip and implanted with a passive integrated transponder (PIT) tag or Floy tag.

A summary of fish that ascended the ladder annually in 2011, 2012, and 2013, as well as a cumulative total for all 3 years is provided in Table 3-2.

Over the last 3 years a total of 8,200 fish have been passed upstream of the Thompson Falls Dam. Non-salmonids represent approximately 90 percent of the fish recorded at the ladder annually and cumulatively over the last 3 years (2011, 2012, and 2013). Although the percentage of salmonids recorded at the ladder has remained around 10 percent annually and cumulatively over the last 3 years, the number of salmonids ascending the ladder has increased from 242 in 2011 to 305 in 2012 and 392 in 2013. The total number of live fish passed upstream includes 927 salmonids, representing 581 rainbow trout, 177 brown trout, 90 westslope cutthroat trout, 43 mountain whitefish, and 28 rainbow x westslope cutthroat trout hybrid, and 8 bull trout.

Table 3-2: Summary of the number of fish and species observed at the ladder annually and total number fish passed upstream of Thompson Falls Dam from 2011-2013.

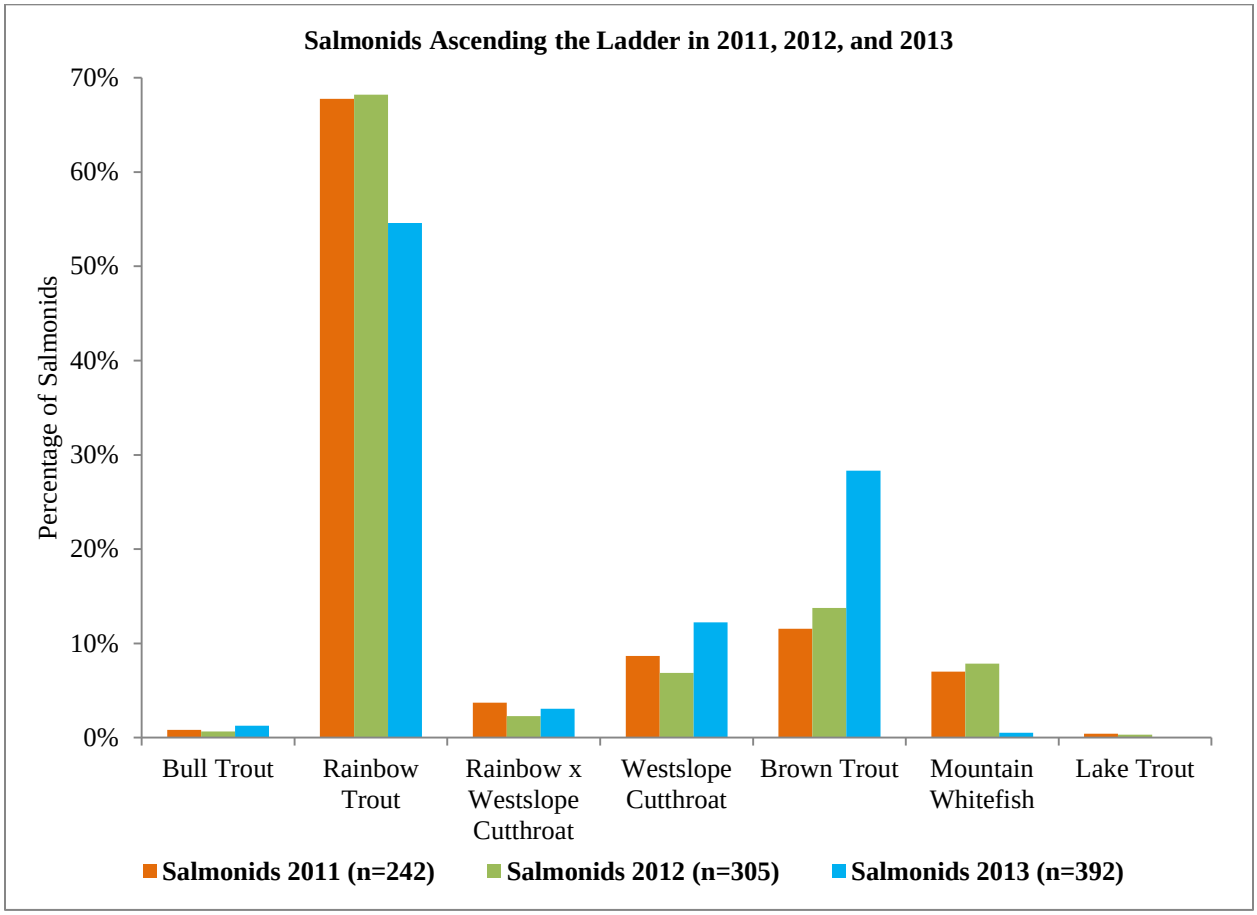
Species	Total Number of Fish (# of Mortalities)			
	2011	2012	2013	Total
BULL	2	2 (1)	5	9 (1)
RB	164 (2)	208 (1)	214 (2)	586 (5)
RBxWCT	9	7	12	28
WCT	21	21	48	90
LL	28	42	111 (4)	181 (4)
MWF	17	24	2	43
LN SU	10 (2)	0	2	12 (2)
LS SU	418 (1)	1,403 (4)	3,041 (5)	4,862 (10)
N PMN	1,000 (73)	926 (1)	387 (1)	2,313 (75)
SMB	135 (4)	34	8	177 (4)
LT	1 (1)	1 (1)	0	2 (2)
Total Salmonids	**242 (3)**	**305 (3)**	**392 (6)**	**939 (12)**
Total Non-Salmonids	**1,563 (80)**	**2,363 (5)**	**3,438 (6)**	**7,364 (91)**
Total Fish	**1,805 (83)**	**2,668 (8)**	**3,830 (12)**	**8,303 (103)**
Total Fish Passed Upstream	**1,722**	**2,660**	**3,818**	**8,200**

3.2.3.1 Species Composition

There were more fish that ascended the ladder in 2013 (n=3,830) compared to previous years (n=2,688 in 2012; n=1,805 in 2011). As mentioned earlier, the increased number of total fish during the season is likely related to the number of operational days and the peak and duration of spring flows. The overall percentage of salmonids (10% in 2013; 11% in 2012; 13% in 2011) compared to non-salmonids (90% in 2013; 89% in 2012; 87% in 2011) that ascended the ladder in all 3 years has remained similar.

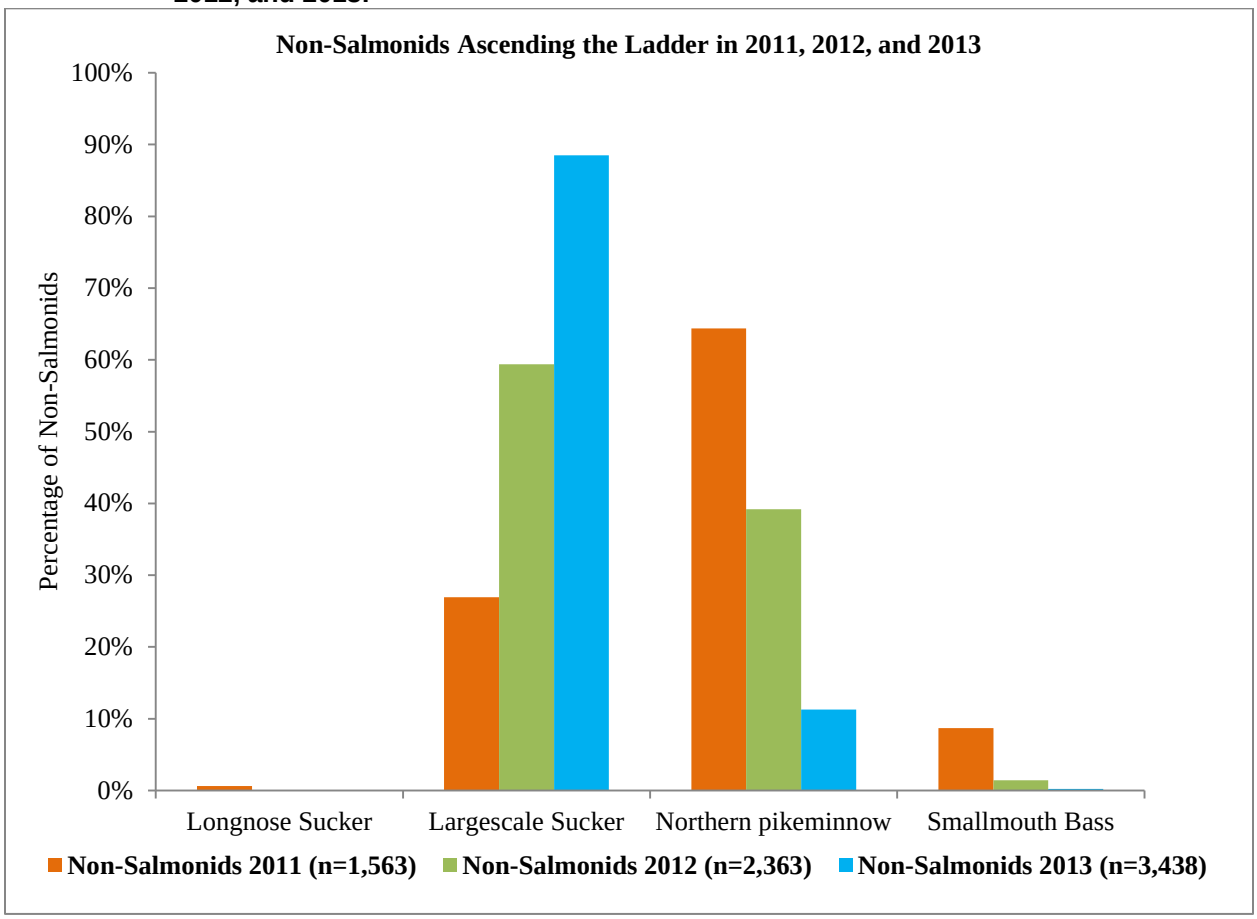
The percent composition of salmonid species remained similar in 2013 compared to 2012 and 2011 (Figure 3-3). Each year rainbow trout were the predominant salmonid species followed by brown trout and westslope cutthroat trout. Although rainbow trout remain the most dominant salmonid species in 2013, the percentage of rainbow trout declined to approximately 55 percent in 2013 compared to 68 percent in 2011 and in 2012. The percentage of brown trout nearly doubled in 2013 (28%) compared to previous years (12% in 2011; 14% in 2012); and the percentage of westslope cutthroat trout also increased in 2013 (12%). The percentage of mountain whitefish declined in 2013 to approximately 1 percent compared to 7 and 8 percent in previous years. Mountain whitefish tend to migrate upstream in the fall and it is possible that the ladder was closed prior to this fall migration. Bull trout remain the least common salmonid species, representing approximately 1 percent of salmonids in all years.

Figure 3-3: Percent composition of salmonid species that ascended the ladder in 2011, 2012, and 2013.



The percent composition of non-salmonids species shifted from northern pikeminnow as the dominant species in 2011 to largescale suckers in 2012. The shift from northern pikeminnow to largescale suckers continued in 2013 (Figure 3-4). Largescale suckers increased dominance in 2013 representing approximately 88 percent of non-salmonid species. Since 2011, the percentage of largescale suckers has increased from 27 percent to 88 percent while the percentage of northern pikeminnow has declined from 64 percent in 2011 to 11 percent in 2013. The percent composition of smallmouth bass remained low in 2013. There were fewer smallmouth bass in 2013 (n=8) compared to 2012 (n=34) and 2011 (n=135). The percent composition of longnose suckers was less than 1 percent in 2013, which was similar to previous years. It is possible that one or more longnose sucker was mistakenly identified as a largescale sucker due to the large quantities of largescale suckers that tend to ascend the ladder at a time.

Figure 3-4: Percent composition of non-salmonid species that ascended the ladder in 2011, 2012, and 2013.



3.2.3.2 Fish Morphology

A summary of the length and weight measurements collected for each fish species recorded at the ladder in 2013 is provided in Table 3-3. The largest fish to ascend the ladder was a brown trout measuring 675 mm in length and weighing 3,832 g. The smallest fish to ascend the ladder was a rainbow trout measuring 169 mm and weighing 58 g.

Table 3-3: Summary of mean and range of lengths (mm) and weights (g) for each fish species that ascended the ladder in 2013.

Species	Count	Mean Length (mm)	Length (mm) Range	Mean Weight (g)	Weight (g) Range
BULL	5	546	478 - 598	1,592	978 - 2,306
RB	214	367	168 - 587	559	58 - 1,774
RBxWCT	12	400	193 - 453	659	74 - 942
WCT	48	368	257 - 445	524	190 - 928
LL	111	395	251 - 675	649	146 - 3,832
MWF	2	344	339 - 349	359	334 - 384
LS SU	3,041	432	308 - 561	800	302 - 1,678
LN SU	2	394	362 - 426	603	454 - 752
N PMN	387	384	238 - 570	520	108 - 1,722
SMB	8	309	252 - 362	414	210 - 692

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 3-4. The table does 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., largescale sucker), the average weight for that species was used in the calculation for biomass.

The total volume of fish biomass that was passed upstream of Thompson Falls Dam has steadily increased from 801.7 kg in 2011 to 1,652.2 kg in 2012 and to 2,760.8 kg in 2013. Annually, non-salmonid species represent the majority of the fish biomass (80-92%) while salmonids represent between 8 and 20 percent of the fish biomass moved upstream of Thompson Falls Dam.

Table 3-4: Summary of total biomass in kilograms (kg) for each fish species that ascended the ladder and was passed upstream of Thompson Falls Dam from 2011-2013.

Species	Total Biomass (kg) Passed Upstream of Thompson Falls Dam			
	2011	2012	2013	Total
BULL	1.8	1.2	8.0	**10.9**
RB	119.4	102.2	116.9	**337.8**
RBxWCT	4.8	3.8	7.9	**16.6**
WCT	11.0	9.6	25.1	**45.8**
LL	18.3	28.0	69.1	**115.5**
MWF	5.9	7.8	0.7	**14.4**
LS SU	267.9	1,042.7	2,414.0	**3,724.5**
LN SU	4.6	0	1.2	**5.8**
N PMN	344.1	445.4	115.2	**904.7**
SMB	23.9	11.5	3.3	**38.7**
TOTAL	**801.7**	**1,652.2**	**2,760.8**	**5,214.7**

3.2.3.3 Fish Growth

Growth data were evaluated for 40 fish, including 27 rainbow trout, eight brown trout, three westslope cutthroat trout, and two bull trout. These fish were either initially captured during electrofishing efforts downstream of Thompson Falls Dam or at the ladder. The table below (Table 3-5) summarizes the average fish growth rate for length and weight by species for all fish except two bull trout. The growth information for the individual bull trout is summarized in Table 3-6. In general, the variation in growth is likely related to age of the fish. Younger fish are generally smaller and have faster growth rate than older (larger) fish.

Table 3-5: Growth rate summary for 38 fish, including the fish species, the number of fish, the duration between the initial capture and second capture dates, and the mean growth rate for length (mm/year) and weight (g/year).

Species	Number of Fish	Mean Duration (days)	Mean Growth	
			mm/year	g/year
Brown Trout	8	526	54	203
Rainbow Trout	27	376	50	265
Westslope Cutthroat	3	492	64	293
Overall Average	38	464	56	254

Table 3-6: Growth information for two bull trout, including dates recorded, length and weight measurements, and estimated growth rate for length (mm/year) and weight (g/year).

Bull Trout PIT Tag	Initial Capture Date	Duration (days) to Second Capture Date	Size At Initial Capture	Estimated Growth	
			L (mm), Wt (g)	mm/year	g/year
985121023464730	4/26/2011	391 days	547 mm, 1438g	14.9 mm/yr	*See Note**
985121021877906 & 982000357016269	5/31/2011	350 days	482 mm, 966 g	29.2 mm/yr	214.8 g/yr
*Note: Bull trout found dead outside of the holding pool, so weight measurement is likely an underestimate.					

In Table 3-6, the first bull trout (PIT tag #985121023464730) that was initially captured on April 26, 2011 at the ladder and returned to the ladder approximately 391 days later in May 2012 (*refer to* PPL Montana, 2012). This bull trout was found deceased, outside of the holding pool, measuring 563 g and 1,404 g. The length had increased over the year, but the weight had decreased. Because the measurements were taken after the fish had died, it is likely the weight measurement is an underestimate and not reflective of the bull trout's live weight.

The second bull trout (PIT tag #985121021877906) referenced in Table 3-6 was initially captured on May 31, 2011 electrofishing below Thompson Falls Dam and then ascended the ladder the following year on May 15, 2012. In 2012, the bull trout received a second tag, a half-duplex (HDX) PIT tag (#98200357016269). This bull trout was passed upstream of the Thompson Falls Dam and had grown approximately 29 mm and 215 g in 1 year. This bull trout was detected below Thompson Falls Dam in 2013. For more details *refer to* Section 3.2.4.

3.2.3.4 Bull Trout Ascending the Ladder

In 2013, there were a total of five bull trout that ascended the ladder. The size of the five bull trout varied between 482 and 598 mm in length and between 978 and 2,306 g in weight. At the time of the ascent, the water temperature varied between 8.9 and 22.2 degrees Celsius (°C) and streamflow in the river varied between 8,680 and 38,100 cfs. All five bull trout were released upstream of the ladder.

As in previous years, the majority of the bull trout ascended the ladder between April and June with the exception of one bull trout that ascended the ladder in August 2013. A summary of the bull trout that have ascended the ladder in 2011, 2012, and 2013 is provided below, in Table 3-7. *Refer to* Section 3.2.10 for results of the bull trout genetics analysis.

Table 3-7: Summary of bull trout that ascended the ladder in 2011, 2012, and 2013, including date recorded at the ladder, length, weight, PIT tag(s), water temperature, and mean daily streamflow from USGS Clark Fork River Gage Station at Plains, Montana (#12389000). Note: 2013 fish are listed in bold and shaded in blue.

Date	Length (mm)	Weight (g)	PIT Tag	Water Temperature (°C)	USGS Mean Daily Streamflow (cfs)
4/13/2011	365	364	985121023302169	6.6	24,500
4/26/2011	547	1438	985121023464730	7.8	25,900
5/15/2012	510	1172	985121021877906 & 982000357016269	11.3	51,000
5/21/2012	563	1404	985121023464730	11.1	56,100
4/30/2013	**598**	**2306**	**982000357016065**	**8.9**	**25,100**
5/6/2013	**576**	**1694**	**982000357016109**	**10.6**	**24,000**
5/7/2013	**478**	**978**	**982000357016155**	**11.3**	**25,000**
6/7/2013	**596**	**1926**	**HDX tag not recorded (Genetics 118-073)**	**15.5**	**38,100**
8/9/2013	**482**	**1058**	**982000357016151**	**22.3**	**8,680**

3.2.4 Recaptured Fish

Since 2011, fish that have ascended the ladder and moved upstream of the Thompson Falls Dam have received a unique tag (PIT or Floy) or fin clip. In 2011, a total of 300 tags (226 PIT tag; 74 Floy tags) were implanted in fish that ascended the ladder. In 2012, a total of 286 tags (256 PIT tags; 30 Floy tags) were implanted in fish that ascended the ladder. In 2013, a total of 351 tags (344 PIT tags; 7 Floy tags) were implanted in fish that ascended the ladder. In total there are approximately 937 tagged fish (salmonids and non-salmonids) that have been passed upstream of the Thompson Falls Dam that were initially tagged at the ladder.

In 2011 and 2012, several fish (salmonids and non-salmonids) were implanted with PIT and Floy tags during electrofishing efforts completed immediately downstream of Thompson Falls Dam. In 2011, a total of 212 fish were implanted with tags (206 PIT tags and 6 Floy tags). In 2012, a total of 357 fish were implanted with tags (344 PIT tags and 13 Floy tags). In 2013, there was no electrofishing or tagging activity conducted below Thompson Falls Dam. In total, 569 fish were implanted with a unique tag downstream of the Thompson Falls Dam.

Approximately 1,506 fish have been uniquely tagged (1,376 PIT and 130 Floy tags) at the ladder or below the Thompson Falls Dam from 2011 through 2013. Of these tagged fish, a total of 39 fish recorded at the ladder in 2013 either had a unique tag or fin clip marking indicating these were recaptured fish. Of the 39 fish, 31 fish were initially tagged at the ladder in 2011 or in 2012; six of the fish were initially tagged below the Thompson Falls Dam during electrofishing activities in 2011 or in 2012; and no initial capture data was available for two fish (Table 3-8).

Table 3-8: Summary of the recaptured fish recorded at the ladder in 2013.

Fish Species	Initially Captured at Ladder in 2011, 2012, or 2013 and Returned to Ladder in 2013	Initially Captured Electrofishing Below Dam in 2011 or 2012 and Returned to Ladder in 2013	Initial Capture Information Unknown and Returned to Ladder in 2013
Brown Trout	6	2	1
Rainbow Trout	23	2	1
Rainbow x Westslope Cutthroat Trout	1		
Westslope Cutthroat Trout	1	2	
TOTAL	**31**	**6**	**2**

3.2.4.1 Duration between Ladder Visits

A total of nine fish (3 brown trout; 6 rainbow trout) were initially tagged in 2011 at the ladder and returned to the ladder in 2013. The duration between the initial ascent at the ladder in 2011 and the second ascent at the ladder varied between 353 and 752 days. Of the six rainbow trout, two fish have returned to the ladder annually since the ladder started operations in 2011. One rainbow trout first ascended the ladder on April 24, 2011, then a second ascent on April 15, 2012, and a third ascent on April 3, 2013. The other rainbow trout first ascended the ladder on April 13, 2011 followed by a second ascent on April 12, 2012, and a third ascent on April 8, 2013.

A total of 18 fish (14 rainbow trout; 3 brown trout; 1 westslope cutthroat trout) were initially tagged in 2012 at the ladder and returned to the ladder in 2013. The duration between the initial ascent at the ladder in 2012 and the second ascent at the ladder in 2013 varied between 273 and 417 days.

A total of four fish (3 rainbow trout; 1 rainbow x westslope cutthroat trout hybrid) were tagged at the ladder in March or April 2013 and returned to the ladder between 36 and 127 days later in

2013. These fish are referred to as “fallback” fish, which are discussed in more detail in Section 3.2.5.

3.2.4.2 Bull Trout PIT Tag Detections

One bull trout has been detected each year (2011, 2012, and 2013) in the Project area. On May 31, 2011, a bull trout (482 mm and 966 grams) was captured electrofishing downstream of Thompson Falls Dam in the Clark Fork River. A PIT tag (#985121021877906) was implanted in the bull trout. Approximately 1 year later on May 15, 2012, the same bull trout ascended the ladder measuring 510 mm and weighing 1,172 g. A second tag, this time a HDX PIT tag (#982000357016269), was implanted in the bull trout before it was released upstream of the Thompson Falls Dam. Between July 6 and August 12, 2013, Avista detected the same bull trout downstream of Thompson Falls Dam in lower Prospect Creek, a tributary to the Clark Fork River. The remote array in Prospect Creek is located approximately 0.5 mile upstream of the Cherry Creek bridge crossing (GPS location: 47.58017209N, -115.3719052W).

3.2.5 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 flow-thru 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 fish fall back through the turbines. When streamflows are above 23,000 cfs, fish can fall back via turbines or over the spillway.

A summary of fallback fish is provided in Table 3-9 for the 2011, 2012, and 2013 seasons. In 2011, there were a total of 13 fish (11 rainbow trout; 1 westslope cutthroat trout) defined as fallback. The majority of these fish (11 of the 13 fish) ascended the ladder in April and May and then returned to the ladder between 1 and 161 days later. In 2012, there were a total of two rainbow trout that were defined as fallback. Both rainbow trout ascended the ladder in the April or May of 2012 and returned to the ladder 57 and 100 days later. In 2013, there were a total of four fish (3 rainbow trout; 1 rainbow x westslope cutthroat trout hybrid) defined as fallback. All four fish were initially observed at the ladder between March 18 and April 29, 2013 and returned between 36 and 127 days later.

Over the past 3 years (2011, 2012, and 2013), the majority of the fallback fish ascend the ladder in the spring before the ascending limb of the hydrograph and return to the ladder later in the summer or fall after the peak of the hydrograph. During this period the range of streamflows

often exceed 23,000 cfs, therefore it is unknown as to whether the fish are moving downstream via turbines or over the spillway.

Table 3-9: Summary of the number of fish PIT or Floy tagged and subsequent "fallback" by fish recaptured at the ladder in 2011, 2012, and 2013.

Fish Species	2011 PIT/Floy Tagged Fish at Ladder	Tagged in 2011 - Fallback in 2011	2012 PIT/Floy Tagged Fish at Ladder	Tagged in 2012 - Fallback in 2012	2013 PIT/Floy Tagged Fish at Ladder	Tagged in 2013 - Fallback in 2013
BULL	2	-	-	-	4	-
RB	141	11	189	2	187	3
RBxWCT	9	-	7	-	11	1
WCT	20	2	20	-	45	-
LL	27	-	40	-	97	-
MWF	17	-	-	-	-	-
LN SU	1	-	-	-	-	-
LS SU	6	-	-	-	-	-
N PMN	3	-	-	-	-	-
SMB	73	-	30	-	7	-
TOTAL	**299**	**13**	**286**	**2**	**344**	**4**

3.2.6 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) pools 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 in 2011, 2012, and 2013. 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, went downstream through the turbines or spillway, and were returning once again to ascend the ladder. A summary of the fish detected via the remote antennas in 2011, 2012, and 2013 is presented in Table 3-10.

In 2011, a total of 17 fish representing three species and one hybrid (rainbow trout, rainbow trout x westslope cutthroat trout hybrid, largescale sucker, and brown trout) with PIT tags were detected via the remote antennas. The majority of fish detected were rainbow trout. Although the time to ascend the ladder ranged from 0.85 to 19.8 hours, the median time for all species to ascend the ladder was approximately 3 hours.

In 2012, a total of 30 fish representing six species (bull trout, brown trout, rainbow trout, mountain whitefish, westslope cutthroat trout, and largescale sucker) were detected via the remote antennas. For all 30 fish, it took on average 2.7 hours to ascend the ladder with time ranging from under 1 hour to over 8 hours.

In 2013, a total of 52 fish representing four species and one hybrid (brown trout, rainbow trout, westslope cutthroat trout, rainbow x westslope cutthroat trout hybrid, and largescale sucker) were detected via the remote antennas. Overall fish spent between 1 hour and 40.8 hours ascending the ladder. The majority of the fish ascended the ladder within a couple of hours. The median time for salmonids (excluding the rainbow x westslope cutthroat trout hybrid) to ascend the ladder was between 1.8 and 2.0 hours. The median time for largescale suckers was 8.2 hours. The median time for all 52 fish to ascend the ladder was 2.0 hours and the average time for all 52 fish to ascend the ladder was 6.3 hours.

Table 3-10: 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 in 2011, 2012, and 2013.

2011				
Species	**Number**	**Median Time (Hours)**	**Average Time (Hours)**	**Range of Time (Hours)**
RB	13	3.0	5.3	0.9 - 19.8
RBxWCT	2	1.3	1.3	1.0-1.7
LS SU	1	3.6	3.0	3.6
LL	1	10.8	10.8	10.8
TOTAL	**17**	**3.0**	**5.0**	**0.9 - 19.8**

2012				
Species	**Number**	**Median Time (Hours)**	**Average Time (Hours)**	**Range of Time (Hours)**
BULL	2	2.6	2.6	2.4-2.8
LL	1	1.1	1.1	1.1
RB	18	2	2.2	0.7-4.4
MWF	1	2.1	2.1	2.1
WCT	1	1.7	1.7	1.7
LS SU	7	3.2	4.6	2.3-8.3
TOTAL	**30**	**2.3**	**2.7**	**0.7 - 8.3**

2013				
Species	**Number**	**Median Time (Hours)**	**Average Time (Hours)**	**Range of Time (Hours)**
LL	14	1.8	2.0	1.0-3.3
RB	24	1.8	6.7	1.0-40.8
RBxWCT	1	19.1	19.1	19.1
WCT	3	2.0	2.0	1.4-2.5
LS SU	10	8.2	11.6	1.7-31
TOTAL	**52**	**2.0**	**6.3**	**1.0 - 40.8**

In general, salmonids appear to ascend more quickly than largescale suckers. However, in 2012 and 2013, the largescale suckers were all detected in mid-July when hundreds of fish were

present in the ladder. Therefore, the volume of fish in the ladder may also influence the amount of time a fish spends ascending the ladder.

3.2.7 Most Active Periods for Fish Ascending the Ladder

Fish entry to the ladder and timing of ascent was evaluated on two spatial scales, daily timing of ladder entry and seasonal movement. The following text summarizes the daily movements of fish detected (via remote antenna) in the ladder during 2012 and 2013 and seasonal movement patterns observed during the 2011, 2012, and 2013 seasons.

3.2.7.1 Daily Movements

Data collected from the three remote antennas in the ladder (described in Section 3.2.6) were utilized to evaluate the time of day fish entered the ladder in 2012 and 2013. In 2012 and 2013, data from 135 fish representing seven species and one hybrid were analyzed for time of ladder entry in 2012 and 2013 (Table 3-11). The species information for six of the fish detected via the remote antennas in 2012 was not in the PPL Montana database and were identified as unknown (Table 3-10).

Table 3-11: Summary of the number of fish species detected in the ladder via remote antennas in 2012 and 2013.

SPECIES	2012	2013
BULL	2	0
LL	3	15
LS SU	30	22
MWF	2	2
NPMN	1	1
RB	18	28
RBxWCT	0	1
WCT	1	3
Unknown	6	0
TOTAL	**63**	**72**

The timing of fish entry into the ladder was depicted by dividing a 24-hour period into 3-hour increments. The number of fish was tallied for each time interval. In 2012, a total of 63 fish were analyzed with over half of the fish represented by non-salmonid species (primarily largescale suckers) and approximately 38 percent of the fish represented by salmonid species (Table 3-11). In 2013, a total of 72 fish were analyzed with approximately 32 percent represented by non-salmonid species (primarily largescale suckers) and 68 percent represented by salmonid species (Table 3-11).

In 2012, fish entered the ladder any time of day, but appeared to display some preference to the early morning hours (pre-dawn and dawn) and the evening hours (dusk and dark) (Figure 3-5). Although the majority of the fish analyzed in 2012 were largescale suckers (non-salmonid

species), the trend for fish to enter the ladder in the early morning hours and evening hours was observed for both salmonid and non-salmonid species in 2012 (Figure 3-5).

Figure 3-5: Time of day that the salmonids (top graph) and non-salmonids (bottom graph) were detected in the ladder in 2012 and 2013.

In 2013, fish continued to enter the ladder any time of day (Figure 3-5). However, the preferred time frame for most fish to enter the ladder appeared to differ from 2012 and was more concentrated between afternoon and evening (noon to 9PM). Although the majority of fish in 2013 analyzed were salmonid species, a similar trend in the ladder entry time (preference from noon to 9PM) was observed for both salmonid and non-salmonid species in 2013 (Figure 3-5).

Several factors likely contribute to fish movement and timing that was observed in 2012 and 2013, including, but not limited to, water temperature, streamflow in the ladder, lunar cycle, and ladder operations. However, the interaction of these factors and potential influence on when fish enter the ladder is unknown. In 2013, the ladder was operated in orifice mode for the entire season in contrast to 2012, when the ladder was operated in alternating weir modes (orifice and

notch). It is possible that the operating mode, or the weekly alternation from orifice to weir mode in 2011 and 2012, influenced the movement and behavior of fish in the ladder. However, other factors, such as water temperature and streamflows in the river may also be contributing factors and varied between years.

In 2014, the ladder will continue to be operated in orifice mode during the entire season. Data regarding the timing of fish entry in the ladder collected in 2014 will be evaluated and compared to data from 2012 and 2013. These data will be presented in next year's annual report.

3.2.7.2 Seasonal Movements

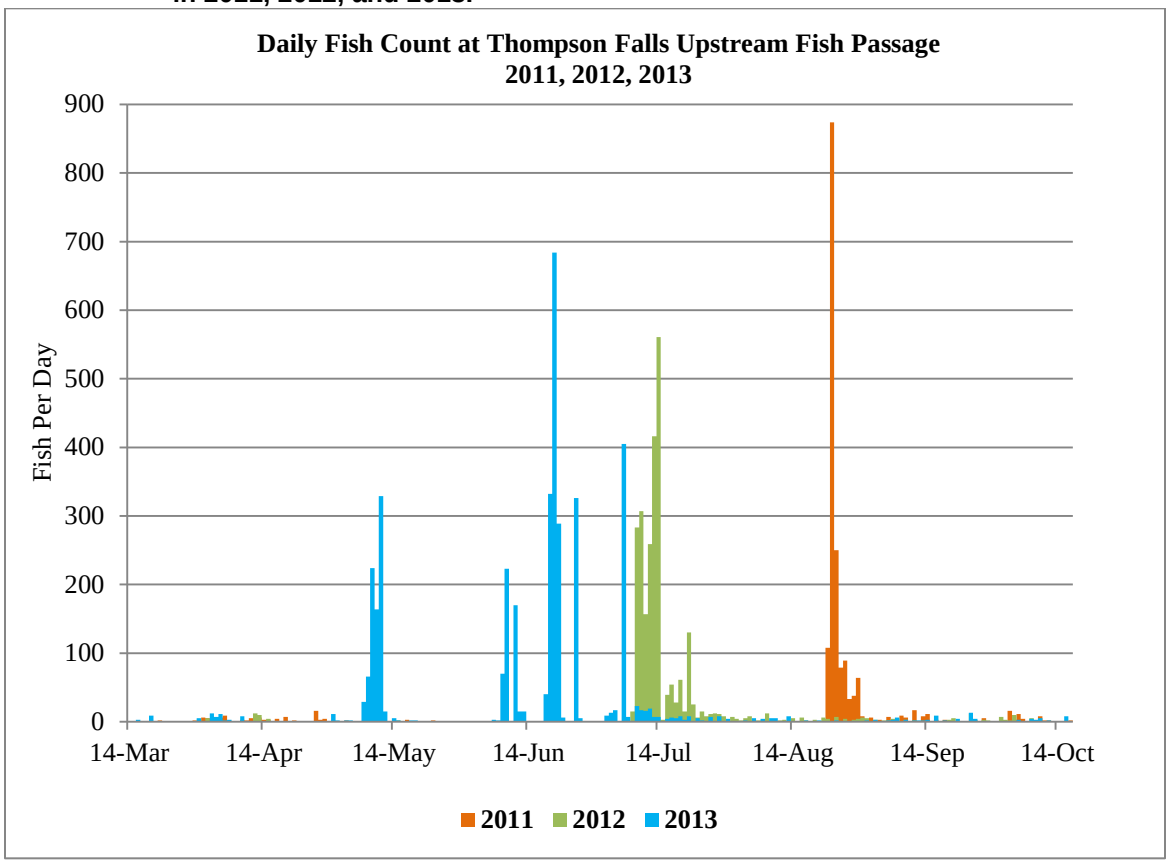
Seasonal movement of fish ascending the ladder has varied annually from 2011 through 2013. The daily count of fish (both salmonids and non-salmonids) at the ladder in 2011, 2012, and 2013 is shown in Figure 3-6. It is likely that several factors contribute to the different seasonal movement patterns of fish including, but not limited, to hydrologic conditions and stream temperature. In addition to annual variations in streamflow and water temperature, it is worth noting that although ladder operations for 2011, 2012, and 2013 have all spanned between March and October, the individual days of operation varied from year to year. A summary of the number of days per month the ladder was closed, the mean monthly streamflow in the Clark Fork River (based on the USGS gage station #12389000), and the mean monthly water temperature in the ladder (Pool 48) is provided in Table 3-12.

Table 3-12: Summary of the number of days the ladder was closed each month; mean monthly streamflow (cfs) from the USGS Clark Fork River Gage Station at Plains, Montana (#12389000); and mean monthly water temperature in the ladder (°C) in 2011, 2012, and 2013.

Month	Number of Days Ladder Closed Per Month			Mean Monthly Streamflow (cfs)			Mean Monthly Water (Pool 48) Temperature (°C)		
	2011	2012	2013	2011	2012	2013	2011	2012	2013
March*	0		7	16,240	13,880	10,650	5.1	5.4	6
April	0	2	7	25,370	33,060	20,110	6.5	8.2	8.4
May	7	7	0	54,500	53,850	45,203	9.3	10.4	11.4
June	27	11	0	90,270	61,630	38,123	12.6	11.4	15.4
July	28	2	0	57,750	31,420	16,212	16.7	20.0	22.1
August	22	0	0	17,810	10,580	8,080	21.1	21.5	22.1
September	0	0	0	10,170	6,583	6,750	17.4	16.5	18.8
October*	0	0	0	13,280	10,190	10,592	13	12.8	10.9

*March and October were partial operating months in all years.

Figure 3-6: Summary of the daily fish count at the ladder between mid-March and mid-October in 2011, 2012, and 2013.



In 2011, the ladder was closed several days during the summer months. In 2012, ladder closures occurred during spring flows but the duration of the overall closures was less than in 2011. In 2013, there were two short-term closures in the spring due to mechanical issues, but the ladder remained open during peak spring flows and throughout the summer months.

Mean monthly flows have also varied greatly from 2011 through 2013, specifically the timing of the peak flow and duration of peak spring flows (Table 3-12). Between 2011 and 2013, the highest and longest duration of spring flows was observed in 2011 compared to the lowest and shortest duration of spring flows observed in 2013. Stream temperatures in the ladder have shown similar seasonal trends from 2011 through 2013; however, water temperatures in 2013 increased and stayed warmer longer compared to 2011 and 2012 (Table 3-12).

The following sections detail the seasonal movement of salmonid and non-salmonid species in 2011, 2012, and 2013.

3.2.7.3 Salmonids Seasonal Movement

The daily number of salmonids that ascended the ladder each year along with the annual hydrograph and mean daily stream temperatures for 2011, 2012, and 2013 are shown in Figure 3-7.

Salmonids have been observed in the ladder throughout each season (when the ladder is open) with minimal activity during peak flows and/or when stream temperatures remain above 20 °C for an extended period of time. The number of salmonids per day recorded at the ladder has varied between zero and 37 fish over the last 3 years. The daily number of salmonids and total number of salmonids at the ladder was greatest in 2013 compared to 2011 and 2012 (Figure 3-7).

In general, there are approximately three times a year when the number of salmonids per day at the ladder is greatest. Salmonids appear to move and ascend the ladder in the spring prior to the ascending limb of the hydrograph; then again following the peak spring flows during the descending the limb of the hydrograph; and lastly in the fall once stream temperatures start to decline below 20 °C (Figure 3-7).

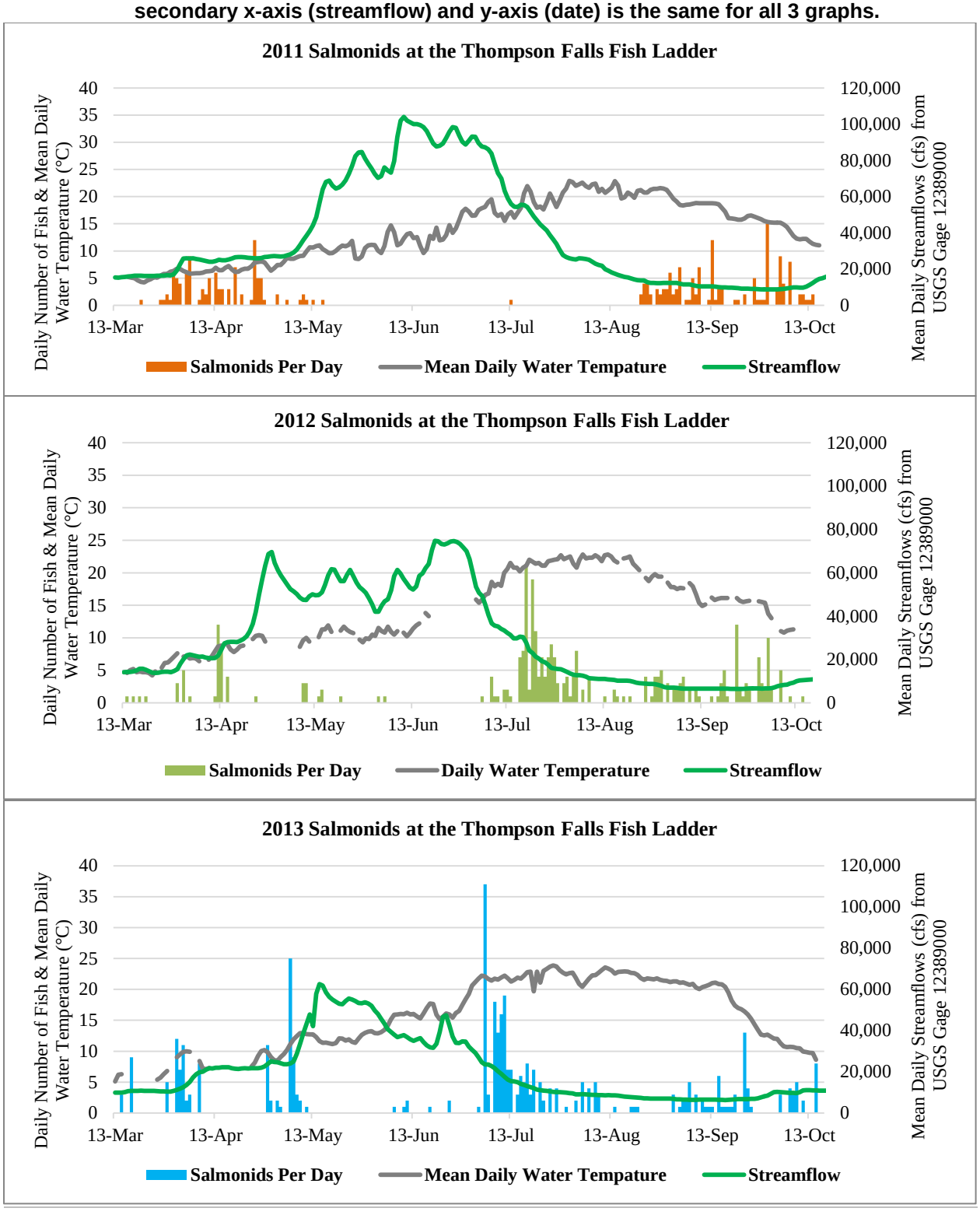
In general, spring (March and April) activity in the ladder is minimal until stream temperatures start to warm and exceed 7 °C. The number of salmonids per day during the spring months has generally been less than 13 fish per day except for 1 day in May 2013 when 25 salmonids ascended the ladder. The peak number of salmonids in the ladder in the spring is typically lower than the peak daily number of salmonids observed in July (evaluating only 2012 and 2013 data).

Although some salmonids have ascended the ladder during peak spring flows, in general, there is minimal activity of salmonids ascending the ladder at this time or the ladder has been closed. Peak flows generally occur between May and June, but the timing varies annually and depends on snowpack and precipitation events. In general, once streamflows exceed approximately 30,000 cfs, the presence of salmonids in the ladder is minimal (Figure 3-7).

Peak daily counts of salmonids in the ladder have been greatest during July during the descending limb of the hydrograph. In July 2012 and 2013, an influx of salmonids (> 5 salmonids per day) was observed in the ladder following peak spring flows and stream temperatures exceeding 20 °C. The summer influx of salmonids observed in both 2012 and 2013 lasted for approximately 1 to 2 weeks before the daily number of salmonids declined (5 or less) by late July or early August. Once stream temperatures remained greater than 20 °C for extended periods of time (e.g., late July and August), the number of salmonids at the ladder often declined to one a day or less until temperatures declined below 20 °C (Figure 3-7).

In the fall (September and October), stream temperatures decline from the summer highs and the number of salmonids per day increase from late summer daily counts. The increase in salmonids per day in the fall was generally associated with the presence of brown trout and/or mountain whitefish once water temperatures dropped below 20 °C. For the past 3 years, the ladder has been closed and winterized by mid-October, so it is likely that the data collected at the ladder does not fully capture potential fall movement of salmonids (specifically for mountain whitefish).

Figure 3-7: Summary of the mean daily streamflow (cfs) in the Clark Fork River (USGS Clark Fork River Gage Station at Plains, Montana (#12389000)); mean daily water temperatures in the ladder (°C) and the daily count of salmonid species ascending the ladder in 2011 (top), 2012 (middle), and 2013 (bottom). Note: the range for the primary x-axis (number of fish and water temperature) vary, but the range of the secondary x-axis (streamflow) and y-axis (date) is the same for all 3 graphs.



Salmonid Species and Movement Patterns

Rainbow trout are the dominant salmonid species recorded at the ladder in 2011, 2012, and 2013. Rainbow trout, as well as westslope cutthroat trout and rainbow x westslope cutthroat trout hybrids (*Oncorhynchus* sp. hybrid) have been observed in the ladder at various times of year (when the ladder is open). The presence of these species and hybrids appear to decline in August when stream temperatures are the warmest (> 20 °C), before increasing once temperatures decline in the fall.

Rainbow and westslope cutthroat trout, and hybrids, that entered the ladder prior to July 1 have been slightly larger, on average, than *Oncorhynchus* that have entered the ladder after July 1 (Figure 3-8). During the 2011, 2012, and 2013 seasons, all sexually mature *Oncorhynchus* recorded at the ladder were detected between mid-March and mid-May with the exception of one westslope cutthroat trout that was detected on September 11, 2011. These data may indicate that *Oncorhynchus* collected in the ladder prior to runoff may be sexually mature fish migrating towards tributary spawning areas. The percentage of *Oncorhynchus* collected before and after July 1 has varied substantially between years (Figure 3-9).

Although less frequent in numbers, bull trout appear to ascend the ladder in the spring (April-June) during cooler water temperatures, with the exception of one bull trout that ascended the ladder in August 2013. Brown trout have been documented in the ladder in the spring, but appear more frequently in the summer and fall months. Mountain whitefish have primarily been documented in September and October. It is possible that the potential peak of migration of mountain whitefish in Montana occurs after the ladder is closed in mid-October; as they typically spawn in late October or early November (Brown, 1971).

Figure 3-8: Summary of the mean length for rainbow (RB), rainbow x westslope cutthroat trout hybrids (RBxWCT), and westslope cutthroat trout (WCT) at the ladder before and after July 1 in 2011 (top), in 2012 (middle), and in 2013 (bottom). Note: both the x- and y-axis are the same for all graphs.

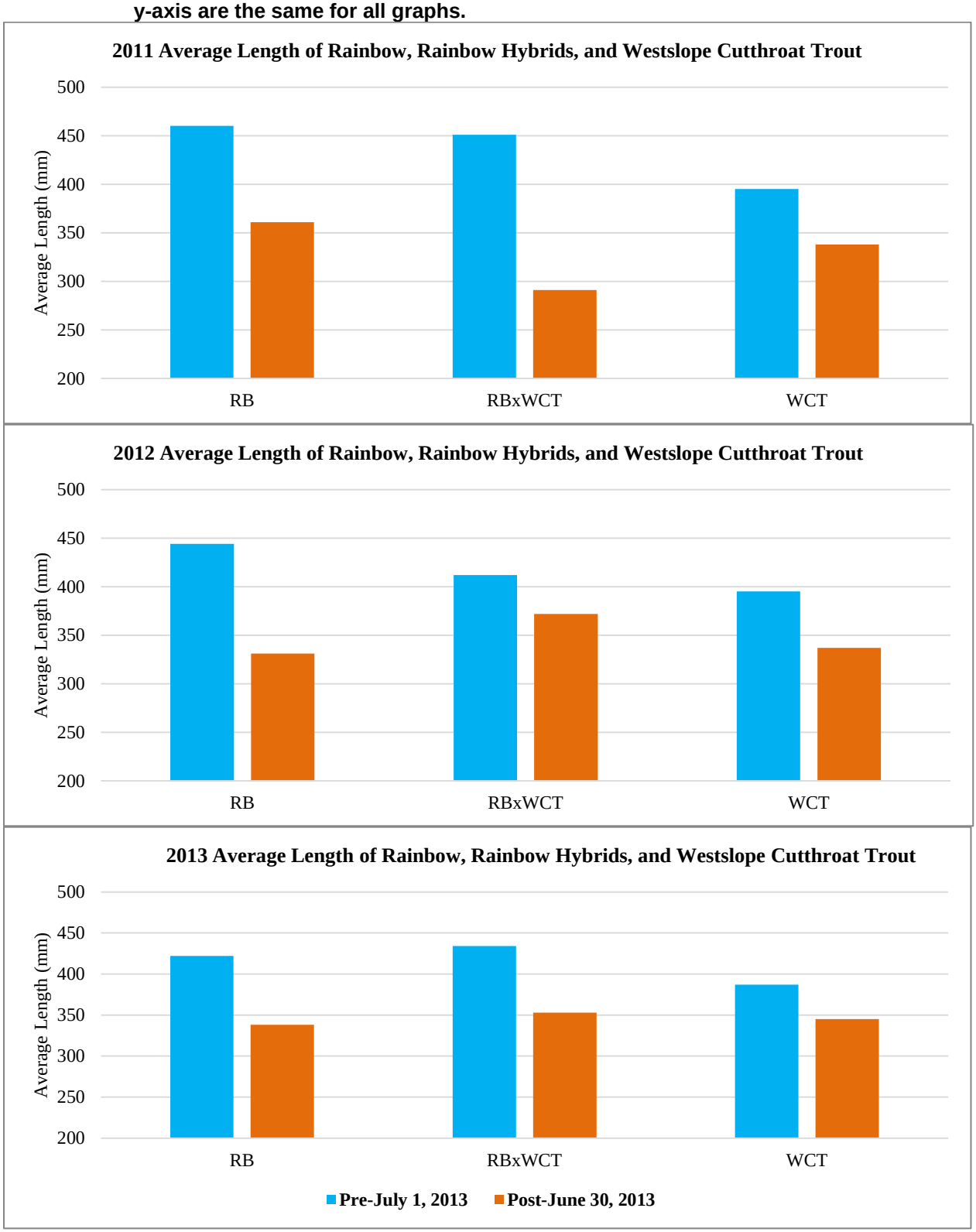
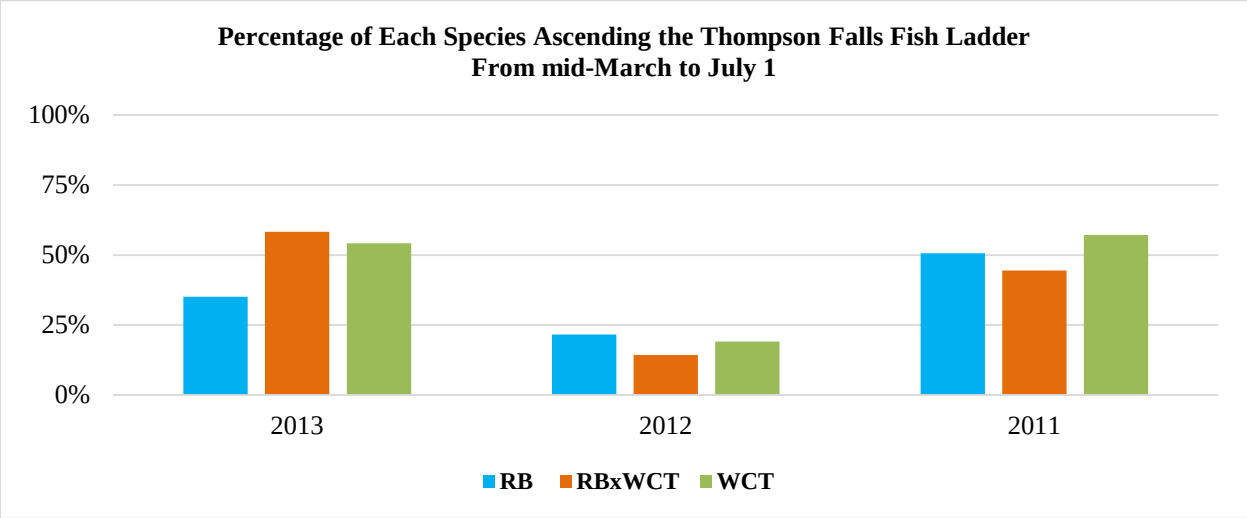


Figure 3-9: Percentage of each species (RB, RBxWCT, and WCT) ascending the ladder prior to July 1 each year.



3.2.7.4 Non-Salmonid Seasonal Movements

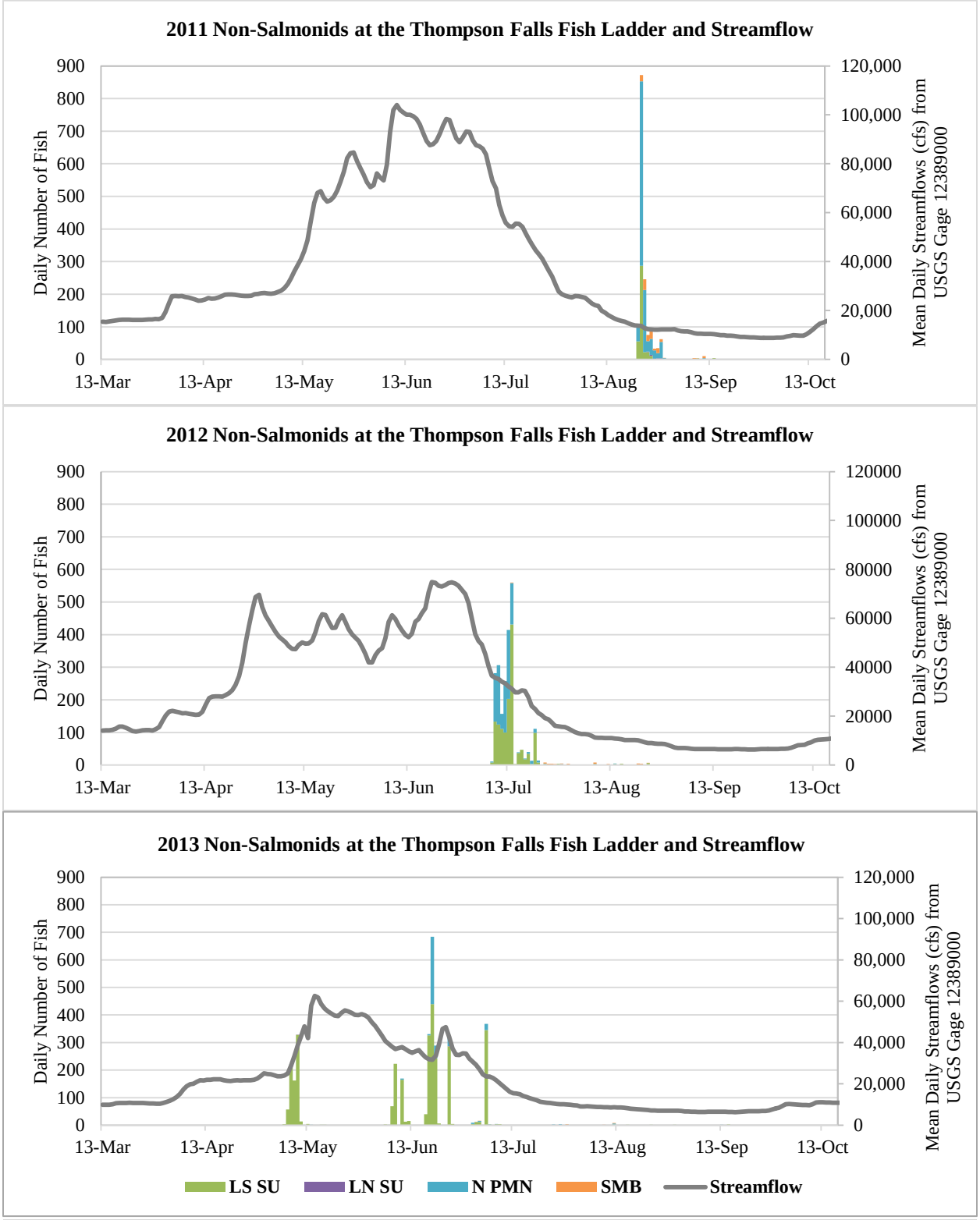
Non-salmonids are the predominant fish ascending the ladder, making up 87 to 90 percent of the total numbers in each year (*refer to* Table 3-2). The daily number of non-salmonids by species that ascended the ladder each year along with the annual hydrograph for 2011, 2012, and 2013 are shown in Figure 3-10. It is worth noting that the ladder closure during the summer months in 2011 may have altered the pattern of seasonal fish movement that year.

The majority of non-salmonids are represented by largescale suckers and northern pikeminnow. By comparison, there were few longnose suckers and smallmouth bass. In general, the daily count of non-salmonids peaked during the summer during the descending limb of the hydrograph and warmer stream temperatures. Smallmouth bass (albeit lower numbers in 2012 and 2013) consistently ascended the ladder in late July and August when stream temperatures were above 20 °C.

In 2011, the ladder was closed for the summer months until August 22 and approximately 97 percent of the non-salmonids ascended the ladder in August. The peak daily count was 872 non-salmonids on August 23. In August stream temperatures were above 20 °C and streamflows were approximately 13,000 cfs.

In 2012, non-salmonids were most common in the ladder in July with a peak daily count of 560 non-salmonids on July 14. Streamflows were approximately 30,000 cfs and stream temperatures were approaching and exceeding 20 °C during the peak movement of non-salmonids. In July, the majority of non-salmonids were largescale suckers and northern pikeminnow. Smallmouth bass ascended the ladder from late July through August in much lower numbers (< 5 per day).

Figure 3-10: Summary of the mean daily streamflow in the Clark Fork River near Plains (USGS Gage #12389000) and daily count of non-salmonid species, by species, ascending the ladder from 2011-2013. The primary x-axis (number of fish) may vary; while the secondary x-axis (streamflow) and y-axis (date) are the same for all graphs.



In 2013, unlike 2011 and 2012, where non-salmonids displayed a large movement in the summer following the declining limb of the hydrograph and warmer stream temperatures; non-salmonids daily counts exceeded 100 fish in May as well as in the summer months. The larger daily counts of non-salmonids were predominantly largescale suckers. In May 2013, non-salmonids were not observed in large numbers until stream temperatures exceeded 11 °C. Daily counts of non-salmonids were greatest on June 19 with 684 non-salmonids, streamflows approximately 30,000 cfs, and the stream temperature 17.5 °C. As observed in 2012, smallmouth bass were in the ladder in late July and August when temperatures exceeded 20 °C.

3.2.8 Weir Modes: Notch vs. Orifice

During the annual TAC meeting held on December 5, 2012, PPL Montana recommended that the ladder be set in orifice mode for the entire 2013 season. The TAC voting members (FWS, CSKT, and FWP) supported this recommendation. The ladder operated in the orifice mode for the entirety of the 2013 season. PPL Montana proposes to continue to operate the ladder in orifice mode for the entire 2014 season because higher overall numbers of fish and more bull trout were passed in 2013 than in prior years, indicating the orifice mode was effective.

3.2.9 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.

PPL Montana's 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 which are present downstream of the Main Channel Dam. For this reason, both the AWS and the HVJ were operated throughout the non-spill season in 2013 (as was done during the 2012 season) to allow fish to reach the entrance to the ladder. PPL Montana will continue to operate the attractant flow system in this manner to ensure that there is sufficient flow downstream of the Project to allow fish to successfully transit the falls.

3.2.10 Bull Trout Genetics

Genetic samples of bull trout collected in 2011, 2012, and 2013 in association to the Project, as referenced in Table 3-13, were submitted to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis.

In 2013, there were a total of six bull trout sampled including one bull trout in the upper section of the Thompson Falls Reservoir reach and five bull trout at the ladder. All the bull trout sampled in 2013 were genetically assigned to Region 4, upstream of the Thompson Falls Dam (5 bull trout to Fishtrap Creek; 1 bull trout to Fish Creek).

In 2012, there were a total of seven bull trout sampled including two bull trout at the ladder; one bull trout below the Thompson Falls Dam; two bull trout in the Thompson Falls Reservoir electrofishing reach (1 in the lower section; 1 in the upper section); and two bull trout in the Paradise to Plains electrofishing reach. Six of the seven fish were genetically assigned to Region 4 and one fish was genetically assigned to a Region 3 tributary to Noxon Reservoir.

In 2011, there were a total of five bull trout genetically tested, including two bull trout that ascended the ladder and three bull trout collected via electrofishing below the Thompson Falls Dam. All five bull trout were genetically assigned to Region 4.

In addition, FWP collected juvenile bull trout samples in 2013 from four tributaries in the middle of Clark Fork River, discussed in more detail in Section 7.1.2.

Table 3-13: Summary of genetics from bull trout captured during project activities in 2011, 2012, and 2013.
Note: EF = electrofishing; 2013 fish are listed in bold and highlighted in blue. Source: Avista Corporation (2013).

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
4/26/2011 5/21/2012	547 563	1438 1404	985121023464730	TFalls Ladder	Fishtrap Creek (R4)	Monture Creek (R4)	500,000
4/13/2011	365	364	985121023302169	TFalls Ladder	Thompson River (R4)	Upper Rock Creek (R4)	1,770
5/31/2011	482	966	985121021877906	EF below TFalls	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
5/31/2011	180	50	985121021907887	EF below TFalls	Fishtrap Creek (R4)	Upper Rock Creek (R4)	11,040,300
5/31/2011	247	130	985121021914545	EF below TFalls	Fishtrap Creek (R4)	Cooper Gulch (R3)	10,424,600
4/10/2012	272	150	985121027393272	EF below TFalls	Graves Creek (R3)	Rock Creek (R2)	10,698,400
4/16/2012	222	76	985121027360192	Lower Section – EF TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	1,000,000
4/17/2012	260	140	985121027402995	Upper Section – EF TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	17,920,300
5/15/2012	510	1172	985121021877906 & 982000357016269	At Ladder	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
10/30/2012	472	800	982000357016135	Paradise – Plains EF	Monture Creek (R4)	Fish Creek (R4)	1.07
10/30/2012	444	678	982000357016066	Paradise – Plains EF	Fish Creek (R4)	Cooper Gulch (R3)	21.35
4/10/2013	**260**	**108**	**982000357016097**	**Upper TFalls Reservoir in CFR (EF)**	**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**
5/6/2013	**576**	**1694**	**982000357016109**	**TFalls Ladder**	**Fishtrap Creek (R4)**	**EF Bull River (R2)**	**500,000**

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
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 (Genetics 118-073)	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

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

4.0 Bull Trout Passage from Downstream Facilities

Avista Corporation (Avista) continued their trap and haul upstream fish passage program in 2013. Bull trout captured downstream of Cabinet Gorge Hydroelectric Project were genetically tested using rapid response genetic identification methodology (DeHaan et al., 2013). 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 Dam. Bull trout with a natal stream upstream of the Thompson Falls Project are referred to as "Region 4" fish.

Avista captured a total of 47 unique adult bull trout (including 1 mortality) below Cabinet Gorge Hydroelectric Project (in 2013). Of the 47 bull trout, 40 were released upstream of Cabinet Gorge Dam in either Region 2, Cabinet Gorge Reservoir (n=16); upstream to Region 3, Noxon Reservoir (n=16); or upstream to Region 4 (n=8). The eight bull trout transported upstream of the Thompson Falls Dam (Region 4) were PIT tagged. All eight fish genetically assigned to Region 4 and were released into the Thompson River, including four in lower West Fork Thompson River, two at the confluence of Fishtrap Creek, and two in lower Fishtrap Creek. Table 4-1 summarizes the eight bull trout captured in 2013 by Avista below Cabinet Gorge Hydroelectric Project that were assigned and transported to Region 4. A summary of Avista's Upstream Fish Passage Program for 2013 is available in Moran and Posselt (2014) and Bernall and Duffy (2014, in prep.).

Table 4-1: Summary of the 8 bull trout captured below Cabinet Gorge Dam in 2013, assigned to Region 4 and released in Region 4. Note: EF = electrofishing. Source: Avista Corporation (2013).

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

5.0 Thompson River Drainage (5-Year Reservoir Plan)

In 2010, PPL Montana developed and submitted the *5-Year Reservoir Monitoring Plan, 2011-2015* (PPL Montana, 2010b) (5-Year Reservoir Plan) to the Commission in compliance with Term 5a of the FWS's Biological Opinion Terms and Conditions (Section 8.5.1). The Commission issued an Order on February 9, 2011 approving the 5-Year Reservoir Plan, and PPL Montana began implementation in 2011.

Due to the geographic proximity of the Thompson Falls Dam to the Thompson River and the duration that the Thompson Falls Dam has served as a fish barrier, the Thompson Falls Dam has likely had the greatest impact on bull trout in the Thompson River drainage. Therefore, the Thompson Falls Fisheries TAC has identified the Thompson River as a critical drainage to concentrate bull trout protection and enhancement measures and allocation of funding.

The overall goal of the 5-Year Reservoir Plan is to gather information that will assist in developing recommendations to *maximize survival of out-migrant juvenile and adult bull trout through Thompson Falls Reservoir and Dam*. In order to address this goal, two objectives were identified:

1. Characterization of bull trout in the Thompson River drainage
2. Characterization of the effects of Thompson Falls Reservoir on bull trout emigrating from the Thompson River drainage and migrating downstream in the Clark Fork River

Activities that have been completed since 2010 and are proposed in 2014 in support of the 5-Year Reservoir Plan include the following:

- A fish survey was completed in West Fork Thompson River in 2010 (PPL Montana, 2012)
- A fish survey was completed in Fishtrap Creek in 2011 (PPL Montana, 2012)
- A Thompson River Drainage database documenting available records from 1973 through 2011 was completed in 2012 (PPL Montana, 2012)
- *Thompson River Bull Trout Enhancement and Recovery Plan* (GEI Consultants, Inc. and Steigers Corporation, 2013) was prepared in 2012 (PPL Montana, 2013)
- Fish surveys were completed in four tributaries in the Thompson River, including Lazier Creek, Indian Creek, Twin Lakes Creek, and Big Rock Creek in 2013. These surveys were funded by the TAC (Sections 5.1 and 7.1.1)
- Fish surveys in Thompson River tributaries Mudd Creek, Murr Creek, and Alder Creek are proposed for 2014
- A juvenile bull trout out-migration study is scheduled to start in 2014 and end in 2016 in Thompson Falls Reservoir (Section 9.5.1)

5.1 2013 Thompson River Tributaries – Fish Surveys

The *Thompson River Bull Trout Enhancement and Recovery Plan* (Plan) identified potential bull trout habitat patches in the Thompson River drainage (GEI Consultants, Inc. and Steigers Corporation, 2013). Based on the results of the Plan, several watersheds in the drainage appear to have suitable habitat for bull trout based on available water temperature data and geomorphology characteristics, but biological information of some tributaries was limited. The watersheds with minimal biological information included Mudd Creek, Alder Creek, Murr Creek, Lazier Creek, Twin Lakes Creek, and Indian Creek. In addition, bull trout presence was documented in Big Rock Creek, but the presence of the migratory component in the drainage is currently unknown. In order to determine whether the watersheds provide potential migratory bull trout habitat, additional fish surveys were proposed and completed in 2013.

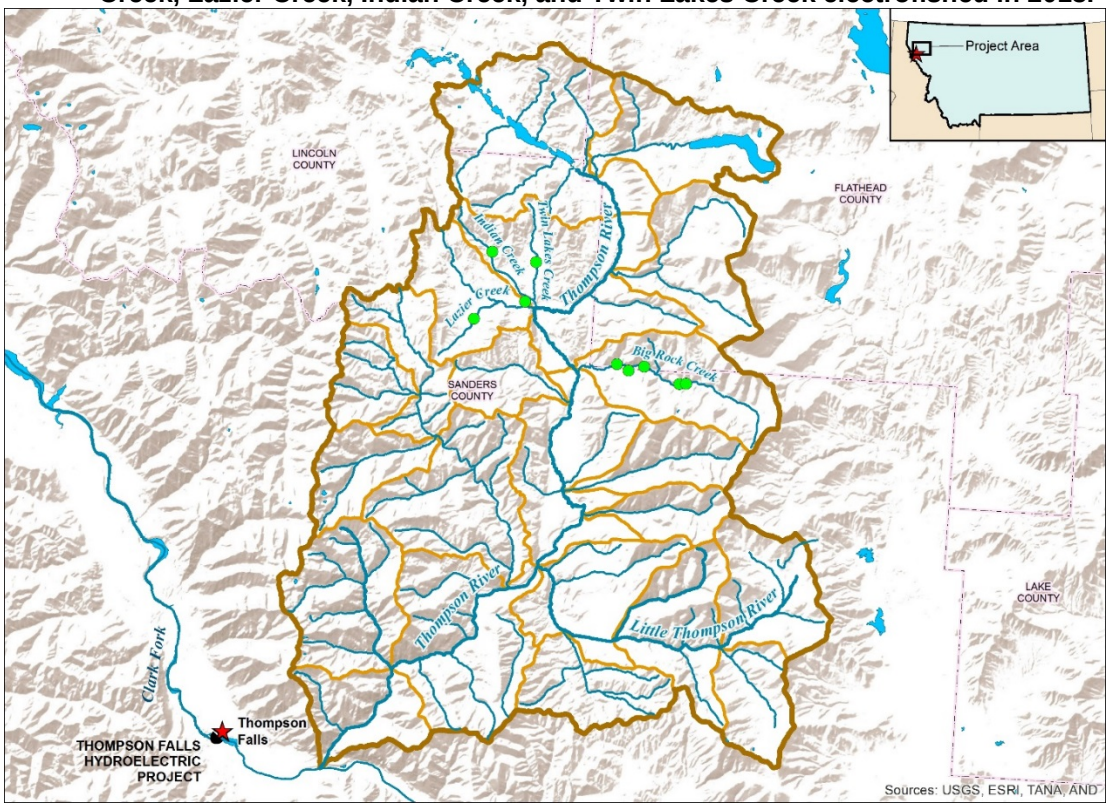
The U.S. Forest Service, FWP, and PPL Montana received funding from the TAC to complete additional fish surveys in several tributaries (Big Rock Creek, Mudd Creek, Alder Creek, Murr Creek, Lazier Creek, Twin Lakes Creek, and Indian Creek) in the Thompson River drainage in order to assess the current status of fish populations and complete on-the-ground habitat review for bull trout. The primary objective for these surveys was to identify the fish populations in the streams, identify whether bull trout are present and/or whether the tributary had potential to provide bull trout habitat.

In August and September 2013, FWP, with assistance from PPL Montana, completed the fish surveys in Big Rock Creek, Lazier Creek, Indian Creek, and Twin Lakes Creek. The locations of the tributaries and survey reaches in the Thompson River drainage are shown in Figure 5-1. Additional fish surveys in Mudd Creek, Alder Creek, and Murr Creek are scheduled for the 2014 field season. Results of the 2014 field season will be presented in next year's annual report.

A summary of the fish species observed, total number electrofished by tributary and reach, fish per hour, and fish per meter is provided in Table 5-1.

In Big Rock Creek, bull trout were observed in the three of the five reaches surveyed in 2013 (Table 5-1). Bull trout were not detected near the confluence of Big Rock Creek with the Thompson River or in the headwaters. One bull trout (196 mm, 55 g) was detected in Reach 2; 20 bull trout were observed in Reach 4.5; and one bull trout (55 mm) was detected in Reach 7.5. The average size of bull trout in Reach 4.5 was approximately 133 mm and 58 g with lengths ranging from 60 to 386 mm and weights ranging from 1 to 446 g. HDX PIT tags were implanted in 10 bull trout ranging in size from 112 to 386 mm collected in Reach 4.5.

Figure 5-1: Thompson River drainage and the locations of the reaches (green dots) in Big Rock Creek, Lazier Creek, Indian Creek, and Twin Lakes Creek electrofished in 2013.



In addition, genetic samples were taken from the bull trout recorded in Big Rock Creek and submitted by FWP to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis. These samples were collected and submitted to improve the genetic baseline for Big Rock Creek.

No bull trout were observed in Indian Creek, Lazier Creek, and Twin Lakes Creek (Table 5-1). Water from Twin Lakes Creek is diverted for irrigation and the creek is not hydrologically connected to the Thompson River.

Table 5-1: Summary of the 2013 fish data collected during the electrofishing efforts in the Thompson River tributaries of Big Rock Creek, Lazier Creek, Indian Creek, and Twin Lakes Creek.

Sampling Date	Tributary & Reach	Fish Species	Total Fish	Fish per hour	Fish per meter
August 7, 2013	Big Rock Creek 1	WCT	57	26.5	0.6
		LL	37	17.2	0.4
		Total	**94**	**43.7**	**0.9**
August 21, 2013	Big Rock Creek 2	BULL	1	0.5	0.0
		WCT	92	42.6	1.3
		RBxWCT	5	2.3	0.1
		LL	1	0.5	0.0
		Total	**99**	**45.9**	**1.4**
August 5, 2013	Big Rock Creek 4.5	BULL	20	10.0	0.2
		WCT	132	65.7	1.4
		Total	**152**	**75.6**	**1.6**
August 22, 2013	Big Rock Creek 7.5	BULL	1	2.2	0.0
		WCT	35	76.1	0.6
		Total	**36**	**78.3**	**0.7**
August 6, 2013	Big Rock Creek 8	WCT	169	117.0	2.1
September 9, 2013	Indian Creek	EB	97	66.5	1.3
		LL	13	8.9	0.2
		RB	1	0.7	0.0
		Total	**111**	**76.1**	**1.5**
September 16, 2013	Upper Indian Creek	WCT	43	96.5	0.7
September 16, 2013	Lazier Creek	EB	2	4.5	0.0
		RB	31	69.3	0.3
		RBxWCT	1	2.2	0.0
		Total	**34**	**76.0**	**0.4**
September 10, 2013	Twin Lakes Creek	WCT	56	43.0	0.7

6.0 Total Dissolved Gas and Gas Bubble Trauma

In 2012, the Thompson Falls Fisheries TAC agreed to initiate total dissolved gas (TDG) and gas bubble trauma (GBT) monitoring when and if streamflows reached or exceeded 75,000 cfs. In 2013, mean daily streamflows taken from the USGS gage station near Plains, Montana in the Clark Fork River peaked at approximately 62,600 cfs on May 15. Because the streamflows did not reach or exceed 75,000 cfs in 2013, no TDG or GBT monitoring was completed downstream of Thompson Falls Dam. The same protocol for initiating TDG and GBT monitoring will be followed in 2014.

7.0 TAC-Funded Projects in 2013

7.1 2013 TAC-Funded Projects

The Thompson Falls Fisheries TAC-funded several projects in 2012 and 2013 that were implemented in 2013. These projects include genetic testing of bull trout sampled in the Clark Fork River drainage; a model for supporting native trout restoration actions; a bull trout genetic study for a sex identification marker; and a remote HDX PIT tag array installed in lower Prospect Creek. Summaries of these projects are provided below.

The Thompson Falls Fisheries TAC also approved a multi-year study scheduled to start in 2014 evaluating juvenile bull trout out-migration in the Thompson Falls Reservoir. The TAC allocated funding in 2013 for equipment purchasing and the first study season (2014). For more details about the study plan and project funding, refer to Section 9.5.1.

7.1.1 Thompson River Tributaries – Fish Surveys

TAC funding (approximately $23,933) for survey work in the Thompson River drainage was completed in 2013 in support of the 5-Year Reservoir Plan. In summer 2013, PPL Montana and FWP completed fisheries surveys in four tributaries in the Thompson River drainage, including Big Rock Creek, Twin Lakes, Indian Creek, and Lazier Creek. The fish survey efforts in Murr Creek, Mudd Creek, and Alder Creek were not completed in 2013, but are scheduled for the 2014 field season. A summary of the 2013 fish surveys is provided in Section 5.1.

7.1.2 Bull Trout Genetic Sampling

In 2013, PPL Montana allocated approximately $10,000 to bull trout genetic analysis from samples collected in the Clark Fork River drainage to improve the genetic baseline database. Results from bull trout genetic analysis is reported annually by Abernathy Fish Technology Center Conservation Genetics Laboratory.

In 2013, approximately 50 samples were taken from juvenile bull trout in Fish Creek, Cedar Creek, Little Joe Creek, and Rattlesnake Creek. The samples from Fish and Cedar creeks were submitted to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis in 2013. It is anticipated that the samples from Little Joe and Rattlesnake creeks will be submitted to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis in 2014. The results of the genetic analyses for the samples will be included in next year's annual report, if available.

7.1.3 Strategic Prioritization of Native Trout Restoration Actions in the Lower Clark Fork Using Spatially Explicit Decision Support Modeling

In 2013, the TAC funded approximately $6,704 in support of the Strategic Prioritization of Native Trout Restoration Actions in the Lower Clark Fork Using Spatially Explicit Decision Support Modeling. The model is being designed to use a combination of existing data and expert input to identify and prioritize conservation actions in the lower Clark Fork River that will be most likely to benefit bull trout within the next 15 years. The development of the model is still in progress and the schedule for an initial release of the model is anticipated in spring 2014. FWS will provide the TAC an update on the status of the model during the 2014 annual meeting, which will be included in next year's annual report. Details of the proposed model are available in the 2012 Annual Report (PPL Montana, 2013).

7.1.4 Bull Trout Sex Identification Marker

In 2012, the TAC funded approximately $2,000 for Avista's proposal to support the development of a bull trout sex identification genetic marker. Funding for this project came from a cost-share between Avista, Kalispel Tribe, FWP, and PPL Montana. The work and funds were not started until 2013. In 2013, researchers at the Flathead Lake Biological Station, associated with the University of Montana, began working on the development of a bull trout sex identification genetic marker that could be used in a number of Avista projects to determine if fish are male or female. This genetic marker would complement the current bull trout passage program by verifying the gender of transport fish and be useful for other studies in the project area. The lab was successful in identifying one marker that was 95 percent accurate in matching the field call for known sex bull trout. This marker will be available for use by geneticists at the Abernathy Fish Technology Center Conservation Genetics Laboratory where bull trout genetic assignments that are used for fish passage decision making are currently analyzed.

7.1.5 Prospect Creek – HDX Remote Reader

In 2012, the TAC funded approximately $2,507 for Avista to install a remote HDX PIT tag array in lower Prospect Creek. The remote array was installed in late September of 2012 and was operated throughout the 2013 field season. The lower antenna at this site was broken and not operational from late May through the middle of August 2013 due to high flows. Three bull trout were detected at this site during 2013, one juvenile originally captured and PIT tagged in Crow Creek in 2012; and two adults, one previously captured moving upstream in the Prospect Creek weir trap in 2012 and the second, an adult that was first captured by PPL Montana electrofishing below Thompson Falls Dam in 2011, then captured in the Thompson Falls Upstream Fish Ladder and finally passed upstream of Thompson Falls Dam in 2012 prior to its detection on this lower Prospect Creek array in 2013.

8.0 Compliance with the Terms and Conditions of the Biological Opinion

The sections below provide the seven Terms and Conditions from the FWS's Biological Opinion (BO) followed by a statement describing PPL Montana's actions of compliance.

8.1 Term and Condition TC1 – Upstream Passage

8.1.1 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[3] 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

[3] U.S. Fish and Wildlife Service

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).

8.1.2 Compliance

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

PPL Montana will continue to stay in compliance with TC1d for the term of the License. PPL Montana will continue funding for the upstream fish passage facility and operate the facility in conformance with the approved SOP.

PPL Montana 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. In 2011, PPL Montana implemented the Fish Passage Evaluation Plan, which complies with TC1 (e, f, g, and h). PPL Montana will continue to implementation of the 5-Year Reservoir Plan through 2020.

8.2 TC2 – Downstream Passage

8.2.1 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.

8.2.2 Compliance

On November 11, 2013, PPL Montana electronically filed the renewed 7-year (effective January 1, 2014 through December 31, 2020) MOU, dated September 20, 2013, for the Thompson Falls Hydroelectric Project to the Commission. The renewed MOU received approval from FWS, FWP, CSKT, and PPL Montana 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 adaptive management funding account (AMFA) will start with $150,000 on

January 1, 2014. PPL Montana 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 3, 2013, PPL Montana approved two proposals requesting funding for 2014. The details of the proposals are provided in Section 9.0 of this report. PPL Montana will continue to collaborate and coordinate with agencies and other entities to support projects in compliance with Term 2a. As proposals are submitted, PPL Montana will distribute the information to the TAC for review and approval.

8.3 TC3 – Gas Supersaturation

8.3.1 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[4] 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.

[4] [gas bubble trauma]

8.3.2 Compliance

PPL Montana 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.

In 2012, the TAC agreed to initiate TDG and GBT monitoring when and if streamflows reached or exceeded 75,000 cfs. In 2013, mean daily streamflows taken from the USGS gage station near Plains, Montana in the Clark Fork River peaked at approximately 62,600 cfs on May 15. Because the streamflows did not reach or exceed 75,000 cfs in 2013, no TDG or GBT monitoring was completed downstream of Thompson Falls Dam. However, fish downstream of the Thompson Falls Dam were assessed in 2011 and 2012 for GBT; the results are provided in the 2011 and 2012 Annual Report, respectively (PPL Montana, 2012 and 2013). Bull trout that have been recorded at the ladder or downstream of the Thompson Falls Dam in 2011, 2012, and 2013 did not show any external symptoms of GBT.

PPL Montana 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.

8.4 TC4 – MOU and TAC

8.4.1 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.

8.4.2 Compliance

The current MOU expires on December 31, 2020 (Section 8.2.2). PPL Montana will coordinate with the TAC and FWS to revisit the terms of the MOU in 2020, prior to the expiration of the current agreement.

8.5 TC5 – Thompson Falls Reservoir

8.5.1 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.

8.5.2 Compliance

In compliance with TC 5a, PPL Montana collaborated with TAC members and prepared the 5-Year Reservoir Plan, which was approved by FWS and submitted to the FERC on June 17, 2010. FERC issued an Order approving the 5-Year Reservoir Plan on February 9, 2011. The objectives identified in the 5-Year Reservoir 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

The following activities have been completed or are proposed to gather information in support of the 5-Year Reservoir Plan:

- A fish survey was completed in West Fork Thompson River in 2010 (PPL Montana, 2012)
- A fish survey was completed in Fishtrap Creek in 2011 (PPL Montana, 2012)
- A Thompson River Drainage database documenting available records from 1973 through 2011 was completed in 2012 (PPL Montana, 2012)
- *Thompson River Bull Trout Enhancement and Recovery Plan* (GEI Consultants, Inc. and Steigers Corporation, 2013) was prepared in 2012 (PPL Montana, 2013)
- Fish surveys were completed in four tributaries in the Thompson River, including Lazier Creek, Indian Creek, Twin Lakes, and Big Rock Creek in 2013. The 2013 efforts were funded by the TAC (Sections 5.1 and 7.1.1)
- Fish surveys in Thompson River tributaries Mudd Creek, Murr Creek, and Alder Creek are proposed for 2014 (Section 9.0)
- Study proposed for 2014 through 2016 focused on juvenile bull trout out-migrating through the Thompson Falls Reservoir evaluating travel time; travel route, habitat use, and survival rate (Section 9.0)

In 2015, PPL Montana will provide a summary of the initial findings as described in TC5a and complete an evaluation of the site specific need for a nonnative species control program in the Thompson Falls Reservoir in compliance with TC 5b. Both evaluations will be completed by December 31, 2015.

8.6 TC6 – System-wide Monitoring

8.6.1 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).

8.6.2 Compliance

PPL Montana will comply with these requirements by holding necessary TAC meetings (and sub-committee meetings) in 2014 to ensure compliance and to aggressively address the adaptive needs of the operations of the ladder. PPL Montana's proposal to continue bull trout genetic sampling efforts in the Clark Fork River drainage in 2014 was approved and funded by the TAC during the annual TAC meeting held on December 3, 2013. PPL Montana has completed the construction of the ladder, which includes three remote antennas installed on the weirs. These remote antennas detect PIT tags as fish move through the ladder. PPL Montana will also continue to collaborate and coordinate with local biologists regarding the need to conduct radio telemetry studies.

8.7 TC7 – Reporting

8.7.1 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.

8.7.2 Compliance

PPL Montana complied with TC 7a requirements by preparing this annual report for the work completed in 2013. PPL Montana will continue to submit annual reports 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 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.

PPL Montana proposes to continue to provide the following information in future annual reports. PPL Montana 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

PPL Montana will prepare and present a comprehensive written assessment of the first 5 years of fishway operation to the TAC and FWS by December 31, 2015 in compliance with TC 7c.

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

8.7.3 Bull Trout Incidental Take Summary 2011-2013

In compliance with TC 7a, this section provides a summary of the cumulative extent of incidental take from all previous year activities (2009-2013) in support of the upstream fish passage at the Project.

In 2013, PPL Montana collected a total of six bull trout, all were released live. Table 8-1 provides details of the bull trout collected since 2009, including the six bull trout collected in 2013.

Of the six bull trout collected in 2013, five ascended the ladder and one bull trout was sampled via electrofishing in the upper section of the Thompson Falls Reservoir. Additional details of the five bull trout that ascended the ladder in 2013 are provided in Section 3.2.3.4. Additional details of the fish sampled via electrofishing can be found in Section 2.1.2.

Table 8-1: Cumulative incidental "take" of bull trout for the Project, since January 1, 2009.
Note: EF = electrofishing; PPLM = PPL Montana; 2013 fish are listed in bold.

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

Date	Method of Capture	Drainage	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/21/12	TFalls Ladder	Clark Fork (Lower)	TFalls Ladder	Fish Passage Studies	PPLM/FWP	563	1404	985121023464730	Fishtrap Creek (R4)	Mortality – Jumped out of Holding Pool at Ladder
10/30/12	EF	Clark Fork (Lower)	Paradise-Plains	Fish Passage Studies	PPLM/FWP	472	800	982000357016135	Monture Creek (R4)	Alive
10/30/12	EF	Clark Fork (Lower)	Paradise-Plains	Fish Passage Studies	PPLM/FWP	444	678	982000357016066	Fish Creek (R4)	Alive
4/10/2013	**EF**	**Clark Fork (Lower)**	**Upper TFalls Reservoir (CFR)**	**Fish Passage Studies**	**PPLM/FWP**	**260**	**108**	**982000357016097**	**Fishtrap Creek (R4)**	**Alive**
4/30/2013	**TFalls Ladder**	**Clark Fork (Lower)**	**TFalls Ladder**	**Fish Passage Studies**	**PPLM/FWP**	**598**	**2306**	**982000357016065**	**Fish Creek (R4)**	**Alive**
5/6/2013	**TFalls Ladder**	**Clark Fork (Lower)**	**TFalls Ladder**	**Fish Passage Studies**	**PPLM/FWP**	**576**	**1694**	**982000357016109**	**Fishtrap Creek (R4)**	**Alive**
5/7/2013	**TFalls Ladder**	**Clark Fork (Lower)**	**TFalls Ladder**	**Fish Passage Studies**	**PPLM/FWP**	**478**	**978**	**982000357016155**	**Fishtrap Creek (R4)**	**Alive**
6/7/2013	**TFalls Ladder**	**Clark Fork (Lower)**	**TFalls Ladder**	**Fish Passage Studies**	**PPLM/FWP**	**596**	**1926**	**HDX tag not recorded (Genetics 118-073)**	**Fishtrap Creek (R4)**	**Alive**
8/9/2013	**TFalls Ladder**	**Clark Fork (Lower)**	**TFalls Ladder**	**Fish Passage Studies**	**PPLM/FWP**	**482**	**1058**	**982000357016151**	**Fishtrap Creek (R4)**	**Alive**

9.0 Proposed Activities for 2014

9.1 Baseline Fisheries Data Collection

In 2014, PPL Montana 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 fall electrofishing reach, which is scheduled to be completed every other year (next survey in 2014). Baseline fisheries data will include spring and fall electrofishing and fall gillnetting at the designated sites. Data collected in 2014 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 2014 baseline fisheries studies will be no more than 10 bull trout.

9.2 Upstream Adult Fish Passage Studies

In 2014, PPL Montana 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. PPL Montana will collect biological and operational data during ladder operations in 2014. PPL Montana 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 which fallback after passing the Thompson Falls Dam
- Bull trout genetic sampling and tributary assignment

PPL Montana will operate the ladder in orifice mode full-time during the 2014 season (as was done during the 2013 season). The fisheries data collected in 2014 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). PPL Montana will provide a status report for the multi-year studies in next year's annual report. A list of the studies and their respective schedule is provided in Table 9-1. Based on prior year's sampling in the Thompson Falls tailrace it is conservatively estimated that incidental take of bull trout during 2014 upstream adult fish passage studies will be no more than 10 bull trout.

Table 9-1: **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 Only	Orifice Mode – No additional study	-	-	-	-	-	-
	Attractant Flow & Radio Telemetry	x (no radio telemetry)	x (no radio telemetry)	x (maximum attractant flow, no radio telemetry)	x (maximum attractant flow, no radio telemetry)	x	x	x	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 Reservoir Plan Report (Dec 31, 2015 – TAC/FWS Submittal)	-	-	-	-	x	-	-	-	-	-
	10-year Fish Passage Evaluation Plan Report (Dec 31, 2020 – TAC/FWS Submittal)	-	-	-	-	-	-	-	-	-	x

9.2.1 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 designed to operate with flows up to 48,000 cfs, but in 2011 it was successful at capturing fish when total Clark Fork River discharge was approximately 75,000 cfs. In 2012 and 2013, PPL Montana continued to test the range of streamflow over which the ladder collected migrating adult fish and found the ladder functional when flows ranged between 50,000 and 60,000 cfs. In 2013, peak spring flows were much lower than 2011 and 2012 with flows just exceeding 60,000 cfs. In all years (2011, 2012, and 2013) during periods of higher spring flow (greater than approximately 50,000 cfs), when the ladder was in operation, relatively few fish were observed ascending the ladder. It should also be noted that ladder operations during higher spring flows were dependent on debris and sediment loading. In 2014, the ladder will be operated 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 (Section 3.2.8) 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. Therefore, PPL Montana recommended to the TAC during the December 5, 2012 annual meeting to run the ladder in orifice mode for the entire 2013 season. The TAC members supported this recommendation. During the 2013 season, the ladder was operated under orifice mode resulting in over 3,800 fish ascending the ladder and including more bull trout (n = 5) than the previous 2 years combined (n = 4). PPL Montana proposes to continue to operate the entire 2014 season under orifice mode and analyze the 2014 data and determine if any additional studies regarding weir mode operations at the ladder are recommended.

The attractant flow study began in 2011. PPL Montana originally proposed to use the first 3 years of ladder operations (2011, 2012, 2013) to test variable attraction flows and learn operations. Based on observations in the first 2 years of study, PPL Montana 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, PPL Montana proposes to continue to use near maximum attractant flow during 2014 operations.

9.2.2 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 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) will be PIT tagged (but will not be radio tagged) in 2014. Region 4 bull trout will be released in Region 4 and Region 3 fish will be released in Region 3 in 2014.

The TAC has concluded that no radio telemetry studies will be conducted by PPL Montana in 2014. Therefore, assessment of fish movement patterns, timing, and behavior will be conducted by monitoring fish tagged with PIT tags and Floy tags. 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.

Approximately 1,506 fish have been uniquely tagged at the ladder or below Thompson Falls Dam in an effort to evaluate fish movement patterns, timing, and behavior (*refer to* Section 3.2.4). In 2014, PPL Montana proposes to continue to implant unique PIT tags in salmonids that ascend the ladder; PPL Montana will also insert HDX PIT tags in salmonids during electrofishing efforts downstream of the Thompson Falls Dam. The fish implanted with HDX tags (*vs.* the full-duplex [FDX] tags) will be used to test whether the remote HDX antennas in the ladder detect the HDX tagged fish. It is assumed that the HDX tagged fish will be detected at the work station if it ascends the ladder and PPL Montana can review the remote antenna records to confirm whether the remote antennas functioned properly. Electrofishing and tagging salmonids downstream of Thompson Falls Dam did not occur in 2013, but is proposed for 2014. At the end of the year, PPL Montana will assess the data and consult with the TAC to determine whether tagging efforts immediately downstream of the Thompson Falls Dam should be continued into 2015.

9.2.3 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 (HDX tags beginning in 2012) to monitor the movement of bull trout studies.

9.3 Thompson River Drainage Studies (5-Year Reservoir Plan)

In 2014, PPL Montana will continue to implement the *5-Year Reservoir Monitoring Plan, 2011-2015* (5-Year Reservoir Plan) that was submitted to the FERC in June 2010 and approved by the FERC in an Order issued on February 9, 2011. The goal of the 5-Year Reservoir Plan is to gather information that will assist in developing recommendations to *maximize survival of out-migrant juvenile and adult bull trout through Thompson Falls Reservoir and Dam.* Efforts to implement the 5-Year Reservoir Plan will extend over the next 5 years and beyond. Each year PPL Montana will prepare a status report for the annual report. Following the completion of the 5-Year

Reservoir Plan, PPL Montana will compile, analyze, and summarize data collected and submit a comprehensive report to FWS by December 31, 2015.

Thompson Falls Reservoir monitoring efforts will focus on two key objectives (PPL Montana, 2010b):

1. Characterization of bull trout in the Thompson River drainage
2. Characterization of the effects of Thompson Falls Reservoir 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

The first objective will be to characterize the present bull trout population in the Thompson River drainage. PPL Montana continues to coordinate with the TAC and FWS to review available historic data, available literature, identify data gaps, and develop an annual work/study plan for data collection in the Thompson River drainage. PPL Montana continues to coordinate with the TAC and FWS to develop annual work plans for data collection addressing known data gaps in the Thompson River drainage.

The second objective will be to characterize the influences that the Thompson Falls Reservoir may have on emigrating bull trout. Through continued consultation with the TAC and FWS, PPL Montana has generated a list of tasks to address the second objective that is outlined in the 5-Year Reservoir Plan. Because the Thompson River bull trout local population(s) are the ones most likely to be negatively affected by the Thompson Falls Dam and Reservoir (proximity), it is those populations which will be emphasized and evaluated, but in the process of doing so PPL Montana anticipates learning more about potential migrants from and to other local populations further upstream in the Clark Fork River that may share the Thompson Falls Reservoir habitat. At this time, there is nothing to suggest that differential impacts would occur to other populations, but if PPL Montana and the TAC determine otherwise, adjustments can be made to future monitoring efforts.

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.

In 2013, a study plan was developed for the Thompson River drainage to evaluate juvenile bull trout out-migration in the Thompson Falls Reservoir. This study is scheduled to start in 2014 and conclude in 2016 and will be implemented by the USGS through Montana State University. More details about the study objectives are presented in Section 9.5.1.

9.4 Total Dissolved Gas Control Plan and Gas Bubble Trauma Monitoring

9.4.1 TDG Control Plan

PPL Montana prepared and submitted the *Total Dissolved Gas Control Plan* (PPL Montana, 2010d) (TDG Control Plan) to the MDEQ in 2010. With the TDG Control Plan, PPL Montana 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.

Results of the 2012 TDG monitoring were reported to the TAC at the December 2012 meeting, and also in the 2012 Annual Report (*refer to* Section 6 in PPL Montana, 2013). During discussion on the TDG monitoring results, the TAC agreed that in 2013 the Main Dam Spillway will be operated in a manner than mimics the operations in 2012. In addition, the TAC agreed to:

- Consult with the TAC agencies regarding monitoring TDG depending on the stream runoff forecast. Provide streamflow forecasts to TAC members in early spring. PPL Montana will send an email to entire TAC with updates of the spring forecast. PPL Montana will recommend TDG monitoring if the runoff forecast indicates peak flows in excess of 75,000 cfs are likely.
- Make a monitoring decision in April and/or May in order to get new equipment installed before the beginning of the spring freshet
- Monitor fish for GBT when flows are greater than 75,000 cfs

Streamflows did not exceed 75,000 cfs in 2013; thus no TDG monitoring was conducted. Following the same protocol in 2013, PPL Montana proposes to prepare a report summarizing results from the 2014 TDG monitoring, if any is conducted, and the proposed spillway operation plan, if any changes are made for 2015, in the 2014 Annual Report.

9.4.2 Gas Bubble Trauma (GBT) Monitoring

GBT monitoring in fish downstream of Thompson Falls Hydroelectric Project will continue in 2014 if the spring runoff exceeds 75,000 cfs. The data collected in 2014, if any, will be summarized and presented in the 2014 Annual Report.

9.5 TAC Proposals for 2014 Funding

On December 3, 2013, PPL Montana hosted the annual TAC meeting in Missoula, Montana. During the meeting, the TAC authorized one new project (bull trout genetic sampling and analysis) for funding in 2014. In addition, three existing projects (with funding approved and/or allocated in 2013) will either continue or commence in 2014.

The existing projects with funds allocated in 2013 that will continue in 2014, include the Thompson River fish surveys in select tributaries, including Murr Creek, Mudd Creek, and Alder

Creek (*refer to* Section 7.1.1), and the model for prioritizing native trout restoration in the Lower Clark Fork River (*refer to* Section 7.1.3). Details about the bull trout juvenile out-migration in the Thompson Falls Reservoir study that will start in 2014 (approved and funded in 2013 by the TAC) and the bull trout genetic sampling and analysis proposed for 2014 are provided below.

9.5.1 Evaluation of Juvenile Bull Trout Out-migration in the Thompson Falls Reservoir

In 2013, the TAC approved funding for a multi-year (2014-2016) study that will evaluate juvenile bull trout out-migration through Thompson Falls Reservoir. The study will be completed by a Montana State University graduate student. The research objectives are specific to juvenile bull trout out-migrating from the Thompson River drainage through Thompson Falls Reservoir and include the following:

- Estimate travel time
- Describe travel route
- Describe habitat use
- Estimate survival rate

This study is expected to partially answer the following tasks that are outlined in the 5-Year Reservoir Plan:

- Estimate the proportion of juvenile bull trout that migrate upstream or downstream (in the Clark Fork River) once they have left the Thompson River drainage
- Utilize out-migration data to design a sampling protocol, if feasible, to monitor juvenile out-migration movement through the Thompson Falls Reservoir
- Evaluate out-migration movement in the Thompson Falls Reservoir to determine if the reservoir is influencing bull trout migrating life history stages
- If feasible to evaluate juvenile bull trout movement through the Thompson Falls Reservoir, also consider the evaluation of habitat use in the Thompson Falls Reservoir and determining if there is potential overall for competition with other species or predation losses
- Evaluate movement patterns of juvenile bull trout out-migrating into, through, and out of the Thompson Falls Reservoir
- Estimate residence time of juvenile bull trout out-migrating downstream through the Thompson Falls Reservoir

In 2013, the TAC allocated $37,932 for purchasing equipment (e.g., transmitters, receive, 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. Avista is cooperating in additional tracking of these fish if the fish pass downstream of Thompson Falls Dam. The graduate student will provide the TAC an

annual update on the progress of the study and results. A final report (Master's thesis) is schedule to be submitted to PPL Montana by December 30, 2016.

9.5.2 Bull Trout Genetic Sampling and Analysis

During the annual TAC meeting in December 2013, the TAC approved $20,000 to support bull trout genetic sampling and analysis in 2014. The funding area is approved for the lower Flathead River tributaries (i.e., South and North Fork Jocko River) and Clark Fork River and tributaries, upstream of Thompson Falls Dam. Sampling areas may extend from Thompson Falls Dam upstream to Rattlesnake Creek (near Missoula).

DNA data is needed to continue or update bull trout mapping in the Clark Fork River. This funding will be used to generate or update that bull trout DNA data where needed within the boundaries noted above.

10.0 References

Bernall, S. and K. Duffy. 2014 in prep. Upstream Fish Passage Studies Annual Progress Report – 2013, Fish Passage / Native Salmonid Program, Appendix C. Report to Avista Corporation, Corporation, Noxon, Montana.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books/Montana State University, Bozeman. 207 pp. Last edited: February 21, 2010.

DeHaan, P., B. Adams, and D. Hawkins. 2013. Genetic Analysis of Native Salmonids from the Lake Pend Oreille and Clark Fork River System, Idaho and Montana - Annual Report for Calendar Year 2012. U.S. Fish and Wildlife Service, Abernathy Fish Technology Center, Conservation Genetics Program. Report to Avista Corporation, Noxon, Montana.

Federal Regulatory Energy Commission (FERC). 2009. Order Approving Construction and Operation of Fish Passage Facilities. Issued on February 12, 2009.

Federal Register. 2010. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States; Final Rule. October 18, 2010.

Federal Register. 2005. 50 CFR Part 17. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Klamath River and Columbia River Populations of Bull Trout; Final Rule. September 26, 2005.

Federal Register. 1998. Department of the Interior Fish and Wildlife Service, 50 CFR Part 17 RIN 1018–AB94, Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. Final rule. June 10, 1998.

GEI Consultants, Inc. and Steigers Corporation. 2013. Thompson River Bull Trout Enhancement and Recovery Plan. Thompson Falls Project No. 1869, Thompson Falls, Montana. Prepared for PPL Montana, Butte, Montana.

MOU (Memorandum of Understanding). 2013. Facilitation and Funding of FERC License based Consultation Process and Implementation of Minimization Measures for Bull Trout. PPL Montana, Montana Fish and Wildlife and Parks, U.S. Fish and Wildlife Service, Confederate Salish and Kootenai tribes. Signed September 20, 2013.

MOU (Memorandum of Understanding). 2008. Facilitation and Funding of FERC License based Consultation Process and Implementation of Minimization Measures for Bull Trout. PPL Montana, Montana Fish and Wildlife and Parks, U.S. Fish and Wildlife Service, Confederate Salish and Kootenai tribes. Signed January 15, 2008.

Moran, S. and N. Posselt. 2014. Fish Capturing Facilities Developing and Testing Studies, Development and Evaluation of Fish Capturing Facilities: Nighttime Electrofishing, Hook-and-Line, and Cabinet Gorge Fish Hatchery Ladder - 2013, Fish Passage / Native Salmonid Restoration Program. Avista Corporation, Spokane, Washington.

PPL Montana. 2013. 2012 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869. Submitted to FERC, Washington D.C.

PPL Montana. 2012. 2011 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869. Submitted to FERC, Washington D.C.

PPL Montana. 2010a. Final Thompson Falls Fish Ladder – Fishway Operations Manual 1.0. Submitted to FERC, Washington D.C.

PPL Montana. 2010b. Thompson Falls Hydropower Project FERC Project Number 1869. 5-Year Reservoir Monitoring Plan, 2011-2015. Public. Submitted to FERC, Washington D.C.

PPL Montana. 2010c. Thompson Falls Hydropower Project FERC Project Number 1869. Fish Passage Evaluation Plan, Phase 2 Action Plan, 2011-2020. October 2010. Public. Submitted to FERC, Washington D.C.

PPL Montana. 2010d. Total Dissolved Gas Control Plan. Thompson Falls Hydroelectric Project FERC Project Number 1869. Submitted to Montana Department of Environmental Quality, Helena, Montana.

U.S. Fish and Wildlife Service (FWS). 2008. Biological Opinion for Thompson Falls Hydroelectric Project Bull Trout Consultation. Federal Energy Regulatory Commission Docket No. 1869-048 – Montana. PPL Montana, LLC, Licenses. Prepared by FWS Montana ES Field Office, Helena.