

NorthWestern Energy, 1801 South Russell, Missoula, Montana 59806

NWE-TFalls-3462

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

March 22, 2017

RE: NorthWestern Energy Files 2016 Annual Activity, Fish Passage and Bull Trout Take Report for the Thompson Falls Hydroelectric Project (1869)

Dear Secretary Bose:

Herein attached, per Item D of Commission Order dated February 12, 2009, is NorthWestern Energy's 2016 Annual Activities, Fish Passage and Bull Trout Take Report for the Thompson Falls Project completed in consultation with the U.S. Fish and Wildlife Service (USFWS), Montana Fish, Wildlife and Parks, Montana Department of Environmental Quality and Confederated Salish and Kootenai Tribes. The USFWS signature of approval (under their Section 7 Terms and Conditions Authority) for this report and filing with the Commission is included on page 2.

Sincerely,

Jon Jourdonnais  
Leader, Hydropower License Compliance

Cc: Wade Fredenberg, USFWS	Craig Barfoot, CSKT
Jason Garber, MDEQ	Don Skaar, MFWP
Mark Deleray, MFWP	Ryan Kreiner, MFWP
Andy Welch, NorthWestern	Brent Mabbott, NorthWestern
John Tabaracci, NorthWestern	Mary Gail Sullivan, NorthWestern
Ginger Gillin, GEI Consultants	Kristi Webb, New Wave

The USFWS has reviewed and by signature below, approves this Thompson Falls Project 2016 Annual Activity, Fish Passage and Bull Trout Take Report filing with the Commission.



---

Name

Supervisory Fish and Wildlife Biologist

---

U.S. Fish and Wildlife Service (position)

March 22, 2017

---

Date



**2016 Annual Report  
Fish Passage Project  
Thompson Falls Hydroelectric Project  
FERC Project Number 1869**

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

Submitted by:  
**NorthWestern Energy Corporation**  
Butte, Montana

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

**U.S. Fish and Wildlife Service**  
Kalispell, Montana

**Montana Department of Environmental Quality**  
Helena, Montana

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

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

**New Wave Environmental Consulting, LLC**  
Missoula, Montana

March 2017  
©2017 by NorthWestern Energy Corporation All Rights Reserved

# Table of Contents

---

<b>Executive Summary .....</b>	<b>ES-1</b>
Baseline Fisheries Studies .....	ES-1
Upstream Fish Passage (10-Year Fish Passage Evaluation Plan).....	ES-2
Bull Trout Incidental “Take” .....	ES-4
Avista Bull Trout Passage and Monitoring .....	ES-4
Total Dissolved Gas (TDG) Monitoring.....	ES-5
Thompson Falls Reservoir Monitoring .....	ES-5
TAC-Funded Projects .....	ES-5
<b>1.0 Introduction.....</b>	<b>1</b>
1.1 Background.....	1
1.2 Compliance with the FERC Order .....	2
<b>2.0 Baseline Fisheries Studies .....</b>	<b>3</b>
2.1 Spring Electrofishing .....	7
2.1.1 Lower Section .....	7
2.1.2 Upper Section .....	9
2.1.3 Spring Electrofishing Summary .....	11
2.2 Autumn Electrofishing .....	11
2.2.1 Electrofishing above the Island Complex .....	12
2.2.2 Electrofishing Paradise to Plains.....	15
2.2.3 Autumn Electrofishing Summary .....	17
2.3 Autumn Gillnetting.....	18
2.4 Salmonids Released Upstream of the Ladder and Detected during the Baseline Fisheries Surveys .....	20
2.5 Bull Trout Recorded During Baseline Fisheries Surveys.....	22
<b>3.0 Upstream Fish Passage Evaluation .....</b>	<b>23</b>
3.1 2016 Ladder Evaluation .....	23
3.2 Ladder Operations .....	23
3.3 Clark Fork River Hydrograph and Water Temperatures.....	24
3.4 Ladder Design Limitations and Fish Passage .....	27
3.5 Fish Ascending the Ladder .....	29
3.5.1 Species Composition .....	30
3.5.2 Fish Metrics.....	32
3.5.2.1 Fish Length and Weight .....	32
3.5.2.2 Fish Biomass Passed Upstream .....	34
3.6 Bull Trout Ascending the Ladder .....	35
3.7 Detecting Fish in the Ladder .....	37
3.7.1 Time of Day Fish Enter Ladder .....	37
3.7.2 Length of Time to Ascend the Ladder .....	39
3.8 Seasonal Movement Patterns .....	40

3.8.1	Streamflow and Fish Movement to the Ladder.....	42
3.8.2	Water Temperature and Fish Movement to the Ladder.....	45
3.8.3	Spring and Autumn Spawners.....	47
3.9	Tagged Fish Returning to the Ladder.....	49
3.9.1	Fish Tagged at the Ladder.....	49
3.9.2	Fish Tagged Below the Dam.....	51
3.9.3	Monitoring PIT-Tagged Fish Entering the Ladder.....	52
3.10	Fallback.....	54
3.11	Fish Movement Upstream of Thompson Falls Dam.....	56
3.11.1	Angler Reports of Ladder Fish.....	56
3.11.2	Ladder Fish Detected in the Thompson River Drainage.....	58
3.12	Weir Modes: Notch vs. Orifice.....	64
3.13	Attractant Flow.....	65
<b>4.0</b>	<b>Bull Trout Sampled in the Project Area.....</b>	<b>66</b>
4.1	Bull Trout Movement Patterns at the Ladder 2011-2016.....	69
4.2	Bull Trout Length Frequency and Length-Weight Relationship.....	72
<b>5.0</b>	<b>Bull Trout Passage from Downstream Facilities.....</b>	<b>74</b>
5.1	Avista’s 2016 Upstream Fish Passage Program.....	75
<b>6.0</b>	<b>Thompson Falls Reservoir Monitoring Plan.....</b>	<b>84</b>
<b>7.0</b>	<b>Total Dissolved Gas Monitoring.....</b>	<b>85</b>
<b>8.0</b>	<b>TAC-Funded Projects in 2016.....</b>	<b>86</b>
<b>9.0</b>	<b>Compliance with the Terms and Conditions of the Biological Opinion..</b>	<b>87</b>
9.1	Term and Condition TC1 – Upstream Passage.....	87
9.1.1	Requirement.....	87
9.1.2	Compliance.....	89
9.2	TC2 – Downstream Passage.....	89
9.2.1	Requirement.....	89
9.2.2	Compliance.....	89
9.3	TC3 – Gas Supersaturation.....	90
9.3.1	Requirement.....	90
9.3.2	Compliance.....	91
9.4	TC4 – MOU and TAC.....	91
9.4.1	Requirement.....	91
9.4.2	Compliance.....	92
9.5	TC5 – Thompson Falls Reservoir.....	92
9.5.1	Requirement.....	92
9.5.2	Compliance.....	92
9.6	TC6 – System-wide Monitoring.....	93
9.6.1	Requirement.....	93
9.6.2	Compliance.....	94

9.7	TC7 – Reporting.....	94
9.7.1	Requirement .....	94
9.7.2	Compliance .....	95
9.7.3	Bull Trout Incidental Take Summary 2011-2016 .....	96
<b>10.0</b>	<b>Proposed Activities for 2017 .....</b>	<b>100</b>
10.1	Baseline Fisheries Data Collection.....	100
10.2	Upstream Adult Fish Passage Studies.....	100
10.2.1	Effectiveness of the Ladder and Operations .....	102
10.2.2	Evaluation of Fish Movement Patterns, Timing, and Behavior.....	102
10.2.3	Evaluation of Fallback .....	103
10.3	5-Year Reservoir Monitoring Plan .....	103
10.4	Total Dissolved Gas Control Plan and Gas Bubble Trauma Monitoring.....	104
10.5	TAC Proposals for 2017 Funding .....	104
<b>11.0</b>	<b>Acknowledgements.....</b>	<b>106</b>
<b>12.0</b>	<b>References .....</b>	<b>107</b>

## List of Tables

Table 2-1:	Summary of abbreviations for fish identification, species common name, and scientific name. ....	4
Table 2-2:	Summary of the sample dates, water temperature, duration of electrofishing efforts, and streamflows (USGS gage #12389000) completed in the lower and upper sections of the Thompson Falls Reservoir 2009-2016. ....	7
Table 2-3:	Summary of the 2016 spring electrofishing results in the Thompson Falls Reservoir lower section, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016. ....	8
Table 2-4:	Summary of the 2016 spring electrofishing results in the Thompson Falls Reservoir upper section, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016. ....	10
Table 2-5:	Summary of autumn electrofishing efforts in the Above Islands reach and Paradise-to-Plains reach, including the year, date(s), duration of sample, approximately streamflow during sample event. ....	12
Table 2-6:	Summary of the 2016 autumn electrofishing results in the Clark Fork River above the islands, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016. (-) indicates a zero. ....	14
Table 2-7:	Summary of average catch rate (fish per hour) between 2010-2012, 2014, and 2016 compared to the catch rate in 2016 in the Clark Fork River – Paradise to Plains. ....	16
Table 2-8:	Summary of gillnetting in Thompson Falls Reservoir from 2004-2016. ....	18
Table 2-9:	Catch per net, by species, during annual October gillnetting series on Thompson Falls Reservoir in 2016 and the average, minimum, and maximum catch per net between 2004 and 2016. A dash indicates no (zero) fish of that species was captured. ....	19
Table 2-10:	Summary of the ladder fish released upstream of the Thompson Falls Dam and later recaptured during spring/fall baseline fisheries surveys (electrofishing and gillnetting) since ladder operations began in 2011. ....	21
Table 3-1:	Summary of when the ladder was in operation, 2011-2016. ....	24
Table 3-2:	Summary of the annual peak streamflow in the Clark Fork River (USGS gage #12389000) near Plains and maximum daily temperature recorded in the ladder, 2011-2016. ....	26
Table 3-3:	Summary of ladder checks and the number of fish (and species) recorded when streamflows exceeded 48,000 cfs at the USGS gage #12389000 during ladder operations, 2011-2016. ....	28
Table 3-4:	Summary of all fish species, including subtotals of salmonids and non-salmonids recorded at the Thompson Falls Dam ladder annually between 2011 and 2016. ....	29
Table 3-5:	Summary of the annual totals between 2011 and 2016 for the number of fish recorded at the ladder, the number of fish released upstream, the number of fish implanted with a PIT tag, and the number of mortalities/fish not authorized for upstream fish passage. ....	30
Table 3-6:	Summary of the number of fish measured and the mean and range of lengths (mm) and weights (g) for each fish species that ascended the ladder and was moved upstream in 2016. ....	34
Table 3-7:	Summary of the estimated total biomass in kilograms (kg) for each fish species that ascended the ladder and passed upstream of Thompson Falls Dam annually, 2011-2016. ....	35
Table 3-8:	Summary of Bull Trout that ascended the ladder, 2011-2016. ....	36
Table 3-9:	Summary of each species including the number of fish detected entering the ladder and the median, minimum and maximum range of time (hours) spent ascending the ladder in 2016. ....	39
Table 3-10:	Summary of the number of salmonids and non-salmonids detected via remote antennas in the ladder and the median time (hours) spent ascending the ladder each year. ....	40

Table 3-11: Summary of the number of fish, by species, with unique PIT or Floy tag implanted annually in fish at the Thompson Falls fish ladder prior to release upstream between 2011 and 2016. ....	50
Table 3-12: Summary of the number of ladder ascents (fish ascend ladder and are released upstream) for 280 returning fish, by species between 2011 and 2016. ....	51
Table 3-13: Summary of the number of salmonids PIT-tagged each year and the percentage of the PIT-tagged salmonids recorded at the ladder the following year, 2011-2016. ....	51
Table 3-14: Summary of spring electrofishing efforts (March through June) completed in 2011, 2012, and 2014, including number of days, overall duration of electroshocking, number of fish recorded. ....	52
Table 3-15: Summary of individual PIT-tagged salmonids detected in the ladder in 2016 via the remote PIT tag arrays in the lower pools and the holding pool. ....	53
Table 3-16: Summary of the total number of “fallback” by fish by species in 2016 detected either downstream of the Thompson Falls Dam within 30 days, between 31 and 90 days, or greater than 90 days after being released upstream. ....	54
Table 3-17: Summary of the total number of “fallback” fish by species between 2011 and 2015, as well as when fish were detected after being released upstream of Thompson Falls Dam: either detected downstream of the Thompson Falls Dam within 30 days, between 31 and 90 days, or greater than 90 days. ....	56
Table 3-18: Summary of Floy-tagged Smallmouth Bass captured by anglers and reported to FWP (2011-2016) that were initially tagged at the Thompson Falls fish ladder. ....	57
Table 3-19: Summary of the number of individual ladder fish detected in the Thompson River each year, 2014 - 2016. ....	59
Table 3-20: Summary of the 538 fish detected in the Thompson River between 2014 and 2016 and the last record of the fish at the Thompson Falls fish ladder. ....	62
Table 3-21: The travel time once fish were released upstream of Thompson Falls Dam and then were first detected in the Thompson River. ....	62
Table 3-22: Summary of the PIT-tagged salmonids released upstream of Thompson Falls Dam in 2015 and 2016 and detected in the Thompson River in the same year as they were released. ....	63
Table 4-1: Summary of Bull Trout genetics from the 31 individual Bull Trout sampled in the Project area between 2011 and 2016. ....	67
Table 4-2: Summary of the 8 Bull Trout detected in the Thompson Falls fish ladder via the remote antennas that did not ascend to the holding pool in 2015 and 2016, including the date(s) of detection, PIT tag identification, most likely population of origin, previous detection(s), other detections in ladder (if any), most recent length (mm). ....	71
Table 5-1: Summary of Bull Trout captured by Avista below Cabinet Gorge Dam, genetically assigned to Region 4 (R4) and transported to Region 4, and Bull Trout ascending Thompson Falls fish ladder. ....	74
Table 5-2: Summary of the Bull Trout captured by Avista below Cabinet Gorge Dam in 2016 as well as previous years (since 2009) assigned to Region 4 and released in Region 3 or 4 (S. Bernall, Avista, personal communication, 2016). Note: EF = electrofishing, LCFR = Lower Clark Fork River. ....	76
Table 9-1: Cumulative incidental “take” of Bull Trout for the Thompson Falls Project area located in the Lower Clark Fork River drainage, since January 1, 2009. Note: 2016 fish are listed in bold; EF = electrofishing; L = length; Wt = weight. ....	97
Table 10-1: Summary of the objectives, studies, and reporting requirements for the Fish Passage Evaluation Plan (2011-2020). Annual activities are indicated by an “x.” A dash (-) indicates no action will be taken for the year. TBD = “to be determined.” (Table was modified from the <i>Fish Passage Evaluation Plan</i> , 2010.) ....	101



## List of Figures

Figure 2-1:	Electrofishing and gillnetting sampling locations near Thompson Falls, Montana. ....	5
Figure 2-2:	Electrofishing reach between Paradise and Plains, Montana. ....	6
Figure 2-3:	Summary of the 2009- 2016 annual catch rate and 2009-2016 average catch rate for salmonids and all fish species captured during spring electrofishing efforts in the lower section of the Thompson Falls Reservoir. ....	9
Figure 2-4:	Summary of the 2009-2016 annual catch rate and 2009-2016 average catch rate for salmonids and all fish species captured during spring electrofishing efforts in the upper section of the Thompson Falls Reservoir. ....	11
Figure 2-5:	Summary of the average catch rate (fish per hour) between 2009 and 2016 compared to the catch rate in 2016 in the Clark Fork River – Above the Island Complex. ....	13
Figure 2-6:	Summary of the 2009-2016 annual catch rate for all salmonids and all fish captured in the Clark Fork River – Above the Island Complex. ....	15
Figure 2-7:	Summary of the average CPUE (2010, 2011, 2012, 2014, 2016) compared to CPUE in 2016 during the Clark Fork River autumn electrofishing between Paradise and Plains. .	17
Figure 2-8:	Summary of the annual catch rate for all salmonids and all fish captured in the Clark Fork River Paradise and Plains between 2010 and 2016. ....	17
Figure 2-9:	Summary of all fish species caught per net during the annual autumn gillnetting in the Thompson Falls Reservoir between 2004 and 2016. ....	20
Figure 3-1:	Mean daily streamflow from March 1 through December 1 in the lower Clark Fork River measured at the USGS gage #12389000 near Plains, Montana during a high-water year (2011), closer to average water year (2014), low water years (2015 and 2016), and the 1911-2014 average. ....	25
Figure 3-2:	Maximum daily water temperatures collected at the Thompson Falls fish ladder (Pool 48) during the ladder operational season each year, 2011-2016. ....	26
Figure 3-3:	Composition of salmonid species that ascended the Thompson Falls fish ladder annually, 2011-2016. ....	31
Figure 3-4:	Composition of non-salmonid species that ascended the Thompson Falls fish ladder annually, 2011-2016. ....	32
Figure 3-5:	Average length and standard deviation for salmonids species measured at the ladder, 2011-2016. ....	33
Figure 3-6:	Average length and standard deviation for non-salmonids species measured at the ladder, 2011-2016. ....	33
Figure 3-7:	Percentage of salmonids (n=330) and percentage of non-salmonids (n=138) and their respective ladder entry time between 2011 and 2016. ....	38
Figure 3-8:	Percentage of salmonids (top graph) and non-salmonids (bottom graph), recorded at the ladder each month for all years of ladder operations, 2011-2016. ....	42
Figure 3-9:	Summary of fish recorded per ladder check and mean daily streamflow during the 2016 season, March 14-October 31. ....	43
Figure 3-10:	Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded the Thompson Falls fish ladder in 2016 during various streamflows. Maximum flows less than 48,000 cfs. ....	44
Figure 3-11:	Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded the Thompson Falls fish ladder between 2011 and 2015 during various streamflows. Maximum flows greater than 68,000 cfs. ....	44
Figure 3-12:	Summary of fish recorded and water temperature in the ladder during each ladder check in 2016 (March 14 – October 31). ....	45
Figure 3-13:	Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded in the Thompson Falls fish ladder in 2016 during various water temperatures recorded at the ladder. ....	46

Figure 3-14: Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded in the Thompson Falls fish ladder between 2011 and 2015 during various water temperatures recorded at the ladder. ....46

Figure 3-15: Percentage of spring spawning salmonids recorded in Thompson Falls fish ladder between 2011 and 2014 (n=939), in 2015 (n=322), and in 2016 (n=407). ....47

Figure 3-16: Percentage of autumn spawning salmonids recorded at the Thompson Falls fish ladder in 2016, in 2015, and between 2011 and 2014 and in 2016. ....48

Figure 3-17: Percentage of non-salmonids recorded at the ladder between 2011 and 2014 (n=12,526), in 2015 (n=11,077), and in 2016 (n=4,006). ....49

Figure 3-18: Monthly detections of ladder fish in the Thompson River and monthly mean streamflows in the Thompson River in 2015 and 2016. ....60

Figure 3-19: Monthly summary of the number of ladder fish, by species first detected in the Thompson River and mean monthly streamflow in the Thompson River in 2015 (top graph) and in 2016 (bottom graph). ....61

Figure 4-1: Clark Fork River streamflow (USGS gage #12389000) corresponding to when Bull Trout were detected either entering the lower pools and did not ascend (some Bull Trout display multiply entries) or ascended to the holding pool between 2011 and 2016. ....70

Figure 4-2: Water temperature in the ladder (based on single daily measurement) corresponding to the date when Bull Trout were detected either entering the lower pools and did not ascend (some Bull Trout display multiply entries) or ascended to the holding pool between 2011 and 2016. ....70

Figure 4-3: Frequency distribution of the total lengths (mm) measured for 32 Bull Trout sampled in the ladder and electrofishing in the Thompson Falls Project area between 2011 and 2016. ....72

Figure 4-4: Weight (g) vs. length (mm) of Bull Trout data collected in the Project Area (n=32), including 15 Bull Trout at Thompson Falls fish ladder, 10 Bull Trout in the Clark Fork River (CFR) upstream of Thompson Falls Dam, and 7 Bull Trout in the CFR immediately downstream of Thompson Falls Dam between 2011 and 2016. ....73

## List of Acronyms

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

mmHg	millimeter of mercury
MDEQ	Montana Department of Environmental Quality
MWF	Mountain Whitefish
Msl	mean sea level
N	number
NP	Northern Pike
N PMN	Northern Pikeminnow
NorthWestern	NorthWestern Energy Corporation
PEA	Peamouth
PIT	passive integrated transponder
PPL Montana	PPL Montana, LLC
Project	Thompson Falls Hydroelectric Project
PUMP	Pumpkinseed
RB	Rainbow Trout
RBxWCT	Rainbow x Westslope Cutthroat Trout hybrid
RS SH	Redside Shiner
SMB	Smallmouth Bass
SOP	Operational and Procedural Manual
TAC	Technical Advisory Committee
TCs	Terms and Conditions
TDG	total dissolved gas
TFalls	Thompson Falls
TRiver	Thompson River
USGS	U.S. Geological Survey
WE	Walleye
Wt	weight
WCT	Westslope Cutthroat Trout
WF	West Fork
YP	Yellow Perch

# Executive Summary

---

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

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

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

The 2009 Order requires the Licensee to file with the Commission, by April 1 of each year through the remainder of the License, the annual report referenced in Term 7a of the FWS's TCs (FERC, 2009). In addition to the requirements stipulated in Term 7a, the annual report shall also address the Licensee's compliance with the FWS's TCs.

This report is intended to fulfill the annual reporting requirement, as specified in Term 7a of the BO and the requirements of the FERC Order (FERC, 2009). This report summarizes the Licensee's 2016 activities (Sections 2.0 – 8.0); compliance with the FWS's TCs of the BO (Section 9.0); and proposed activities in 2017 (Section 10.0).

## Baseline Fisheries Studies

In 2016, the Licensee (NorthWestern Energy as of November 18, 2014) with assistance from Montana Fish, Wildlife and Parks (FWP) continued collecting baseline fisheries data as presented in Section 2.0 of this report. Baseline fisheries data includes electrofishing the

Thompson Falls Reservoir; electrofishing the Clark Fork River above the island complex and the reach between Paradise to Plains; and gillnetting in Thompson Falls Reservoir. The baseline fisheries surveys were set up with the intention of monitoring the impact of salmonids passed upstream of Thompson Falls Dam. In the last 6 years, over 2,000 uniquely tagged salmonids were released upstream of Thompson Falls Dam. Baseline fisheries surveys have captured between zero and 11 ladder-tagged fish annually, resulting in a total of 24-tagged salmonids recaptured after release upstream of the dam. Electrofishing and gillnetting efforts have not been effective at detecting ladder fish and the resulting catch per unit effort (fish per hour or fish per net) over the years has been highly variable. This may be related to seasonal use by fish of the Clark Fork River and Thompson Falls Reservoir, habitat preference and availability, and/or sampling methodology.

NorthWestern and FWP propose modifying the frequency of the baseline surveys starting in 2017. Gillnetting efforts will continue annually each autumn, while spring and fall electrofishing efforts will occur every other year with the next sample event scheduled for 2018. Electrofishing will include the same three sites sampled in 2016.

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

In 2011, FERC issued two Orders, one on June 9, 2011 approving the Licensee's 10-year *Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) and the second on June 17, 2011 approving the Licensee's *Final Thompson Falls Fish Ladder – Fishway Operations Manual 1.0* (PPL Montana, 2010a). The ladder became operational in 2011. In 2016, the Licensee implemented the sixth year of studies as outlined in the Fish Passage Evaluation Plan.

In 2016, the ladder commenced operation on March 14 and was winterized on October 31. This was the first season without any ladder closures resulting from maintenance or streamflows. Streamflows in the Clark Fork River were below average, as was the case in 2015. The ladder operated primarily in orifice mode except for a 4-week period in July when weir modes (orifice and notch) were alternated weekly.

During the 231 days of ladder operations in 2016, a total of 4,630 fish (624 salmonids and 4,006 non-salmonids), including three Bull Trout were recorded at the ladder. For the first time since operations began, one Largemouth Bass ascended the ladder in 2016. In addition, one Brook Trout x Bull Trout hybrid was confirmed at the ladder resulting in FWP halting the future passage of Brook Trout. Only one Brook Trout was passed in 2016 prior to this decision. As in previous years, Lake Trout or Walleye were not authorized by FWP for release upstream if captured at the fish passage facility. In 2016, there were no Lake Trout or Walleye recorded at the ladder.

Fish recorded at the ladder in 2016 represented 12 species and three hybrids. A total of 4,611 fish were released upstream. Salmonids are predominately represented by Rainbow Trout and Brown

Trout, while non-salmonids are predominately represented by Largescale Suckers, Northern Pikeminnow, and Smallmouth Bass. Unmarked salmonids recorded at the ladder in 2016 were PIT-tagged, resulting in 525 newly tagged salmonids. Non-salmonids were not uniquely tagged in 2016. Approximately 10 percent of the 483 salmonids PIT-tagged at the ladder in 2015 returned to and ascended the ladder in 2016.

In 2016, approximately 120 PIT-tagged fish were detected entering the ladder via the remote arrays in the lower pools (pool 7 and pool 8) in the ladder. Eighty-eight of these fish ascended to and were detected via remote array in the holding pool (the top of the ladder) where they were recorded and released upstream. A total of eight fish escaped the holding pool (exited the holding pool and went down the ladder) and 27 fish were only detected entering the lower pools of the ladder. Most of the fish only detected entering the lower pools were initially tagged at the ladder (and released upstream) earlier in 2016 or in a previous year(s) except for two fish that were initially tagged downstream of the Project and were entering the ladder for the first time. The fish that “escaped” the holding pool were either detected via remote array(s) in the lower pool(s) after being detected in the holding pool or were not recorded at the work station after being detected in the holding pool. Three of the eight fish that “escaped” the holding pool later returned and ascended the ladder and entered the holding pool where they were recorded and released upstream. In 2016, three of the 88 fish recorded in the holding pool and released upstream had previously ascended the ladder (in the same year), entered the holding pool, and escaped the holding pool.

After fish are released upstream, they either continue to move upstream or return downstream of the dam. The evaluation of upstream movement is limited to baseline fisheries surveys and the remote PIT-tag array in the Thompson River (about 6 miles upstream of the Thompson Falls Dam). Downstream movement is evaluated through fallback detections.

“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 downstream of the Thompson Falls Dam or at the ladder again that same year. There were 20 “fallback” fish identified in 2016. Over half of the salmonid “fallback” in 2016 were detected in the mainstem Thompson River in the same year. Some of these fish made two to three trips to the ladder before moving upstream to the Thompson River. Eight of the 20 fallback were detected below the dam within 30 days. One fallback included a Bull Trout that initially ascended the ladder in April 2016 and was released upstream before returning to the ladder in October, but was only detected in the lower pool. These data demonstrate some fallback fish are surviving downstream passage, either through the turbines or over the spillway, returning to the ladder (sometimes multiple times a year), and continuing to move upstream into the Thompson River.

Upstream movements patterns indicate about 39 percent of PIT tagged-salmonids released upstream of the Thompson Falls fish passage facility in 2015 were detected in the Thompson River drainage in 2015 (via remote array in the mainstem). In 2016, approximately 33 percent of the individually PIT-tagged salmonids released upstream of the fish passage facility were

detected in the same year in the Thompson River drainage. The median travel time to the Thompson River after a fish was released upstream of Thompson Falls Dam was 3 days with over half of the fish traveling the distance within 5 days (data collected between 2014 and 2016).

In summary, salmonids display unpredictable and diverse movement patterns with regards to ascending the ladder, returning to the ladder, and upstream movement. The movement patterns and behavior are likely influenced by a combination of factors such as, but not limited to, species-specific behavior, physical environment (i.e., streamflow, water temperature, photoperiod, water clarity, etc.), ladder operations, genetic assignment, and biological conditions (i.e., life history, foraging, migrating, reproductive status, etc.). The information gathered over the last 6 years clearly indicates salmonids make a choice about their movement patterns that are not solely related to spawning and the fish ladder provides an additional option for these fish to search for optimal habitat under various conditions.

## **Bull Trout Incidental “Take”**

In 2016, the Licensee collected four Bull Trout (3 at the ladder and 1 via spring electrofishing in the upper section of the Thompson Falls Reservoir), all of which were released live. The three Bull Trout were recorded at the ladder on April 18, May 18, and June 6 when streamflows ranged between 19,500 and 32,000 cfs and water temperatures ranged between 9.7 and 17 degrees Celsius (°C). Two of the Bull Trout were detected at least once after being released upstream. The Bull Trout released upstream on April 18 was later detected downstream in the lower pool of the ladder on October 2. The Bull Trout released upstream on May 18 was later detected multiple times upstream in the Thompson River between September 18 and 28.

Since operations at the ladder began (2011-2016), 31 individual Bull Trout were sampled by the Licensee in the Project area with approximately four to seven individual Bull Trout sampled annually. Sampling has included collecting Bull Trout via electrofishing efforts upstream and downstream of Thompson Falls Dam, as well as Bull Trout recorded at the ladder. Of the 31 Bull Trout, one ascended the ladder twice and during the second ascent (2012), the Bull Trout jumped out of a pool and died. This mortality has been the only occurrence in the Project area. A cover was initially installed over the holding pool that was later replaced with a screen installed around the railing above the holding pool to mitigate the potential for this to occur in the future.

## **Avista Bull Trout Passage and Monitoring**

The number of Bull Trout transported by Avista has been documented in each annual report for the Project since 2009. From 2009 through 2016, Avista captured 93 Bull Trout that were genetically assigned to Region 4 (upstream of Thompson Falls Dam) and transported 65 Bull Trout to Region 4 with an average of approximately 10 Bull Trout transported annually to Region 4.

In 2016, Avista captured 26 unique Bull Trout ( 350 mm) downstream of the Cabinet Gorge Hydroelectric Project and transported 21 of the Bull Trout upstream and released them in either



the Cabinet Gorge Reservoir (number [n]=14); Noxon Reservoir (n=5); or upstream of Thompson Falls Dam (n=2).

The two Bull Trout transported upstream of the Thompson Falls Project were PIT-tagged and released in the Thompson Falls Reservoir at the Cherry Creek boat ramp, located downstream of the confluence with the Thompson River. One Bull Trout was detected in the mainstem of the Thompson River via the remote array 9 days after its release.

## **Total Dissolved Gas (TDG) Monitoring**

The April 2016 volume runoff forecast in the Lower Clark Fork basin was approximately 97 percent of normal, well below the threshold of 125 percent identified for any additional total dissolved gas (TDG) monitoring. Thus, no TDG monitoring was executed in 2016.

## **Thompson Falls Reservoir Monitoring**

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015 in compliance with the *5-Year Thompson Falls Reservoir Monitoring Plan* (PPL Montana, 2010b), as well as provide recommendations for improving emigrating juvenile Bull Trout survivorship and evaluate the site-specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS, along with the proposed changes, were filed with the Commission on December 17, 2014. FERC approved the modifications in a letter dated February 25, 2015. The modifications include removing the 5-year comprehensive summary of activities associated with the *5-Year Reservoir Monitoring Plan* because this requirement has been achieved through the annual reports since 2011. The development of any recommendations "for a nonnative species control program in the Thompson Falls Reservoir" was postponed until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of juvenile Bull Trout from the Thompson River.

## **TAC-Funded Projects**

In 2013, the Licensee renewed the Memorandum of Understanding (MOU, 2013) for a 7-year term (January 1, 2014 – December 31, 2020). The MOU was approved and signed by FWS, FWP, Confederated Salish and Kootenai Tribes of the Flathead Nation (CSKT), and the Licensee. The Licensee will provide \$100,000 annually for 7 years and allow a maximum of \$250,000 to accrue in the account from unspent or transferred annual TAC funds. The AMFA is designated for implementation of downstream passage minimization measures in addition to Project License required studies, monitoring activities, reports, upstream fish passage

minimization measures, gas abatement monitoring, predator control measures, and other means to reducing impacts on Bull Trout caused by operation of the Project.

In 2016, the Licensee, through the TAC, allocated funds for Bull Trout protection, mitigation, or enhancement either in whole or in partnership to the following projects:

- Cedar Creek Phase 2 Road Relocation and Large Woody Debris (LWD) Enhancement Project (\$30,000)
- Beartrap Fork Culvert Removal Project (\$11,000)
- Rattlesnake Creek Fish Screen Project, Phase I (\$13,125)
- Thompson River Watershed Coordinator (\$16,500)
- Bull Trout Genetics Analysis (\$10,000)
- Final Year of Thompson Falls Reservoir Study of Juvenile Bull Trout Out-Migration (\$24,669)

Following the annual TAC meeting held on December 6, 2016, two proposals for the 2017 calendar year were submitted via email to the TAC for review. One proposal requested funding (\$10,000) for Bull Trout genetics analysis and the second proposal requested funding (\$16,500) for the Thompson River Watershed Coordinator in 2017. Both proposals were unanimously approved by the voting TAC members (NorthWestern, FWS, FWP, and CSKT). NorthWestern will continue to coordinate with TAC members throughout the year and any proposal(s) submitted during the year will be distributed to the TAC members for review and approval. Projects approved and funded in 2017 will be summarized in next year's annual report.

# 1.0 Introduction

---

## 1.1 Background

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

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

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

In 2008, the Commission concluded that the Project is adversely affecting Bull Trout and the proposed conservation measures will reduce, but not 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.

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

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

## **1.2 Compliance with the FERC Order**

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

This annual report is intended to fulfill the annual reporting requirement, as specified in Term 7a of the BO and the requirements of the FERC Order. This report summarizes the Licensee's 2016 activities in Sections 2.0 through 8.0; NorthWestern's compliance with the FWS's TCs of the BO (Section 9.0); and NorthWestern's proposed activities in 2017 (Section 10.0).

## 2.0 Baseline Fisheries Studies

---

Fisheries monitoring of the Thompson Falls Reservoir has been completed through gillnetting and electrofishing efforts conducted annually, within the same general time frame, since 2004. The locations for autumn and spring electrofishing and autumn gillnetting completed in 2016 are displayed in Figures 2-1 and 2-2.

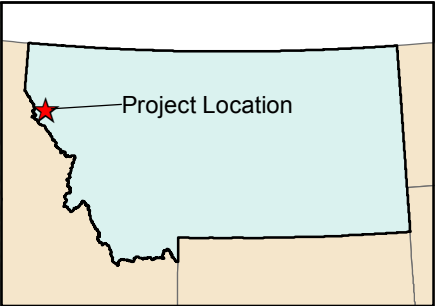
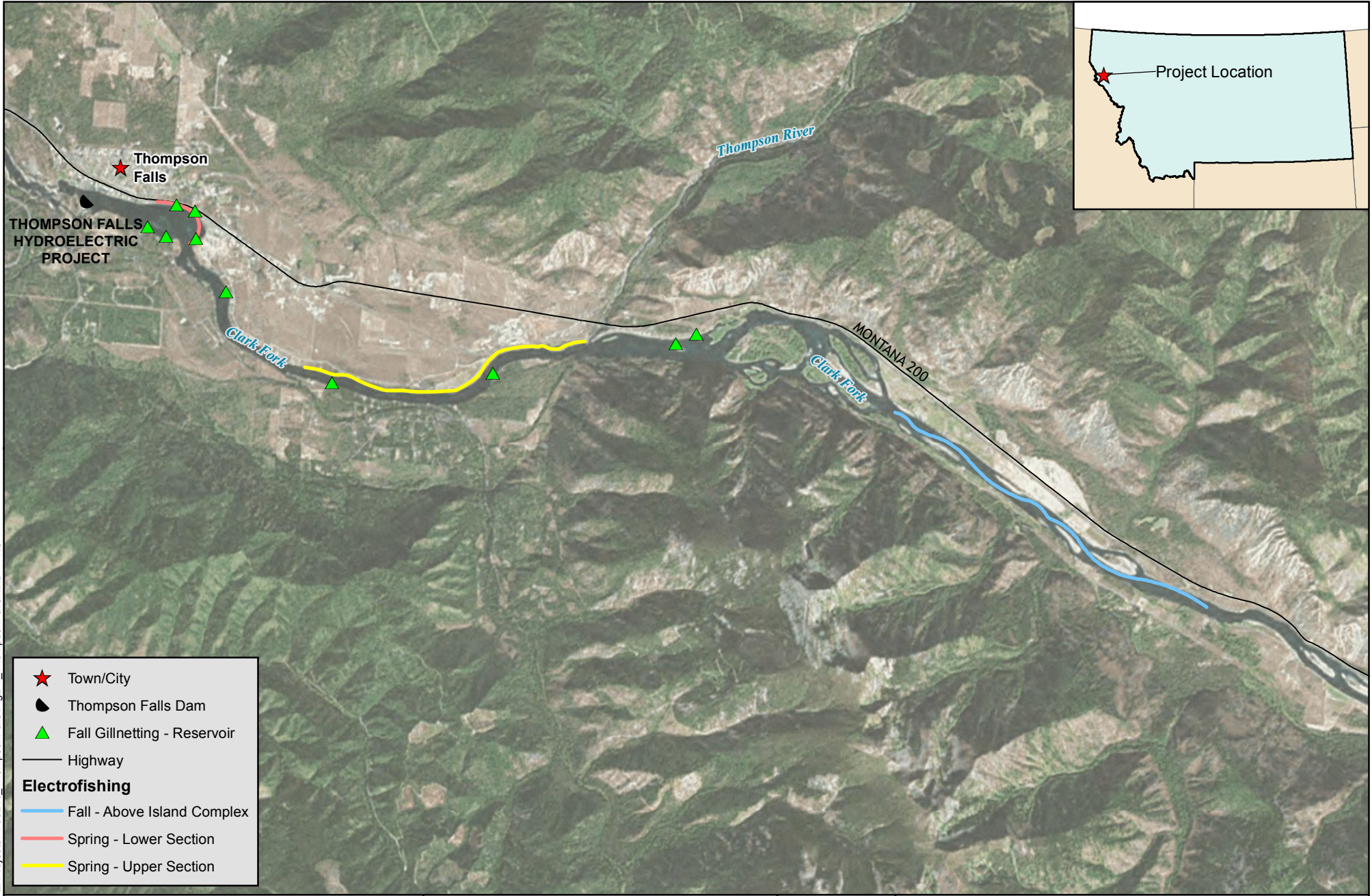
In 2010, the Licensee added a new upstream electrofishing site in the Clark Fork River upstream of the Thompson Falls Hydroelectric Project (Project) between the towns of Plains and Paradise, Montana. This site was surveyed each autumn in 2010, 2011, 2012, 2014, and 2016. Since 2012, the sampling interval of the Plains to Paradise reach was modified from annual to every other year with the next survey scheduled for autumn 2018.

The 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 annual and long-term changes to the fish community. This is especially important with the full-height fish ladder at the Project that commenced operations in spring 2011. This is one monitoring tool that gives managers the ability to track potential system-wide changes with fish passing into the Thompson Falls Reservoir from downstream.

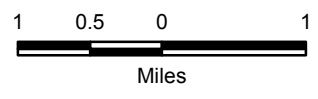
Fish recorded through the baseline fisheries data and fish passage are listed in Table 2-1 along with each species abbreviation, common name, and scientific name. Tables and figures in this report refer to the species abbreviation provided in Table 2-1.

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

<b>Fish Abbreviation</b>	<b>Common Name</b>	<b>Scientific Name</b>
BL BH	Black Bullhead	<i>Ameiurus melas</i>
BULL	Bull Trout	<i>Salvelinus confluentus</i>
EB	Brook Trout	<i>Salvelinus fontinalis</i>
LL	Brown Trout	<i>Salmo trutta</i>
LMB	Largemouth Bass	<i>Micropterus salmoides</i>
LN DC	Longnose Dace	<i>Rhinichthys cataractae</i>
LN SU	Longnose Sucker	<i>Catostomus castostomus</i>
LS SU	Largescale Sucker	<i>Catostomus macrocheilus</i>
LT	Lake Trout	<i>Salvelinus namaycush</i>
L WF	Lake Whitefish	<i>Coregonus clupeaformis</i>
MWF	Mountain Whitefish	<i>Prosopium williamsoni</i>
NP	Northern Pike	<i>Esox lucius</i>
N PMN	Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>
PEA	Peamouth	<i>Mylocheilus caurinus</i>
PUMP	Pumpkinseed	<i>Lepomis gibbosus</i>
RB	Rainbow Trout	<i>Oncorhynchus mykiss</i>
RBxWCT	Rainbow x Westslope Cutthroat Trout hybrid	<i>Oncorhynchus clarkii lewisi</i> and <i>Oncorhynchus mykiss</i>
RS SH	Redside Shiner	<i>Richardsonius balteatus</i>
SMB	Smallmouth Bass	<i>Micropterus dolomieu</i>
WCT	Westslope Cutthroat Trout	<i>Oncorhynchus clarkii lewisi</i>
WE	Walleye	<i>Sander vitreus</i>
YP	Yellow Perch	<i>Perca flavescens</i>
YL BL	Yellow Bullhead	<i>Ameiurus natalis</i>



- ★ Town/City
  - Thompson Falls Dam
  - ▲ Fall Gillnetting - Reservoir
  - Highway
- Electrofishing**
- Fall - Above Island Complex
  - Spring - Lower Section
  - Spring - Upper Section



Thompson Falls Fish Passage Project

Northwestern Energy



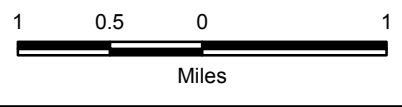
ELECTROFISHING AND GILLNETTING SAMPLING LOCATIONS NEAR THOMPSON FALLS, MONTANA

MARCH 2017

FIGURE 2-1



- ★ Town/City
- Highway
- Electrofishing**
- Fall - Paradise to Plains



Thompson Falls Fish Passage Project

Northwestern Energy



**ELECTROFISHING REACH BETWEEN PARADISE AND PLAINS, MONTANA**

MARCH 2017

FIGURE 2-2



## 2.1 Spring Electrofishing

Spring electrofishing in the Thompson Falls Reservoir consists of two locations, the lower section located immediately upstream of the 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 2016 sampling occurred on April 11 and 12, similar to the sampling dates from previous years as shown in Table 2-2.

**Table 2-2: Summary of the sample dates, water temperature, duration of electrofishing efforts, and streamflows (USGS gage #12389000) completed in the lower and upper sections of the Thompson Falls Reservoir 2009-2016.**

Lower Section			Upper Section			USGS Gage
Date	Water Temperature °C	Duration of Electrofishing (hrs)	Date	Water Temperature °C	Duration of Electrofishing (hrs)	Streamflow (cfs)
4-20-09	10.0	0.6	4-21-09	10.5	0.6	17,000 - 18,200
4-28-10	9.0	0.9	4-29-10	7.5	2.1	14,300 - 14,600
4-13-11	5.8	1.0	4-14-11	5.1	1.9	24,500 - 25,100
4-16-12	7.4	0.8	4-17-12	7.2	1.9	14,400 - 14,900
4-11-13	7.0	0.9	4-10-13	7.0	1.9	21,000 - 21,800
4-14-14	7.0	1.0	4-15-14	7.0	2.1	27,800 - 27,500
4-14-15	6.4	1.0	4-13-15	7.0	2.1	24,900 - 25,200
4-12-16	11.0	0.9	4-11-16	10.7	1.9	20,800 - 22,600
<b>Total hours</b>		<b>7.1</b>	<b>Total hours</b>		<b>12.6</b>	

### 2.1.1 Lower Section

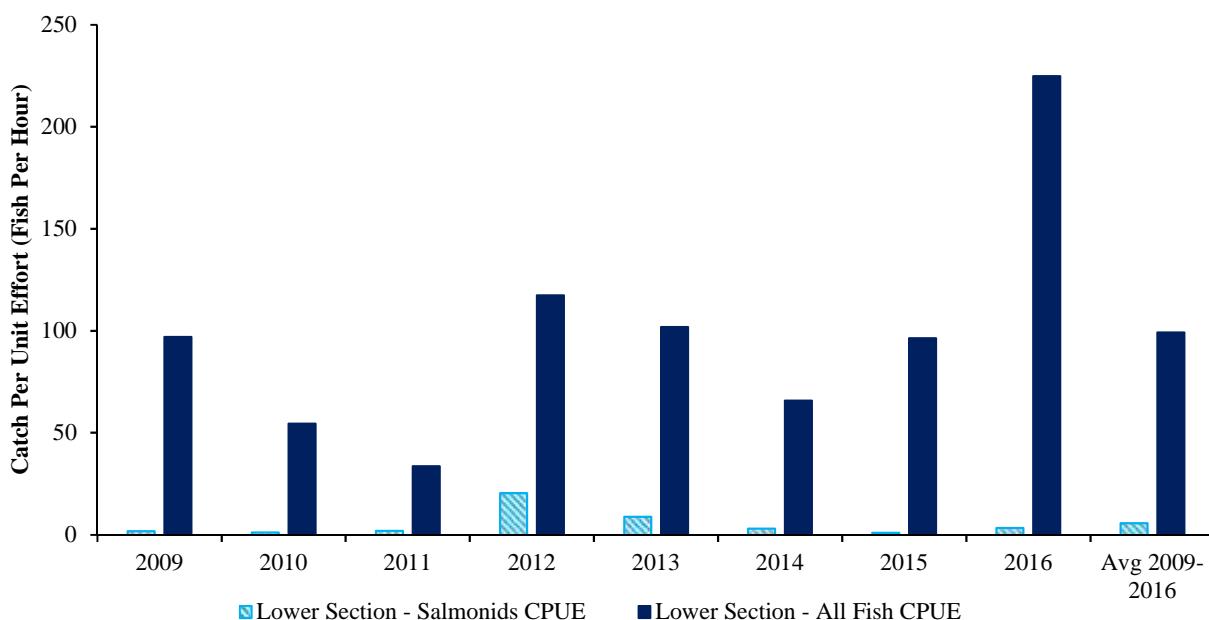
In 2016, spring electrofishing in the lower section captured 207 fish representing 10 species, including three salmonid species (Table 2-3). Two of the salmonids already had PIT tags, including one Rainbow Trout that was previously documented at the Thompson Falls fish ladder in September 2014 and one Westslope Cutthroat Trout that was recorded at the Thompson Falls fish ladder in September 2016.

**Table 2-3: Summary of the 2016 spring electrofishing results in the Thompson Falls Reservoir lower section, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016.**

Lower Section Species	2016		Average 2009-2016		Range 2009 - 2016			
	N	CPUE	Average N	Average CPUE	Min	Max	Min	Max
BL BH	11	11.9	4	4.3	-	13	-	12.5
BULL	-	-	<1	0.2	-	1	-	1.2
LL	-	-	2	2	-	9	-	10.9
LMB	43	46.7	12	12.8	2	43	2.2	46.7
LN SU	-	-	1	1	-	6	-	7.3
LS SU	5	5.4	5	5.8	-	23	-	27.9
MWF	1	1.1	<1	0.3	-	1	-	1.2
NP	12	13	19	19.9	10	30	12.1	33.6
N PMN	1	1.1	4	4.3	1	17	1	20.6
PEA	-	-	<1	0.2	-	1	-	1.2
PUMP	65	70.6	11	12	-	65	-	70.6
RB	1	1.1	2	2.2	-	6	-	6.7
RS SH	-	-	<1	0.2	-	1	-	1.7
SMB	-	-	<1	0.2	-	1	-	1.2
WCT	1	1.1	1	0.9	-	2	-	2.4
YP	67	72.8	31	33	1	67	1	72.8
<b>Subtotal Salmonids</b>	<b>3</b>	<b>3.3</b>	<b>5</b>	<b>5.7</b>	<b>1</b>	<b>17</b>	<b>1</b>	<b>20.5</b>
<b>TOTAL FISH</b>	<b>207</b>	<b>224.9</b>	<b>92</b>	<b>99.2</b>	<b>34</b>	<b>207</b>	<b>33.6</b>	<b>224.9</b>

Since 2009, the lower section has been surveyed annually with the number of individual fish caught ranging between 34 and 207 fish, representing between seven and 15 species per survey. In 2016, the total number of fish captured (n=207) and catch per unit effort (224.9 fish per hour) were the highest recorded since the annual surveys began in 2009. The increased catch rate observed in 2016 is attributed to the higher number of Yellow Perch, Largemouth Bass, and Pumpkinseed compared to previous years (Table 2-3). The average catch rate in the lower section between 2009 and 2016 was approximately 99 fish per hour and 5.7 salmonids per hour. In 2016, the salmonid catch rate was less than the average (Figure 2-3). In general, non-salmonids were more common in the lower section than salmonids in all survey years (Figure 2-3).

**Figure 2-3: Summary of the 2009- 2016 annual catch rate and 2009-2016 average catch rate for salmonids and all fish species captured during spring electrofishing efforts in the lower section of the Thompson Falls Reservoir.**



### 2.1.2 Upper Section

The 2016 sampling of the upper section resulted in 215 fish captured representing six non-salmonid species and five salmonid species plus one hybrid (Table 2-4). A total of 42 salmonids were captured including one Bull Trout. The Bull Trout was 247 millimeters (mm) in length and weighed 124 grams (g). Prior to release, a genetic sample was taken (ID# 118-042) and a passive integrated transponder (PIT) tag (#989001005372235) was implanted in the Bull Trout. The results of the genetic assignment testing are pending.

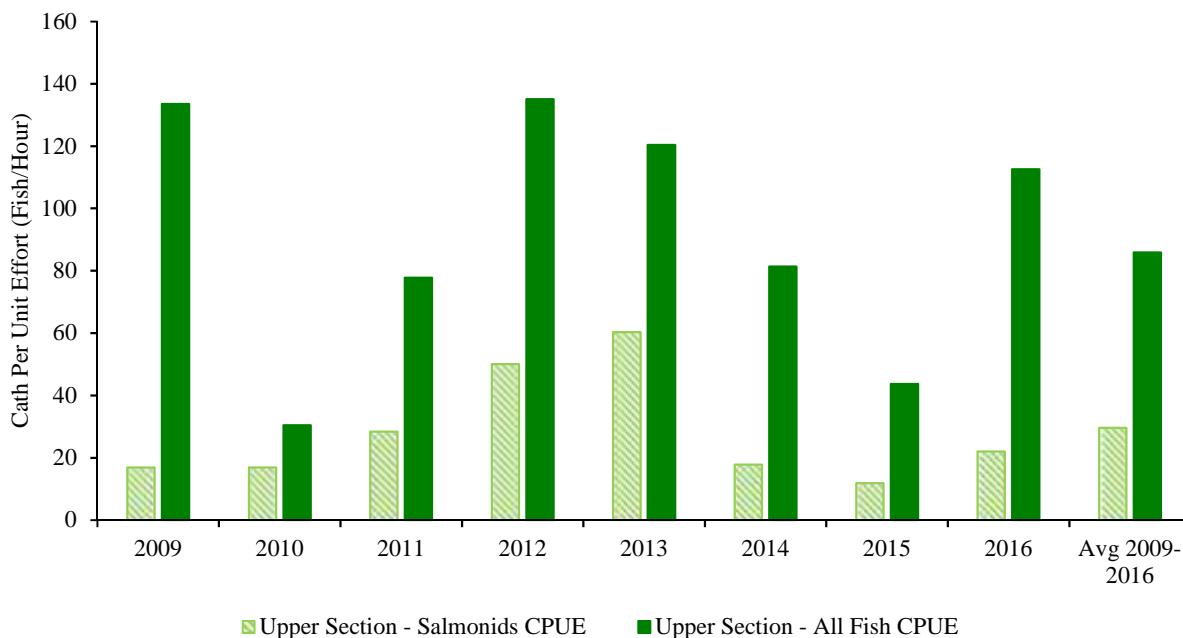
In addition, PIT tags were detected in four of the salmonids (3 Rainbow Trout, 1 Brown Trout). The four salmonids were previously recorded at and were all released upstream of the Thompson Falls ladder. The last ladder detection for the four salmonids varied from July 2014 (1 Rainbow Trout), June 2015 (1 Rainbow Trout, 1 Brown Trout), and March 2016 (1 Rainbow Trout).

Annual spring electrofishing in the upper section has occurred since 2009. During this period, between 63 and 253 individual fish representing nine to 13 species were recorded annually. The number of salmonids caught per year in the upper section has varied between 10 and 115 individual fish and the salmonid catch rate has also varied from 11.8 to 60.3 salmonids per year. The catch rate for all fish species in the upper section has varied annually between 30.4 and 135.1 fish per year (Figure 2-4). Salmonid catch rates in the upper section in 2016 represented approximately 19.5 percent of the total catch rate, which was lower than the average for 2009-2016 where salmonids represent about 35.4 percent of the total catch rate (Figure 2-4).

**Table 2-4: Summary of the 2016 spring electrofishing results in the Thompson Falls Reservoir upper section, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016.**

Upper Section	2016		Average 2009 - 2016		Range 2009 - 2016			
	N	CPUE	Average N	Average CPUE	N		CPUE	
Species					Min	Max	Min	Max
BL BH	1	0.5	<1	0.1	-	2	-	3.4
BULL	1	0.5	<1	0.4	-	1	-	0.5
LL	9	4.7	12	6.3	2	27	2.4	14.2
LN SU	-	-	<1	<0.1	-	1	-	0.5
LS SU	81	42.4	64	32.7	15	119	7.2	86.2
LT	-	-	<1	0.1	-	1	-	1.7
MWF	1	0.5	8	4.4	1	21	0.5	11
NP	22	11.5	12	5.9	4	22	2.1	11.5
N PMN	27	14.1	24	12.3	3	41	1.4	19.2
PUMP	2	1	<1	0.2	-	2	-	1
RB	29	15.2	30	15.4	6	47	6.1	26.1
RBxWCT	1	0.5	<1	0.4	-	2	-	1.1
RS SH	-	-	<1	0.2	-	2	-	3.4
SMB	13	6.8	4	1.9	-	13	-	6.8
WCT	1	0.5	5	2.8	-	21	-	11
YP	27	14.1	6	3	-	27	-	14.1
<b>Subtotal Salmonids</b>	<b>42</b>	<b>21.9</b>	<b>57</b>	<b>29.6</b>	<b>10</b>	<b>115</b>	<b>11.8</b>	<b>60.3</b>
<b>TOTAL FISH</b>	<b>215</b>	<b>112.5</b>	<b>168</b>	<b>85.9</b>	<b>63</b>	<b>253</b>	<b>30.4</b>	<b>135.1</b>

**Figure 2-4: Summary of the 2009-2016 annual catch rate and 2009-2016 average catch rate for salmonids and all fish species captured during spring electrofishing efforts in the upper section of the Thompson Falls Reservoir.**



### 2.1.3 Spring Electrofishing Summary

The CPUE of salmonids remains greatest in the upper section, averaging 29.6 salmonids per hour (2009-2016). The lower section averages 5.7 salmonids per hour (2009-2016). Non-salmonids such as Largemouth Bass, Northern Pike, Pumpkinseed, and Yellow Perch are on average the most commonly captured species in the lower section (*see* Table 2-3); whereas, species such as Largescale Suckers, Northern Pikeminnow, and Rainbow Trout are on average the most commonly captured species in the upper section (*see* Table 2-4). The differences in species composition and abundance of salmonids is likely related to habitat conditions in each survey section. The upper sampling section is more of a riverine environment. The lower sampling section, which is closer to Thompson Falls Dam, is more lacustrine (lake-like).

PIT tags were detected in a total of six fish (four Rainbow Trout, one Brown Trout, and one Westslope Cutthroat Trout) recorded during the spring electrofishing efforts. All six fish were previously detected at the Thompson Falls fish ladder and released upstream. One fish was recorded at the ladder in March 2016, while the other five fish were last recorded at the ladder in 2012, 2014, and 2015. Additional details of these tagged salmonids are provided in Section 2.4 of this report.

## 2.2 Autumn Electrofishing

During the autumn of 2016, NorthWestern and MFWP surveyed two reaches of the Clark Fork River, above the island complex reach and the Paradise-to-Plains reach. The dates and

approximate streamflow [based on the U.S. Geological Survey (USGS) gage #12389000 near Plains] during each survey year are summarized in Table 2-5.

**Table 2-5: Summary of autumn electrofishing efforts in the Above Islands reach and Paradise-to-Plains reach, including the year, date(s), duration of sample, approximately streamflow during sample event.**

	Above Islands			Paradise to Plains		
	Date(s)	Duration of Electrofishing (hrs)	Approx. USGS Streamflow (cfs)	Date	Duration of Electrofishing (hrs)	Approx. USGS Streamflow (cfs)
<b>2009</b>	10/20-21	5.6	10,700	NA	-	-
<b>2010</b>	10/12-13	4.3	9,950	10/19	3.6	9,380
<b>2011</b>	10/5-6	4.6	9,225	10/20-21	3.5	16,150
<b>2012</b>	10/22-23	4.1	11,100	10/30	3.9	14,000
<b>2013</b>	10/22-23	4.4	10,900	NA	-	-
<b>2014</b>	9/25 & 9/29	4.1	8,320	10/22 & 10/28	4.1	12,850
<b>2015</b>	10/19-20	4.7	8,280	NA	-	-
<b>2016</b>	10/12-13	3.7	12,400	10/5	2.0	10,100
				10/20	1.8	13,700

### 2.2.1 Electrofishing above the Island Complex

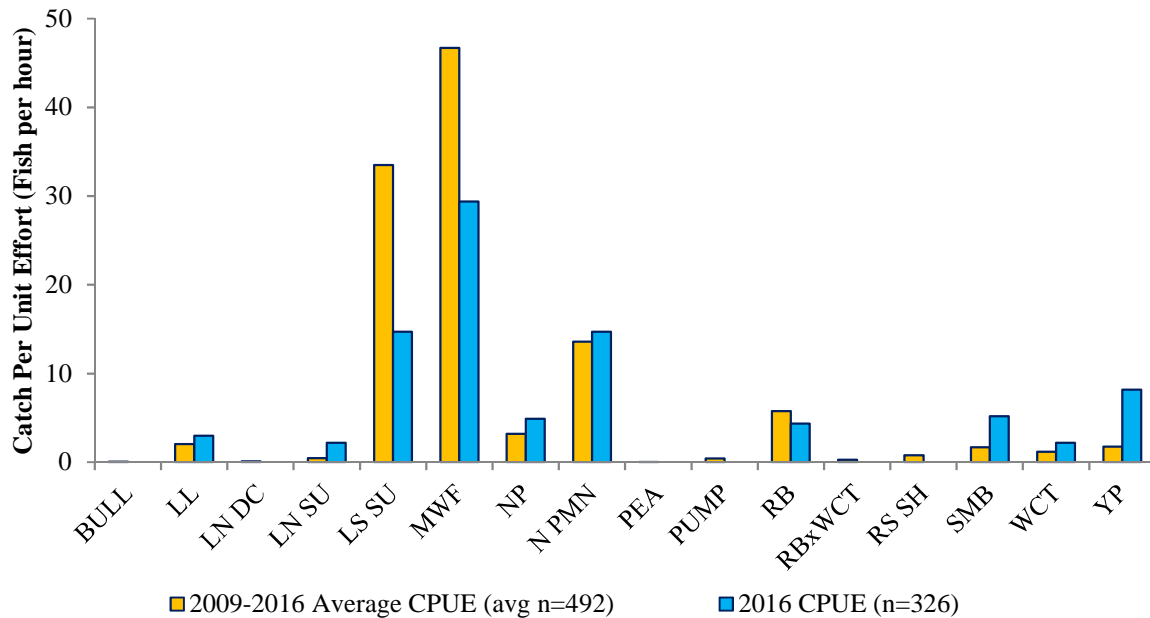
In 2016 electrofishing efforts in the Clark Fork River were completed from the confluence with Eddy Creek downstream to the island complex (*refer to* Figure 2-1). The autumn electrofishing section (Eddy Creek to the island complex) is characterized as riverine habitat. The 2016 survey covered the same length of reach surveyed annually since 2010. In 2009, electrofishing efforts started at the confluence with Eddy Creek and extended further downstream to the confluence of the Thompson River. Approximately 2 miles of the 5-mile section were not sampled in 2010 due to poor habitat and few captures from the downstream end of the island complex to the Thompson River.

In 2016, river right was electrofished the night of October 12 and river left was electrofished the night of October 13. Stream temperatures were approximately 11 °C. A summary of the CPUE by species (river left and right combined) is provided for each year of sampling from 2009 through 2016 in Table 2-6. The duration of the electrofishing effort during each survey year has ranged between 3.7 and 5.6 hours (3.7 hours in 2016).

The 2016 electrofishing efforts collected 326 fish (right and left banks combined) representing 10 species, of which four species were salmonids (Brown Trout, Mountain Whitefish, Rainbow Trout, and Westslope Cutthroat Trout). Of the 143 salmonids recorded, four Rainbow Trout had PIT tags and were previously documented at the Thompson Falls ladder: one in September 2013, one in April 2016, and two in September 2016.

The species composition resulting from the 2016 sampling efforts were similar to previous years with the majority of fish represented by Largescale Suckers, Mountain Whitefish, and Northern Pikeminnow (Figure 2-5). However, the catch rate (fish per hour) for Largescale Suckers and Mountain Whitefish was lower in 2016 compared to 2009–2016 (Figure 2-5).

**Figure 2-5: Summary of the average catch rate (fish per hour) between 2009 and 2016 compared to the catch rate in 2016 in the Clark Fork River – Above the Island Complex.**



Between 2009 and 2016, the number of fish captured above the island complex ranged between 288 fish and 699 fish. Catch rates for salmonids have varied from a low of 21.7 salmonids per hour in 2015 to a high of 111 salmonids per hour in 2012. Catch rates for all species has varied from a low of 61 fish per hour in 2015 to a high of approximately 152 fish per hour in 2012. Sampling efforts in 2016 resulted in a lower than average number of total fish (and total salmonids) and catch rate (fish per hour) since annual electrofishing efforts began in 2009 (Table 2-6).

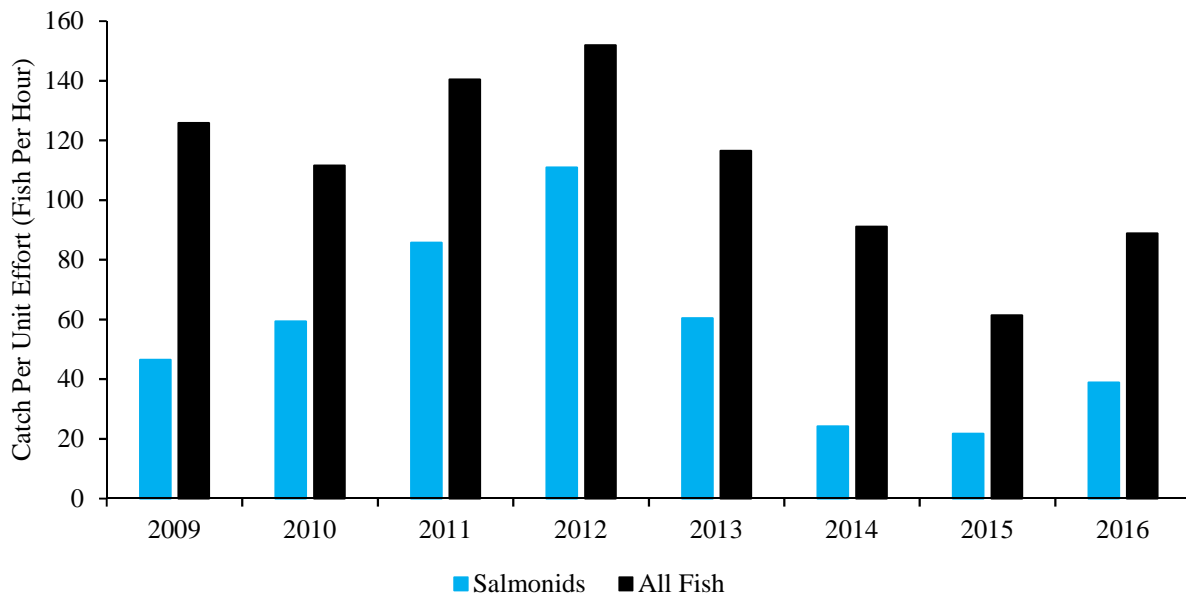
**Table 2-6: Summary of the 2016 autumn electrofishing results in the Clark Fork River above the islands, include the average, minimum, and maximum number of fish captured and catch rates (CPUE) between 2009 and 2016. (-) indicates a zero.**

Above Islands Species	2016		Average 2009 - 2016		Range 2009 - 2016			
	N	CPUE	Average N	Average CPUE	N		CPUE	
					Min	Max	Min	Min
BULL	-	-	<1	0.1	-	1	-	0.2
LL	11	3.0	9	2.0	5	16	0.9	3.9
LN DC	-	-	<1	0.1	-	1	-	0.2
LN SU	8	2.2	2	0.4	-	8	-	2.2
LS SU	54	14.7	153	33.5	54	338	14.7	60.8
MWF	108	29.4	205	46.7	75	397	16.0	97.3
NP	18	4.9	14	3.2	5	27	1.2	5.8
N PMN	54	14.7	60	13.6	34	88	7.2	16.5
PEA	-	-	<1	<0.1	-	1	-	0.2
PUMP	-	-	2	0.4	-	5	-	1.1
RB	16	4.4	26	5.8	6	44	1.5	9.1
RBxWCT	-	-	1	0.3	-	4	-	0.7
RS SH	-	-	3	0.8	-	9	-	2.0
SMB	19	5.2	7	1.7	1	19	0.2	5.2
WCT	8	2.2	5	1.2	1	10	0.2	2.3
YP	30	8.2	6	1.8	-	30	-	8.2
<b>Subtotal Salmonids</b>	<b>143</b>	<b>38.9</b>	<b>246</b>	<b>56.0</b>	<b>99</b>	<b>453</b>	<b>21.7</b>	<b>111.0</b>
<b>TOTAL FISH</b>	<b>326</b>	<b>88.8</b>	<b>492</b>	<b>110.9</b>	<b>288</b>	<b>699</b>	<b>61.4</b>	<b>151.9</b>

The overall catch rates (fish per hour) from electrofishing efforts above the island complex for all fish species, as well as for salmonids appeared to increase between 2009 and 2012, followed by a steady decline between 2013 and 2015 (Figure 2-6). In 2016, the total catch rate for all fish, as well as for salmonids was greater than in 2015. The variability may be related to several factors, including but not limited to the timing of each annual sampling event, streamflow, stream temperatures, etc. Sampling in the above islands section is generally completed the third week in October each year. However, sampling has occurred anytime between late September and the end of October, depending on availability of personnel and equipment. Conditions during the autumn vary annually with respect to streamflow and water temperature, which may contribute to the observed annual variability in catch rates.



**Figure 2-6: Summary of the 2009-2016 annual catch rate for all salmonids and all fish captured in the Clark Fork River – Above the Island Complex.**



### 2.2.2 Electrofishing Paradise to Plains

In 2010, a new electrofishing sampling section between the towns of Paradise and Plains was added to acquire basic species composition in the Clark Fork River approximately 35 miles upstream of the Project. This reach was sampled again in 2011, 2012, 2014, and 2016. Electrofishing began at the town of Paradise (at the Paradise Crossing river access site), approximately 1.5 miles downstream of the Clark Fork/Flathead River confluence, and ended at the USGS gage station #12389000 located near the town of Plains, approximately 4 miles downstream (*see* Figure 2-2).

In 2016, a total of 1,007 fish, representing eight non-salmonid species and four salmonid species (Brown Trout, Mountain Whitefish, Rainbow Trout, Westslope Cutthroat Trout). No previously tagged fish were documented during the October 5 sampling effort, while one Rainbow Trout was recorded with a PIT tag during the October 20 sampling effort. The tagged Rainbow Trout was recorded at the Thompson Falls fish ladder 9 days earlier (October 11, 2016).

The predominant species recorded in 2016 were Largescale Sucker (n=354) followed by Northern Pikeminnow (n=297), Mountain Whitefish (n=209), Rainbow Trout (n=42), Yellow Perch (n=31), Smallmouth Bass (n=26), Westslope Cutthroat Trout (n=25), and Brown Trout (n=10). Species less commonly observed (n = 4) in the Paradise to Plains section included Longnose Sucker, Northern Pike, Pumpkinseed, and Redside Shiner. (Table 2-7).

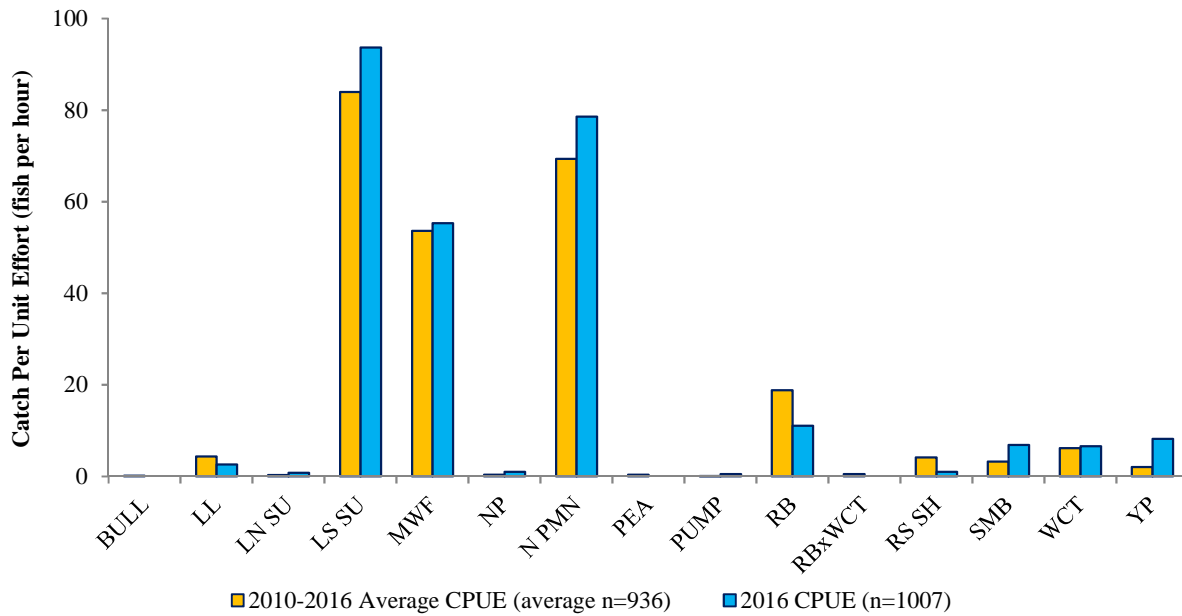
**Table 2-7: Summary of average catch rate (fish per hour) between 2010-2012, 2014, and 2016 compared to the catch rate in 2016 in the Clark Fork River – Paradise to Plains.**

Paradise to Plains Species	2016		Average (2010-2016)		Range 2010 - 2016			
	N	CPUE	Average N	Average CPUE	N		CPUE	
					Min	Max	Min	Max
BULL	-	-	<1	0.2	-	2	-	0.5
LL	10	2.6	17	4.4	10	25	2.6	6.4
LN SU	3	0.8	1	0.3	-	3	-	0.8
LS SU	354	93.7	317	84.0	94	523	25.8	134.6
MWF	209	55.3	203	53.7	85	274	23.3	79.0
NP	4	1.1	2	0.4	-	4	-	1.1
N PMN	297	78.6	262	69.4	164	333	45.0	81.5
PEA	-	-	2	0.4	-	5	-	1.3
PUMP	2	0.5	<1	0.1	-	2	-	0.5
RB	42	11.1	71	18.8	42	151	11.1	43.6
RBxWCT	-	-	2	0.5	-	5	-	1.2
RS SH	4	1.1	16	4.2	1	42	0.2	12.1
SMB	26	6.9	12	3.2	1	26	0.3	6.9
WCT	25	6.6	23	6.2	17	33	4.6	8.1
YP	31	8.2	8	2.1	0	31	0.0	8.2
Subtotal Salmonids	286	75.7	317	83.8	157	472	43.1	136.1
<b>TOTAL FISH</b>	<b>1007</b>	<b>266.4</b>	<b>937</b>	<b>247.9</b>	<b>421</b>	<b>1192</b>	<b>115.5</b>	<b>313.8</b>

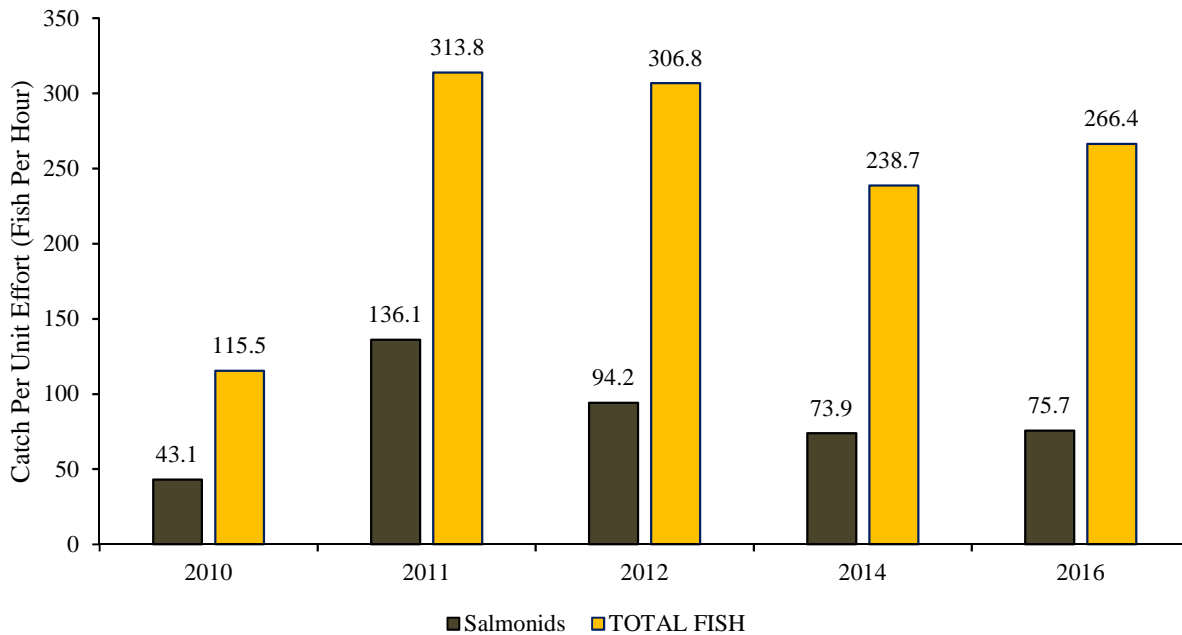
Fish species composition and catch rates observed in 2016 were typical of previous sample years (Figure 2-7). Largescale Suckers, Mountain Whitefish, and Northern Pikeminnow remained the most common species in 2016, as was observed in previous sample years.

Salmonids represent approximately 28 to 43 percent of the fish recorded in the Paradise to Plains reach since sampling commenced in 2010. The catch rate for salmonid species, primarily represented by Mountain Whitefish, has varied between 43 and 136 fish per hour (Figure 2-8). The catch rate for all species has varied between 115 fish per hour in 2010 to 314 fish per hour in 2011.

**Figure 2-7: Summary of the average CPUE (2010, 2011, 2012, 2014, 2016) compared to CPUE in 2016 during the Clark Fork River autumn electrofishing between Paradise and Plains.**



**Figure 2-8: Summary of the annual catch rate for all salmonids and all fish captured in the Clark Fork River Paradise and Plains between 2010 and 2016.**



### 2.2.3 Autumn Electrofishing Summary

The autumn electrofishing results for 2016 were within the range of catch rates observed in previous years. The species composition remained similar to previous years with the dominant species represented by Largescale Suckers, Mountain Whitefish, and Northern Pikeminnow. Out of 429 salmonids (143 salmonids in the above the islands reach, 286 salmonids in the Paradise to

Plains reach), there were five fish (all Rainbow Trout) captured with PIT tags that were previously documented at the Thompson Falls fish ladder in September/October 2016. Additional details about these five-tagged fish are provided in Section 2.4 of this report.

## 2.3 Autumn Gillnetting

Autumn (October) gillnetting in the Thompson Falls Reservoir has been performed in designated locations since 2004 (*refer to* Figure 2-1). Every year, 10 gillnets are set, except in 2004 when six nets were set (Table 2-8).

**Table 2-8: Summary of gillnetting in Thompson Falls Reservoir from 2004-2016.**

Year	# Gillnets	Date Net Set	Date Net Pulled	Total # of Fish Captured	# of Species
2004	6	10/13	10/14	48	8
2005	10	10/13	10/14	79	7
2006	10	10/12	10/13	116	7
2007	10	10/11	10/12	122	9
2008	10	10/8	10/9	59	7
2009	10	10/19	10/20	55	6
2010	10	10/14	10/15	50	9
2011	10	10/5	10/6	33	9
2012	10	10/12	10/13	53	7
2013	10	10/22	10/23	40	6
2014	10	10/15	10/16	62	8
2015	10	10/13	10/14	231	9
<b>2016</b>	<b>10</b>	<b>10/12</b>	<b>10/13</b>	<b>116</b>	<b>6</b>

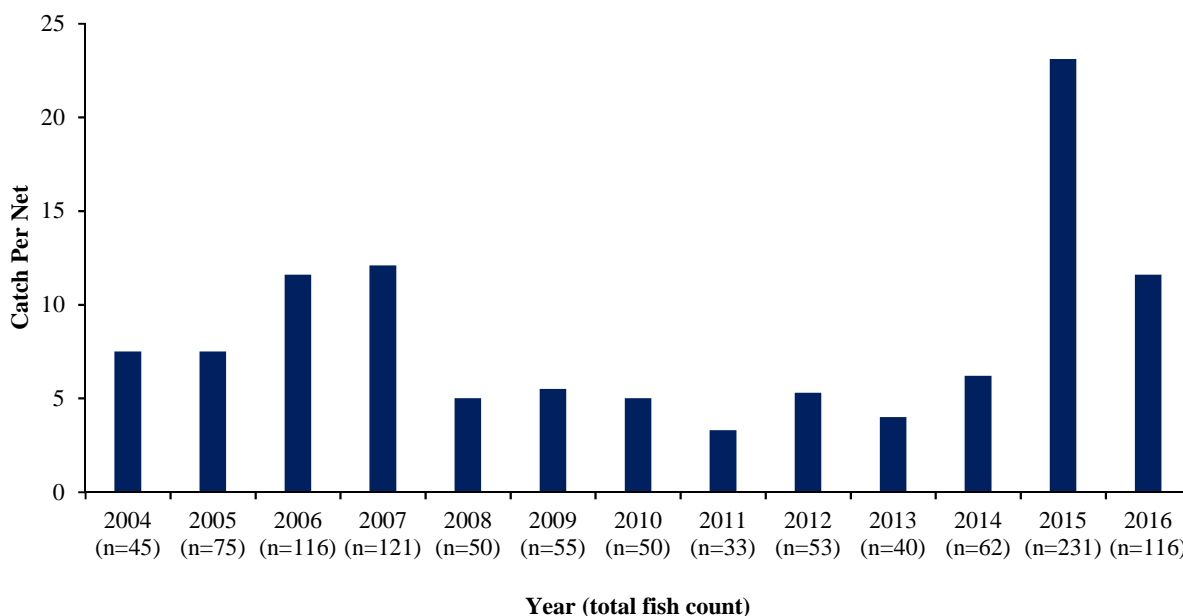
Nylon multifilament experimental sinking gillnets were used at 10 established locations in the Thompson Falls Reservoir (*see* Figure 2-1). These nets are 38 meters (125 feet) long and 1.8 meters (6 feet) deep with five separate 7.6-meter (25-foot) panels consisting of 1.9-cm (0.75-inch), 2.5-cm (1-inch), 3.2-cm (1.25-inch), 3.8-cm (1.5-inch), and 5.1-cm (2-inch) square mesh. Nets were set on October 12, 2016 between 2:23 and 3:37 PM and pulled approximately 18.6 to 18.8 hours later between 9:00 and 10:25 AM on October 13, 2016. The mean catch per net, by species, during the annual gillnetting efforts from 2004 to 2016 is displayed in Table 2-9.

**Table 2-9: Catch per net, by species, during annual October gillnetting series on Thompson Falls Reservoir in 2016 and the average, minimum, and maximum catch per net between 2004 and 2016. A dash indicates no (zero) fish of that species was captured.**

Species	2016	2004-2016		
		Avg	Min	Max
BL BH	5.9	3.1	-	14.1
LL	-	-	-	0.2
LMB	-	0.1	-	0.3
LN SU	-	0.1	-	0.5
LS SU	0.2	0.9	0.6	1.3
NP	4.1	2.2	1.0	4.6
N PMN	0.1	0.4	-	1.0
PEA	-	-	-	0.1
PUMP	0.4	0.3	-	1.8
RB	-	0.1	-	0.4
SMB	-	0.2	-	0.5
WCT	-	-	-	0.2
YP	0.9	0.7	0.1	1.8
YL BL	-	-	-	0.1

In 2016, a total of 116 fish representing six species were captured during gillnetting efforts. The total number of fish captured in 2016 was above the average for gillnetting efforts completed between 2004 and 2016. The total number of fish captured since sampling began in 2004 has varied between 33 fish (2011) to 231 fish (2015). Catch rates (number of fish per net) has varied from a low of 3.3 fish per net in 2011 to a high of 23.1 fish per net in 2015 (Figure 2-9). The average catch rate between 2004 and 2016 was 8.3 fish per net. The total catch rate in 2016 was 11.6 fish per net, mostly attributed to Black Bullhead (n=59) and Northern Pike (n=41).

**Figure 2-9: Summary of all fish species caught per net during the annual autumn gillnetting in the Thompson Falls Reservoir between 2004 and 2016.**



## 2.4 Salmonids Released Upstream of the Ladder and Detected during the Baseline Fisheries Surveys

Thompson Falls ladder operations began in 2011. During the annual baseline fisheries surveys, including spring and fall electrofishing as well as fall gillnetting completed in the last 6 years (2011-2016), a total of 24 salmonids initially tagged at the ladder (referred to as “ladder fish”) and released upstream of the Thompson Falls Dam were recaptured. A summary of the 24-tagged fish is provided in Table 2-10, including the survey year the fish was recaptured, the sampling season (spring/fall), the species, the length of the fish when it was recaptured, the PIT tag identification number, and its detection history through 2016 (Table 2-10).

The number of ladder fish recaptured annually during the baseline surveys has varied from zero to 11 fish (Table 2-10). A total of 24 individual salmonids representing 20 Rainbow Trout, three Brown Trout, and one Westslope Cutthroat Trout were recaptured between 2011 and 2016 during baseline fisheries surveys. Of the 24 recaptured salmonids, a total of eight ladder fish were recaptured during spring electrofishing efforts, 14 ladder fish were recaptured during autumn electrofishing (above islands or Paradise-to-Plains), and two ladder fish were recaptured during the autumn gillnetting (only in 2012). Five Rainbow Trout and one Westslope Cutthroat Trout were also detected in the Thompson River. No Bull Trout recorded at the ladder and released upstream were recaptured during the annual baseline fisheries surveys.

**Table 2-10: Summary of the ladder fish released upstream of the Thompson Falls Dam and later recaptured during spring/fall baseline fisheries surveys (electrofishing and gillnetting) since ladder operations began in 2011.**

Survey Year	Spring/Fall Sampling	Sp.	L (mm)	PIT ID	Detection Date(s) & Location(s) History
2012	Fall	RB	485	985121021876549	9/11/11 – TFalls Ladder 10/14/12 – Gillnet Reservoir (Mortality)
2012	Fall	LL	438	985121021902518	4/14/11 – TFalls Ladder 10/14/12 – Gillnet Reservoir (Mortality)
2012	Fall	RB	467	985121027357883	8/26/12 – TFalls Ladder 10/30/12 – EFish Paradise to Plains
2012	Fall	RB	290	985121027434405	7/25/12 – TFalls Ladder 10/23/12 – EFish Above Islands
2012	Fall	RB	430	985121027366869	10/5/11 – TFalls Ladder 10/22/12 – EFish Above Islands
2012	Fall	RB	351	985121027431379	7/24/12 – TFalls Ladder 10/22/12 – EFish Above Islands
2013	Spring	RB	337	985121021871502	8/4/12 – TFalls Ladder 4/11/13 – EFish Lower Section 7/14/14 – TFalls Ladder 12/9/14; 6/30/15; 3/12/16; 7/29/16 – TRiver
2013	Spring	RB	523	985121027360899	<i>no record of initial capture assume fish was released upstream of TFalls ladder based on PIT tag sequence</i> 4/11/13 - EFish Lower Section
2013	Fall	RB	416	985121027366618	10/5/11 – TFalls Ladder 10/23/13 – EFish Above Islands
2013	Fall	RB	406	985121027405602	9/28/12 – TFalls Ladder 10/22&23/12 – EFish Above Islands 3/30/15; 5/14/15; 3/21/16; 7/31/16 – TRiver
2014	Fall	RB	482	985121010687782	10/16/14 – TFalls Ladder 10/21/14 – EFish Paradise to Plains
2015	Fall	RB	368	982000363519416	9/18/15 – TFalls Ladder 10/19/15 – EFish Above Islands
2015	Fall	LL	466	982000363519355	10/16/15 – TFalls Ladder 10/19/15 – EFish Above Islands 10/24/16 – TFalls Ladder
2016	Spring	RB	403	985121027414450	6/9/15 – TFalls Ladder 6/12/15; 3/15/16 – TRiver 4/11/16 – EFish Upper Section 7/27-28/16 - TRiver
2016	Spring	RB	386	989001005372301	3/25/16 – TFalls Ladder 4/11/16 – EFish Upper Section
2016	Spring	RB	425	985121010667332	7/27/14 – TFalls Ladder 11/3/14, 6/30/15, 9/6/15 – TRiver 4/11/16 – EFish Upper Section 4/12/16; 7/29/16 – TRiver
2016	Spring	LL	475	989001004067348	6/22/15 – TFalls Ladder 4/11/16 – EFish Upper Section

Survey Year	Spring/Fall Sampling	Sp.	L (mm)	PIT ID	Detection Date(s) & Location(s) History
2016	Spring	RB	527	985121027354597	8/29/12; 9/29/14 – TFalls Ladder 7/6 & 7/8/15; 4/10/16 – TRiver 4/12/16 – EFish Lower Section 7/21 & 7/23/16 - TRiver
2016	Spring	WCT	401	989001005372237	4/11/16 – TFalls Ladder 4/12/16 – EFish Lower Section 4/28 & 5/2/16 – TRiver
2016	Fall	RB	498	989001006028606	10/11/16 – TFalls Ladder; 10/20/16 – EFish Paradise to Plains
2016	Fall	RB	425	989001004067401	7/2/15 – TFalls Ladder; 10/13/16 – EFish Above Islands
2016	Fall	RB	472	985121010654887	9/19/13 – TFalls Ladder; 10/12/16 – EFish Above Islands
2016	Fall	RB	339	989001005372514 989001006028665	9/20/16 – TFalls Ladder; 10/12/16 – EFish Above Islands
2016	Fall	RB	481	989001004067193	4/17/15 – TFalls Ladder; 10/12/16 – EFish Above Islands

In summary, between 216 and 525 salmonids were uniquely tagged and released upstream of the Thompson Falls Dam annually since 2011. In the last 6 years, over 2,000 uniquely tagged salmonids were released upstream. The baseline fisheries surveys were set up with the intention of monitoring the impact of salmonids passed upstream of the dam. Electrofishing and gillnetting efforts have detected 24 salmonids, a small percentage of the uniquely tagged fish released upstream of the dam. This may be related to seasonal use by fish of the upper and lower sections of the Clark Fork River and Thompson Falls Reservoir, habitat preference and availability, and/or sampling methodology.

## 2.5 Bull Trout Recorded During Baseline Fisheries Surveys

Annual spring and fall baseline surveys have recorded a total of 11 Bull Trout since 2011. Six Bull Trout were recorded during spring electrofishing efforts in the upper and lower sections of the Thompson Reservoir and five Bull Trout were recorded during the autumn electrofishing, including two fish in the above islands complex reach and three fish in the Paradise to Plains reach.

Bull trout recorded during the baseline fisheries surveys between 2011-2016 ranged between 219 mm and 260 mm in length except for one Bull Trout that measured 577 mm and was transported by Avista from below Cabinet Gorge Dam upstream to the Thompson River.

In addition, the Licensee captured (and released) seven Bull Trout during spring electrofishing efforts downstream of Thompson Falls Dam in 2011, 2012, and 2014. In 2009, prior to ladder operations, one Bull Trout was captured (and released) during spring gillnet survey in the Thompson Reservoir (PPL Montana, 2010). More details on the Bull Trout sampled in the Project area are provided in Section 4.0 and in Table 9.1 in Section 9.7.3.



## 3.0 Upstream Fish Passage Evaluation

---

### 3.1 2016 Ladder Evaluation

FERC issued an Order on June 9, 2011 approving the Licensee's *10-year Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan). The Thompson Falls Upstream Fish Passage Facility (ladder) became operational in 2011 and has operated for six full seasons (2011-2016). The Licensee has implemented the first 6 years of studies outlined in the Fish Passage Evaluation Plan.

The following sections summarize the data collected at the ladder during the 2016 operational season. The data were collected to report on fish passage effectiveness at the ladder as outlined in the Fish Passage Evaluation Plan (PPL Montana, 2010c) and Biological Opinion (FWS, 2008). The ladder results provided in this report include the following:

- Ladder operations
- Clark Fork River hydrology and water temperatures
- Total number of fish and species ascending the ladder and passed upstream
- Fish metrics (morphology and biomass)
- Timing/duration for fish to ascend the ladder
- Movement patterns/active period(s) for fish ascending the ladder
- Number of fish returning to the ladder
- Number of fish that “fallback” after release upstream of the Thompson Falls Dam
- Movement patterns of fish released upstream of Thompson Falls Dam
- Alternative weir operations
- Attractant flows

### 3.2 Ladder Operations

Since the ladder commenced operations in 2011, the operational season has started in mid-March and extended into October in most seasons and once into early November (in 2015). The operational season depends on weather conditions and when air temperatures are above freezing to allow for equipment to operate properly. The operational season in 2016 began on March 14 and ended on October 31.

Since 2011, the total number of days the ladder was closed has declined from 84 days in 2011 to zero days in 2016. Ladder closures are either due to debris/sediment issues related to high spring streamflows or maintenance issues at the ladder that require a closure. As in previous years, the holding pool at the top of the ladder was typically checked daily (in the morning), except for weekends, for fish.

A summary of when the ladder was operating annually between 2011 and 2016, the number of ladder checks per year, the number of days the ladder was closed, and annual weir operations is provided in Table 3-1. In 2016, the ladder was checked 144 times resulting in 4,630 fish recorded at the ladder. A total of 4,611 fish were passed upstream. Of the 19 fish not released upstream, one fish was confirmed to be a Brook Trout x Bull Trout hybrid (Adams et al., in prep) and was not authorized for release upstream and the other 18 fish were mortalities.

**Table 3-1: Summary of when the ladder was in operation, 2011-2016.**

Year	Operating Season (ladder opened and closed)	Total # of Times Ladder Checked*	# of Days Ladder Closed During Season	Weir Mode (notch and/or orifice)
2011	Mar 17 – Oct 17	160	84	Alternating Notch and Orifice Mode
2012	Mar 13 – Oct 15	168	22	
2013	Mar 13 – Oct 15	147	14	
2014	Mar 25 – Oct 21	133	16	Orifice Mode Only
2015	Mar 16 – Nov 9	140	8	
2016	Mar 13 – Oct 31	144	None	Mostly Orifice Mode Except for 2 weeks in Notch Mode (June 30 – July 6 and July 13 – 20)

\*Some days the ladder was checked twice a day

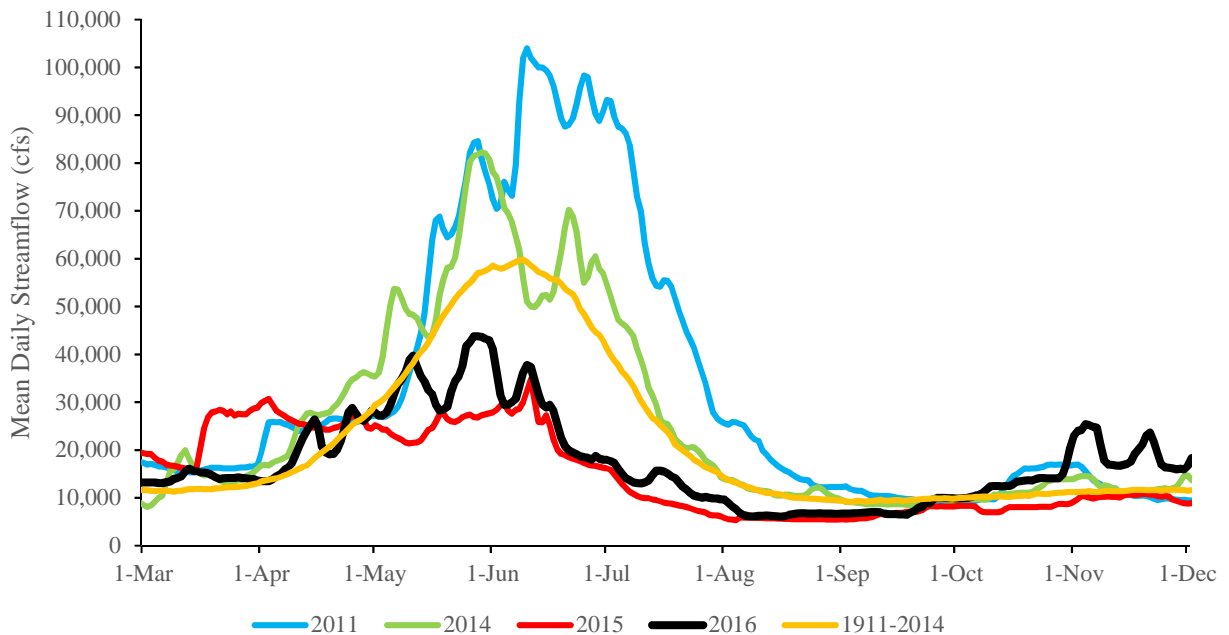
In 2011 and 2012, the ladder was operated in alternating weir mode (orifice and notch). In 2013, 2014, and 2015, the ladder was operated in orifice mode for the duration of each season. In 2016, the ladder primarily operated in orifice mode until water temperatures exceeded 19 °C and then the weir mode was alternated weekly between notch and orifice for a 4-week period before returning to orifice mode for the remainder of the year. The 4-week alteration of weir modes was requested by the TAC to evaluate any response in Smallmouth Bass ascending the ladder. The 4-week period of alternating weir modes began on June 30 and ended on July 28, 2016. Details of the number of fish recorded during the 4-week trial is provided in Section 3.12.

### 3.3 Clark Fork River Hydrograph and Water Temperatures

Mean daily streamflow data are collected by the USGS gage station #12389000 on the Clark Fork River near Plains, Montana (approximately 30 miles upstream of Thompson Falls Dam). The annual hydrograph in the lower Clark Fork River has varied greatly since ladder operations commenced in 2011. The area has experienced higher than average streamflows in 2011, lower than average streamflows in 2013, 2015, and 2016, and closer to average streamflows in 2012 and 2014. Figure 3-1 illustrates some of the variability observed in the annual hydrograph since ladder operations began in 2011. The long-term (1911-2014) average peak streamflow is approximately 60,000 cfs and occurs between the end of May and early June. Peak flows

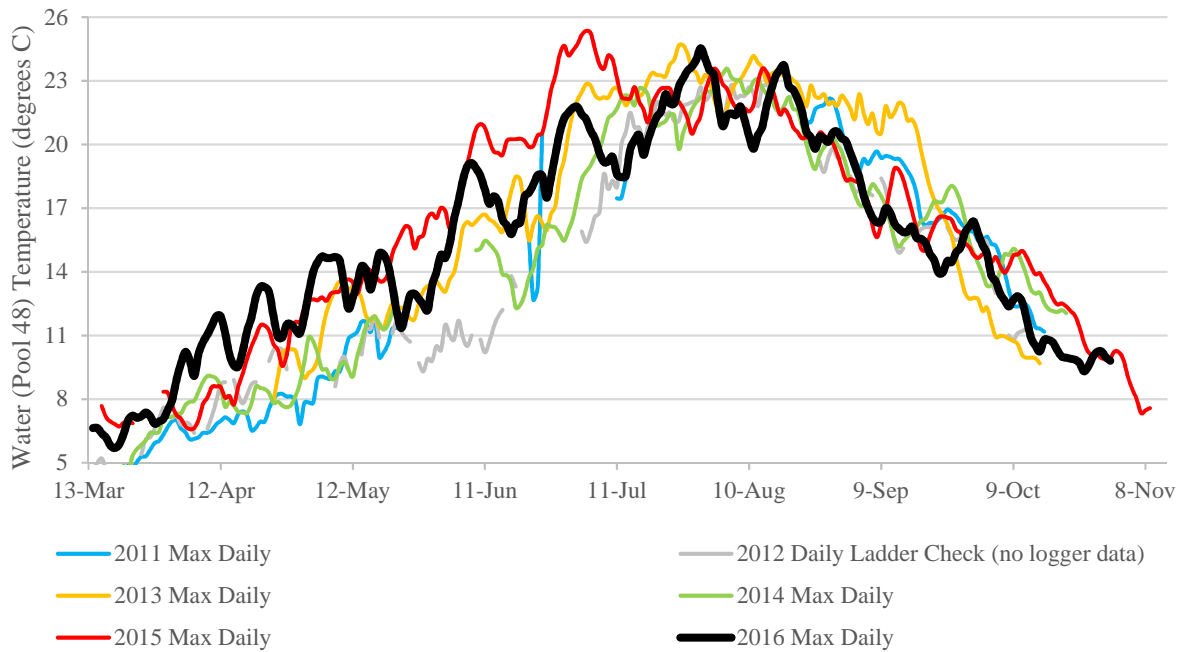
between 2011 and 2016 have varied, occurring as early as May 15 in 2013 and as late as June 20 in 2012. Actual peak flows at Thompson Falls Dam were likely higher with the contribution of other sources such as tributaries (e.g., Thompson River) and groundwater.

**Figure 3-1: Mean daily streamflow from March 1 through December 1 in the lower Clark Fork River measured at the USGS gage #12389000 near Plains, Montana during a high-water year (2011), closer to average water year (2014), low water years (2015 and 2016), and the 1911-2014 average.**



During each operating season, water temperatures in the ladder were recorded through a combination of a single measurement (coinciding with each ladder check) and continuously recording thermographs. Each year water temperatures (in °C) are recorded in the upper most pool (Pool 48) in the ladder and air temperatures are recorded at the work station located at the ladder. Thermographs were set to record air and water temperature on a timed interval. In 2016, air and water temperatures were collected hourly. In previous years, during operational interruptions and maintenance activities resulting in period(s) of ladder closure, water temperature data was not available when water was not flowing in the ladder. In 2012, there was a technical issue with the continuous recording thermographs and only air and water temperature readings taken during each ladder check were available. In 2016, the logger recording the air temperatures stopped working in mid-July, while water temperatures were collected continuously between March 1 and October 31, 2016. The maximum daily water temperature collected each year is shown in Figure 3-2. Data from 2012 is based on the temperature data collected during each ladder check due to technical issues with the thermographs.

**Figure 3-2: Maximum daily water temperatures collected at the Thompson Falls fish ladder (Pool 48) during the ladder operational season each year, 2011-2016.**



A summary of the peak streamflow (per USGS gage #1238900) and maximum daily water temperature recorded in the ladder between 2011 and 2016 is provided in Table 3-2. The annual peak streamflow has varied from 36,600 cfs to 104,000 cfs and the maximum daily temperature has varied from 22.2 to 25.4 °C. Overall, 2016 proved to be a lower than normal water year, although not as low as in 2015, and experienced warmer water temperatures occurring in the spring compared to previous years.

**Table 3-2: Summary of the annual peak streamflow in the Clark Fork River (USGS gage #12389000) near Plains and maximum daily temperature recorded in the ladder, 2011-2016.**

Year	Peak Streamflow	Peak Streamflow Date	Max Daily Water Temperature (°C)
2011	104,000	June 10	22.2*
2012	75,300	June 20	22.8
2013	63,700	May 15	24.7
2014	82,800	May 29	23.6
2015	36,600	June 11	25.4
2016	44,100	May 27	24.5

\*temperature logger data not available for most of June, July, and August due to ladder closures.

### **3.4 Ladder Design Limitations and Fish Passage**

The fish ladder was designed to pass fish with streamflows up to 48,000 cfs. Since the ladder was operational in 2011, streamflows have exceeded this threshold annually except for the 2015 and 2016 seasons.

Between 2011 and 2014, the ladder was checked 91 times when streamflows exceeded 48,000 cfs. Fish were recorded during 26 of the ladder checks (28% of the time), with a total of 45 fish representing six species, including Bull Trout. Ladder checks have been completed with streamflows varying between 48,000 cfs and 95,700 cfs. Fish have only been recorded at the ladder with a maximum streamflow of approximately 69,000 cfs. The highest mean daily streamflow measured concurrent with a Bull Trout recorded at the ladder was 51,600 cfs (measured at the USGS gage #12389000).

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

**Table 3-3: Summary of ladder checks and the number of fish (and species) recorded when streamflows exceeded 48,000 cfs at the USGS gage #12389000 during ladder operations, 2011-2016.**

	2011	2012	2013	2014	2015	2016
USGS Peak Flow	104,000	75,300	63,700	82,800	36,600	44,100
Number of Ladder Checks when Flows >48,000 cfs	14	34	16	27	No Flows over 48,000 cfs	No Flows over 48,000 cfs
# of Ladder Checks with Flows > 48,000 cfs with Fish Recorded in Ladder	4	8	6	8	-	-
Total Number of Fish Recorded in Ladder with Flows >48,000 cfs	9	13	13	10	-	-
Species Recorded	3 RB, 3 LSSU, 3 NMPN	2 BULL, 9 RB, 1 WCT, 1 LSSU	12 LSSU, 1 NPMN	1 RB, 1 LL, 4 WCT, 4 LSSU	-	-
Range of Flows (>48,000cfs) with Fish Recorded at Ladder	55,900 - 69,000 cfs	49,600 - 63,300 cfs	52,200 - 61,800 cfs	50,300 - 58,300 cfs	-	-
Range of Flows with No Fish Recorded at Ladder	over 69,000 cfs (max operation check at 95,700 cfs)	> 64,100 (max operation check at 74,800 cfs)	> 61,800 cfs (max operation check at 62,600 cfs)	>59,300 (max operation check at 66,700 cfs; ladder closed at 67,000 cfs, then reopened when 55,900 cfs)	-	-
Total # of Fish Recorded at Ladder	<b>1,805</b>	<b>2,668</b>	<b>3,830</b>	<b>5,735</b>	<b>11,647</b>	<b>4,630</b>

### 3.5 Fish Ascending the Ladder

Between 2011 and 2016, a total of 30,315 fish were recorded at the ladder representing 14 species and three hybrids (Table 3-4). In 2016, a total of 4,630 fish were recorded at the ladder including three Bull Trout. In 2016, the first confirmed Brook Trout x Bull Trout hybrid (Adams et al., in press) and the first Largemouth Bass were documented at the ladder.

**Table 3-4: Summary of all fish species, including subtotals of salmonids and non-salmonids recorded at the Thompson Falls Dam ladder annually between 2011 and 2016.**

Species	2011	2012	2013	2014	2015	2016
BULL	2	2	5	1	2	3
EBxBULL	-	-	-	-	-	1
EB	-	-	-	1	2	1
RB	164	208	213	187	281	366
RBxWCT	9	7	13	12	4	5
WCT	21	21	48	36	37	36
LL	28	42	111	81	184	204
LS SU	418	1,403	3,041	2,802	6,327	2,270
LN SU	10	0	2	1	26	6
MWF	17	24	2	254	54	8
NPMN	1,000	926	387	1,003	3,356	707
PEA	-	-	-	-	120	2
PEAxNPMN	-	-	-	-	2	13
SMB	135	34	8	1,356	1,244	1,007
LMB	-	-	-	-	-	1
LT	1	1	-	1	6	-
WE	-	-	-	-	2	-
Salmonids	<b>242</b>	<b>305</b>	<b>392</b>	<b>573</b>	<b>570</b>	<b>624</b>
Non-Salmonids	<b>1,563</b>	<b>2,363</b>	<b>3,438</b>	<b>5,162</b>	<b>11,077</b>	<b>4,006</b>
<i>TOTAL</i>	<b>1,805</b>	<b>2,668</b>	<b>3,830</b>	<b>5,735</b>	<b>11,647</b>	<b>4,630</b>

Since operations began in 2011, Lake Trout and Walleye have never been authorized by MFWP for release upstream of Thompson Falls Dam. In 2016, the Licensee, in consultation with MFWP, ceased release of Brook Trout and/or Brook Trout x Bull Trout hybrids upstream of Thompson Falls Dam.

Cumulatively 30,315 fish were documented at the ladder and 30,165 fish were released upstream of Thompson Falls Dam since 2011 (Table 3-5). A total of 150 fish (112 non-salmonids, 38 salmonids) were not released upstream. Of the 38 salmonids, 10 fish (9 Lake Trout, 1 Brook Trout x Bull Trout hybrid) were not authorized to be released upstream and the remaining 28 salmonids were recorded as mortalities at the ladder (14 Rainbow Trout, 11 Brown Trout, 2 Mountain Whitefish, 1 Bull Trout). Over half of the mortalities (79 non-salmonids, 3 salmonids) documented at the ladder in the last 6 years occurred during the first season of operation. The mortalities recorded in 2011 were primarily related to mechanical operations and

learning curve associated with running the ladder for the first season. Mechanical-related mortalities declined substantially in subsequent years.

In 2016, a total of 4,611 fish (out of the 4,630 fish documented) were released upstream. Of the 19 fish not released upstream, there was one confirmed Brook Trout x Bull Trout hybrid that was not authorized for release upstream plus 18 mortalities, including three Largescale Suckers, three Northern Pikeminnow, two Mountain Whitefish, five Rainbow Trout, and five Brown Trout. Four mortalities included fish (Rainbow Trout, Brown Trout, Northern Pikeminnow, and Largescale Sucker) that were selected for educational outreach and were not related to ladder operations. In 2016, no Walleye or Lake Trout were recorded at the ladder.

An annual summary of the total fish count at the ladder, the number of fish released upstream, the number of salmonids PIT-tagged at the ladder, and the number of fish not released upstream of Thompson Falls Dam is provided in Table 3-5.

**Table 3-5: Summary of the annual totals between 2011 and 2016 for the number of fish recorded at the ladder, the number of fish released upstream, the number of fish implanted with a PIT tag, and the number of mortalities/fish not authorized for upstream fish passage.**

Year	Total Fish Count at Ladder	Number of Fish Released Upstream	Salmonids with New PIT Tags at Ladder	Total Mortalities/Fish Not Authorized for Upstream Passage
2011	1,805	1,723	216	82
2012	2,668	2,660	256	8
2013	3,830	3,818	344	12
2014	5,735	5,733	258	2
2015	11,647	11,620	483	27
2016	4,630	4,611	525	19
<b>TOTAL</b>	<b>30,315</b>	<b>30,165</b>	<b>2,082</b>	<b>150</b>

### 3.5.1 Species Composition

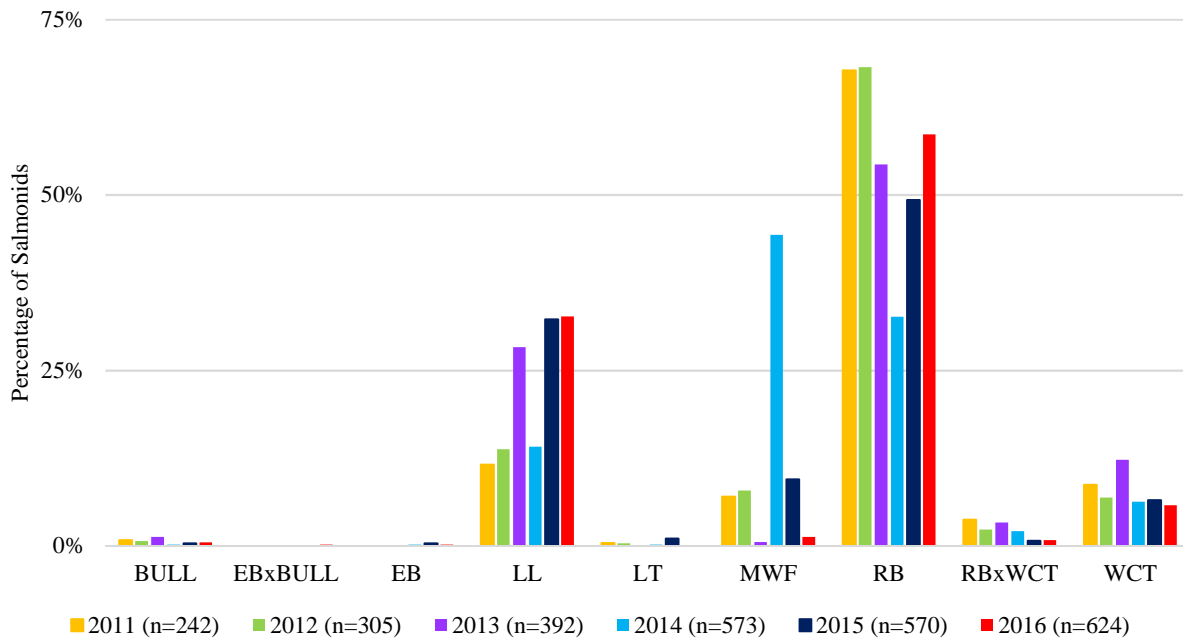
A total of 14 species and three hybrids are documented ascending the ladder between 2011 and 2016. Salmonids are represented by seven salmonid species and two hybrids. Non-salmonids are represented by 7 species and one hybrid. The species composition for salmonids and non-salmonids remained relatively consistent since operations began in 2011. Salmonids generally represent 10 to 13 percent of the total fish count at the ladder with the exception of the 2015 ladder season. In 2015, the total number of salmonids was 570 fish, similar to 2014 (n=573), but the total number of non-salmonids was more than double the total in 2014. Therefore, the percentage of salmonids at the ladder in 2015 declined to 5 percent.

The majority of salmonids recorded at the ladder annually are represented by (in order from greatest to least) Rainbow Trout, Brown Trout, Westslope Cutthroat Trout, and Mountain



Whitefish. The annual composition of salmonids is illustrated in Figure 3-3. Rainbow Trout generally represent about half of the salmonids recorded at the ladder each year. Other salmonids such as Bull Trout, Brook Trout, Lake Trout, and Rainbow x Westslope Cutthroat Trout hybrid are also observed at the ladder in most years, but at much lower numbers.

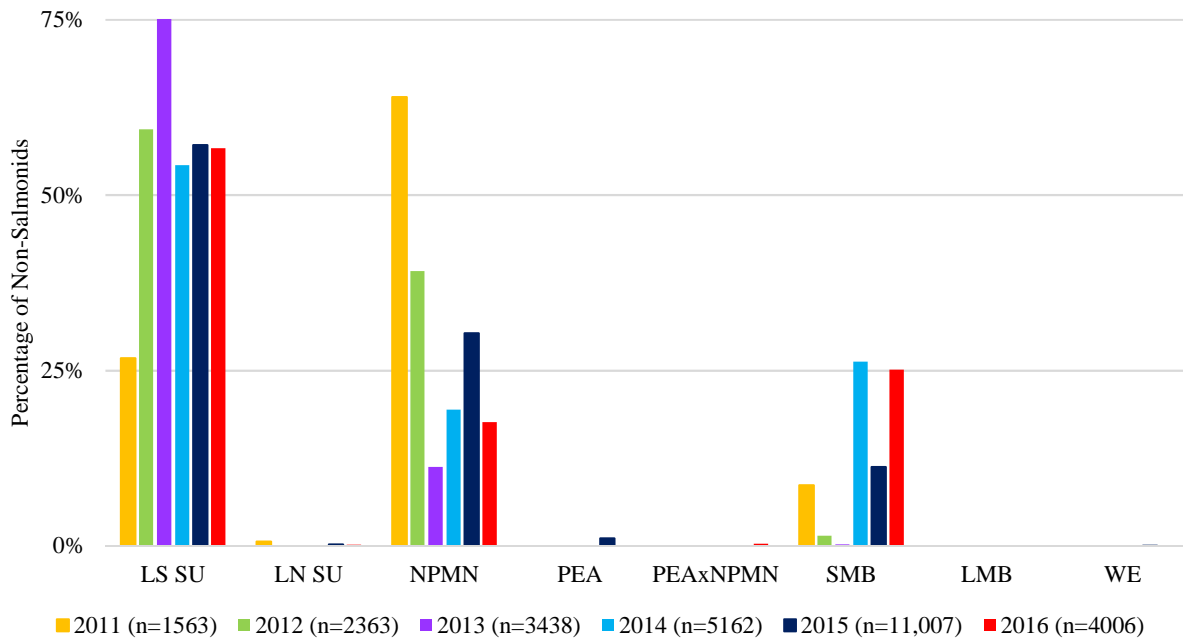
**Figure 3-3: Composition of salmonid species that ascended the Thompson Falls fish ladder annually, 2011-2016.**



Mountain Whitefish counts have oscillated the most from year to year. There was a large influx of Mountain Whitefish recorded at the ladder in 2014, but not repeated in any of the other seasons. Mountain Whitefish are more commonly observed in the fall months in the ladder. Limitations in the operational season (in October/November), due to pending freezing temperatures and associated operational challenges, may also limit the ability to facilitate upstream passage of Mountain Whitefish during the fall months.

Non-salmonids represent most fish (87% or more) recorded at the ladder each year and are predominantly Largescale Suckers, Northern Pikeminnow, and Smallmouth Bass. Other species such as Longnose Suckers, Peamouth, Peamouth x Northern Pikeminnow hybrids, Largemouth Bass, and Walleye have also been recorded at the ladder but at much lower numbers. The annual composition of non-salmonids is illustrated in Figure 3-4.

**Figure 3-4: Composition of non-salmonid species that ascended the Thompson Falls fish ladder annually, 2011-2016.**



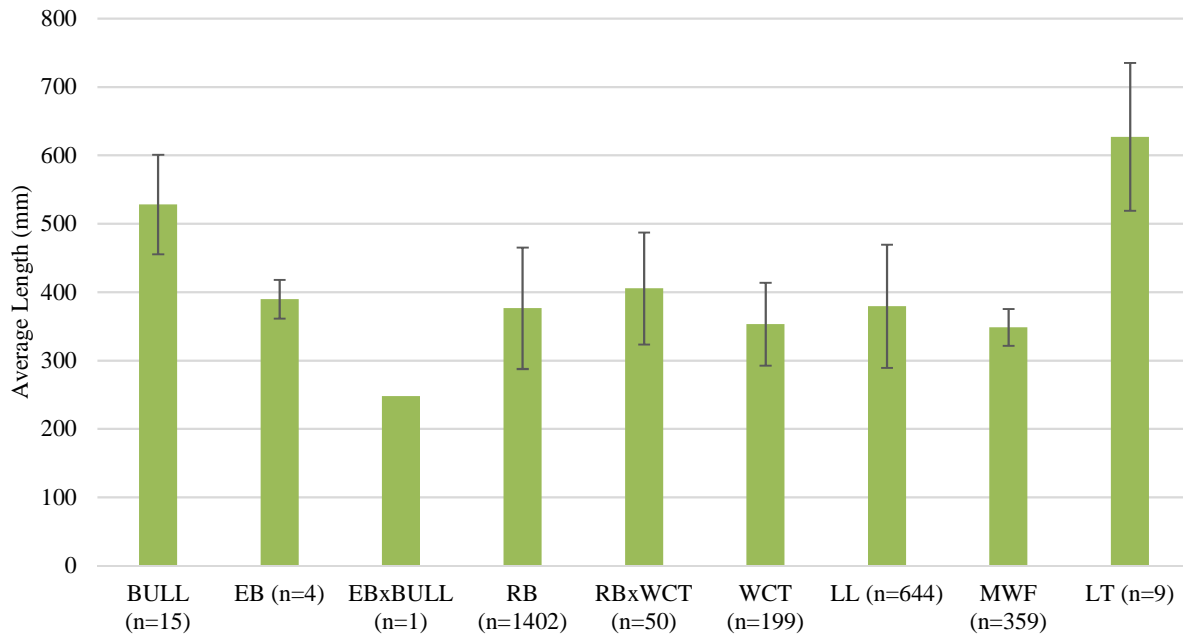
### 3.5.2 Fish Metrics

At the ladder, the majority of salmonids ascending the ladder were measured for total length in millimeters (mm) and weight in grams (g), and marked via an adipose fin clip and implanted with a PIT tag. Non-salmonids were also measured for total length and weight, and sub-samples were measured when large groups of non-salmonids were recorded at the ladder. The following sections summarize the annual fish metric data collected at the ladder between 2011 and 2016.

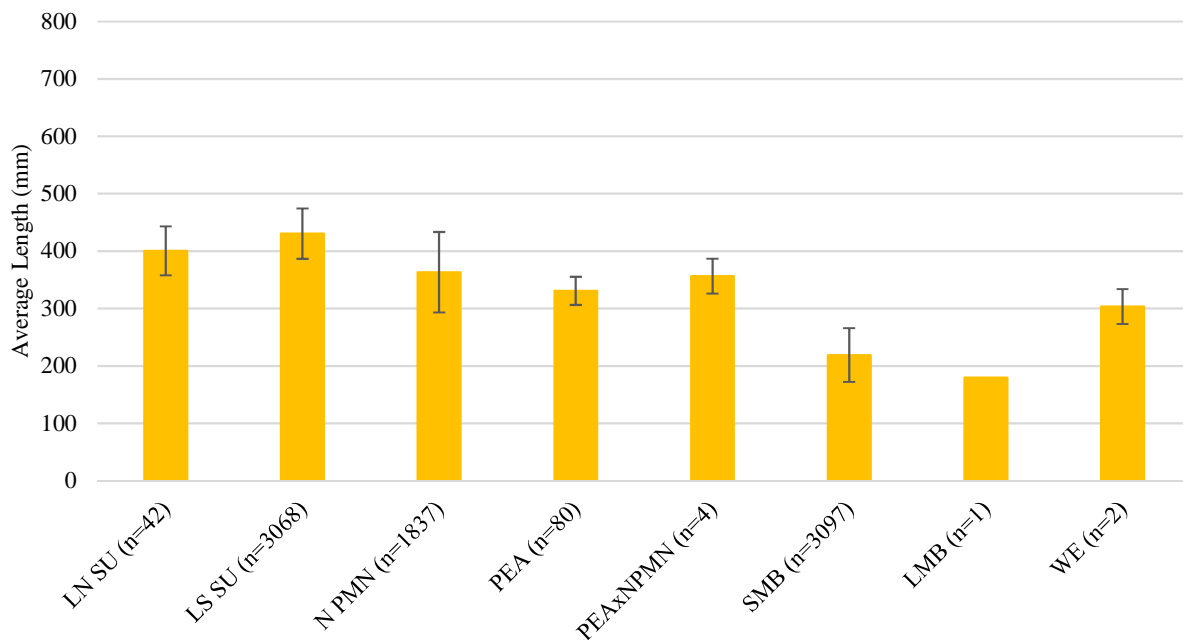
#### 3.5.2.1 Fish Length and Weight

Since 2011, length and weight measurements were recorded for approximately one-third of the 30,315 fish recorded at the ladder. The size of salmonids (2,683 fish measured) recorded at the ladder range from a minimum of 107 mm to a maximum of 785 mm. The size of non-salmonids (8,131 fish measured) recorded at the ladder range from a minimum of 82 mm to a maximum of 610 mm. The average length (along with the standard deviation) for each species of salmonids and each species of non-salmonids recorded at the ladder between 2011 and 2016 is illustrated in Figures 3-5 and 3-6, respectively.

**Figure 3-5: Average length and standard deviation for salmonids species measured at the ladder, 2011-2016.**



**Figure 3-6: Average length and standard deviation for non-salmonids species measured at the ladder, 2011-2016**



In 2016, length and weight measurements were taken from 1,876 fish (617 salmonids and 1,259 non-salmonids) of the 4,630 fish recorded at the ladder. A summary of the mean and range of length and weight measurements collected for each fish species is provided in Table 3-6.

**Table 3-6: Summary of the number of fish measured and the mean and range of lengths (mm) and weights (g) for each fish species that ascended the ladder and was moved upstream in 2016.**

Species	Count	Mean Length (mm)	Length (mm) Range	Mean Weight (g)	Weight (g) Range
BULL	3	549	413 – 618	1495	602 – 1950
EB	1	402	-	610	-
EBxBULL	1	248	-	118	-
RB	359	377	144 – 615	572	26 – 2520
RBxWCT	5	435	311 – 491	771	272 – 972
WCT	36	362	262 – 486	499	182 – 1036
LL	204	363	200 – 620	508	78 – 2170
MWF	8	350	247 – 397	405	114 – 600
LN SU	6	430	412 – 452	832	740 – 1034
LS SU	555	432	216 – 562	870	100 – 1910
N PMN	319	389	206 – 565	575	40 – 1816
PEA	2	343	342 – 343	403	384 – 422
PEA x NPMN	4	356	320 – 390	398	264 – 578
SMB	373	240	160 - 453	177	50 - 1000
LMB	1	180	-	76	-

### 3.5.2.2 Fish Biomass Passed Upstream

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

Since ladder operations began in 2011, approximately 19,051 kg of biomass was released upstream of Thompson Falls Dam. Annually, non-salmonid species represent the majority of the fish biomass (80-96%) while salmonids represent between 4 and 20 percent of the fish biomass moved upstream of Thompson Falls Dam.

**Table 3-7: Summary of the estimated total biomass in kilograms (kg) for each fish species that ascended the ladder and passed upstream of Thompson Falls Dam annually, 2011-2016.**

Species	Approximate Total Biomass (kg) Passed Upstream						
	2011	2012	2013	2014	2015	2016	Total
BULL	1.8	1.2	8.0	1.3	2.5	4.5	<b>19</b>
EB	-	-	-	0.6	1	0.6	<b>2</b>
RB	118.6	102.1	116.3	124.2	153.7	207.3	<b>822</b>
RBxWCT	4.8	3.8	7.9	8.3	5.2	3.9	<b>34</b>
WCT	11.0	9.6	25.1	15.2	14.4	18.0	<b>93</b>
LL	18.3	28.0	69.1	60.6	100.5	99.7	<b>376</b>
MWF	5.9	7.8	0.7	100.0	25.3	2.1	<b>142</b>
LN SU	4.6	-	1.2	0.8	19.8	5.0	<b>31</b>
LS SU	267.9	1,040.5	2,414	2,037	5,789.2	1,972.1	<b>13,521</b>
N PMN	344.1	445.4	115	320	1,766.7	402.9	<b>3,394</b>
PEA	-	-	-	-	37.8	0.8	<b>39</b>
PEAxNPMN	-	-	-	-	-	8.8	<b>9</b>
SMB	23.9	11.5	3.3	171.8	180.9	177.1	<b>569</b>
LMB	-	-	-	-	-	0.08	<b>&lt;1</b>
<b>Salmonid Biomass</b>	<b>161</b>	<b>153</b>	<b>227</b>	<b>310</b>	<b>303</b>	<b>336</b>	<b>1,489</b>
<b>Non-Salmonid Biomass</b>	<b>640</b>	<b>1,497</b>	<b>2,534</b>	<b>2,530</b>	<b>7,794</b>	<b>2,567</b>	<b>17,562</b>
<b>TOTAL Biomass</b>	<b>801</b>	<b>1,650</b>	<b>2,761</b>	<b>2,840</b>	<b>8,097</b>	<b>2,903</b>	<b>19,051</b>

### 3.6 Bull Trout Ascending the Ladder

During the last 6 years of operations, 15 Bull Trout (representing 14 unique individuals) ascended the ladder. The majority (13 of the 14 individual Bull Trout) ascended the ladder between April and June while one Bull Trout was recorded ascending the ladder on August 9, 2013 (Table 3-8).

**Table 3-8: Summary of Bull Trout that ascended the ladder, 2011-2016.**

Date	Length (mm)	Weight (g)	PIT Tag	Water Temp (°C)	USGS #12389000 Mean Daily Streamflow (cfs)	Last Detection of Bull Trout
4/18/2016	413	602	989001005372232	9.7	19,500	4/18/2016 released live upstream of TFalls Dam; 10/2/2016 detected in the lower pool in the Thompson Falls fish ladder
5/18/2016	615	1934	989001005372387	13.4	29,500	5/18/2016 released live upstream of TFalls Dam; 9/18-19, 9/21, 9/24, 9/26-18/2016 detected in the Thompson River
6/6/2016	618	1950	989001005372405	17.0	32,000	Released live upstream of TFalls Dam
5/17/2015	519	1334	982000363519407	12.9	26,400	Released live upstream of TFalls Dam; recaptured during 2015 FWP electrofishing in Big Hole Section of Thompson River on 6/2/2015 (543mm, 1348g) and released live in Thompson River
6/3/2015	520	1112	982000357016242 982000357016210	15.6	29,900	Released live upstream of TFalls Dam; 7/15/2015 detected in West Fork Thompson River
5/16/2014	523	1264	982000357016169	10.8	44,000	Released live upstream of TFalls Dam; recaptured during 2014 annual reservoir monitoring led by FWP in Noxon Reservoir on 10/13/2014 via gillnet ( <b>Mortality</b> )
4/30/2013	598	2306	982000357016065	8.9	25,100	Released live upstream of TFalls Dam
5/6/2013	576	1694	982000357016109	10.6	24,000	Released live upstream of TFalls Dam; detected downstream of TFalls Dam by Avista in Prospect Creek on 9/21/2014
5/7/2013	478	978	982000357016155	11.3	25,000	Released live upstream of TFalls Dam
6/7/2013	596	1926	Half-duplex (HDX) tag not recorded (Genetics 118-073)	15.5	38,100	Released live upstream of TFalls Dam
8/9/2013	482	1058	982000357016151	22.3	8,680	Released live upstream of TFalls Dam
5/15/2012	510	1172	985121021877906/ 982000357016269	11.3	51,000	First observed below TFalls Dam on 5/31/2011; ascended TFalls Ladder on 5/15/2012; released live upstream of TFalls Dam; detected Downstream of TFalls Dam by Avista in Prospect Creek 7/7/2013 – 8/13/2013
4/26/2011	547	1438	985121023464730	7.8	25,900	First Ascent
5/21/2012	563	1404		11.1	56,100	Second Ascent - <b>Mortality</b> (jumped out of pool)
4/13/2011	365	364	985121023302169	6.6	24,500	Released live upstream of TFalls Dam

In 2016, three Bull Trout ascended the ladder and all three fish were released live upstream of Thompson Falls Dam. The first Bull Trout (PIT #989001005372232) was recorded at the work station on April 18; the second Bull Trout (PIT #989001005372387) was recorded on May 18; and the third Bull Trout (PIT #989001005372405) was recorded on June 6. Between April 18 and June 6, stream temperatures (measured in the ladder) and Clark Fork River streamflows (USGS station 12389000 near Plains) varied from approximately 9.7 °C to 17.0 °C and from 19,500 cfs to 32,000 cfs, respectively.

A genetic sample of each Bull Trout recorded at the ladder was analyzed for the most likely population of origin. The results of the genetic analysis for 12 of the 14 Bull Trout were available at the time of this report, while two samples from 2016 are still pending (*refer to* Table 9-1 for genetic assignments). Based on the results, the most likely population of origin for the 12 Bull Trout were Region 4 tributaries [i.e., Fishtrap Creek (n=9), Thompson River (n=1), Fish Creek (n=1), North Fork Fish Creek (n=1), Meadow Creek (n=1)].

Since the release of the 14 Bull Trout upstream of Thompson Falls Dam, a total of 8 individual Bull Trout were detected at least once after being released upstream of Thompson Falls Dam (Table 3-8). Three Bull Trout were recorded upstream in the Thompson River drainage (2 in the mainstem, 1 in West Fork Thompson River), two Bull Trout were detected downstream of the Thompson Falls Dam in Prospect Creek, two Bull Trout re-entered the ladder (1 resulted in a mortality in 2012, the second only entered the lower pools in 2016), and one Bull Trout was re-captured downstream in Noxon Reservoir during a gillnetting survey. Out of the 14 Bull Trout, there are two known mortalities, including one Bull Trout that returned to the ladder in 2012 and jumped out of a pool at the ladder and a second Bull Trout in 2013 that was re-captured downstream of the Thompson Falls Dam via gillnetting in the Noxon Reservoir.

A summary of the Bull Trout that ascended the ladder between 2011 and 2016 is provided in Table 3-8. *Refer to* Section 4.0 for a summary of Bull Trout sampled by NorthWestern in the Thompson Falls Hydroelectric Project (Project) area between 2011 and 2016 and genetic assignments.

### **3.7 Detecting Fish in the Ladder**

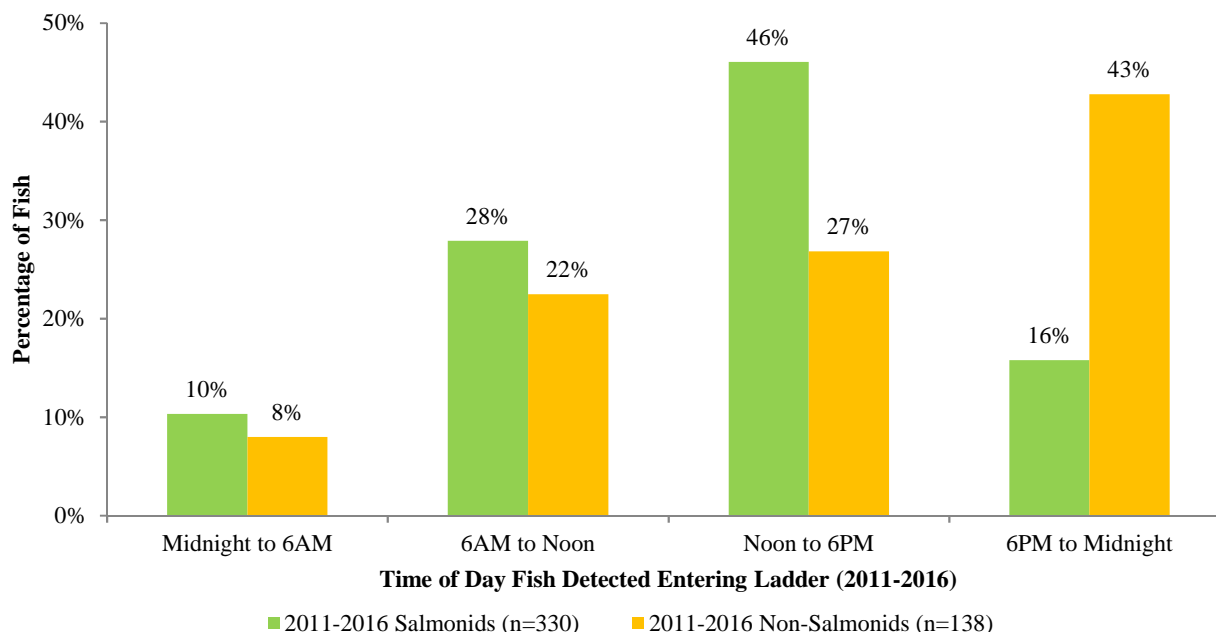
Three remote antennas (non-directional) were installed in the lower pools 7 and 8 and the holding pool (pool 45) of the ladder for detecting the presence of PIT-tagged fish. Fish detections in the ladder are used to evaluate the time of day fish enter the ladder, as well as the length of time fish take to ascend the ladder. These data have been collected annually since operations began in 2011.

#### **3.7.1 Time of Day Fish Enter Ladder**

The remote arrays in the lower pools 7 and 8 record the PIT-tag identification number, date, and time for each time a fish passes over the array. The majority of the PIT-tagged fish detected

entering the ladder were salmonids, but there were also some PIT-tagged Largescale Suckers, representing non-salmonids detected entering the ladder. It is assumed that the first date and time recorded for an individual fish in either pool 7 or 8 (if no detection was recorded by the array in pool 7) represents that fish entering the ladder. The timing of fish entry is depicted by dividing a 24-hour period into 6-hour increments. The entry time of day for 330 salmonids and 138 non-salmonids detected in the ladder between 2011 and 2016 is shown in Figure 3-7.

**Figure 3-7: Percentage of salmonids (n=330) and percentage of non-salmonids (n=138) and their respective ladder entry time between 2011 and 2016.**



Salmonids and non-salmonids were observed entering the ladder throughout of the day; however, the least active period for both groups was in the early hours of the day between midnight and 6:00AM (Figure 3-7). Salmonids were most frequently recorded entering the ladder between 12:00PM and 6:00PM, while non-salmonids were most frequently recorded entering the ladder between 6:00PM and midnight.

In 2016, there were a total of 81 salmonids detected entering the ladder and the diurnal movements into the ladder were similar to the overall trend for the last 6-years. Nearly half of the 81 salmonids entered the ladder between 12:00PM and 6:00PM followed by 28 percent entering the ladder between 6:00AM and 12:00PM, 14 percent entering the ladder between midnight and 6:00AM, and 9 percent entering between 6:00PM and midnight.

The 2016 data were also evaluated for seasonal changes in the time of day salmonids entered the ladder. Salmonids were delineated into four groups including fish that entered the ladder between March-April, May-June, July-August, and September-October. Between March and June, the majority of salmonids (24 of 41 fish) entered the ladder between 12:00PM and 6:00PM. Between July and October, the majority of the salmonids entered the ladder between 6:00AM and 6:00PM



with an even distribution between the 6:00AM and 12:00PM (17 fish) and the 12:00PM and 6:00PM (16 fish) intervals.

In contrast, non-salmonids recorded in the ladder in 2016 did not exhibit similar behavior for diurnal movements into the ladder as in previous years. However, in 2016 the sample size for non-salmonids (Largescale Suckers) was low with only 4 Largescale Suckers recorded entering the ladder. Two Largescale Suckers entered the ladder between 6:00AM and 12:00PM, one entered the ladder between 12:00PM and 6:00PM, and one entered the ladder between 6:00PM and midnight.

### 3.7.2 Length of Time to Ascend the Ladder

The remote antennas and detection data were used to calculate the length of time it took an individual fish to ascend the ladder between the lower pools 7/8 and the holding pool (pool 45). Not all fish detected in pool 45 were recorded at the ladder work station indicating that some fish escaped the holding pool. Tagged fish detected in the ladder were either initially tagged at the ladder or via electrofishing surveys downstream of Thompson Falls Dam.

In 2016, ascent times were calculated for 93 fish (Table 3-9). The 93 fish represent six species, one hybrid, and one unknown species. In 2016, salmonids expended between 0.9 hour and 259 hours (10 days) to ascend the ladder with the median ascent time of 2 hours. Non-salmonids (Largescale Suckers) spent between 3 hours and 5.5 hours to ascend the ladder with a median time of 4.2 hrs.

**Table 3-9: Summary of each species including the number of fish detected entering the ladder and the median, minimum and maximum range of time (hours) spent ascending the ladder in 2016.**

Species	Number of Fish	Median Time (hrs)	Min Time (hrs)	Max Time (hrs)
LL	36	1.9	0.9	259.0
RB	43	1.9	0.6	25.4
RBxWCT	2	6.1	3.1	9.1
BULL	-	-	-	-
MWF	3	2.9	2.4	45.4
WCT	4	1.9	1.6	2.6
LS SU	4	4.2	3	5.5
Unknown	1	2.1	-	-
<b>TOTAL</b>	<b>93</b>	<b>2.0</b>	<b>0.6</b>	<b>259</b>

Between 2011 and 2016 a total of 288 ascent times were recorded, representing 245 salmonids, 42 Largescale Suckers, and one unknown species. Salmonids include Bull Trout, Rainbow Trout,

Brown Trout, Mountain Whitefish, Westslope Cutthroat Trout, and Rainbow Trout x Westslope Cutthroat Trout hybrids.

The annual median ascent time for 245 salmonids ranged between 1.6 and 3.6 hours; and the annual median ascent time for 42 Largescale Suckers (only PIT-tagged non-salmonid species recorded) varied from 3.6 to 9.1 hours. A summary of the annual number of salmonids and non-salmonids (only includes Largescale Suckers) recorded ascending the ladder and their respective median ascent time is provided in Table 3-10. Although 14 individual Bull Trout have ascended the ladder, only two Bull Trout were previously tagged allowing for an ascent time to be documented. These two Bull Trout both ascended the ladder in 2012 in 2.4 and 2.8 hours. The two Bull Trout ascent times were within the range of median ascent times recorded for salmonids (1.6 – 3.6 hours) during the last 6 years of ladder operations.

**Table 3-10: Summary of the number of salmonids and non-salmonids detected via remote antennas in the ladder and the median time (hours) spent ascending the ladder each year.**

Year	Salmonids		Non-Salmonids	
	Number of Fish	Median Time (hrs)	Number of Fish	Median Time (hrs)
2011	17	3.6	1	3.6
2012	23	2.3	7	6.6
2013	42	1.8	10	8.2
2014	32	1.6	-	-
2015	44	2.2	20	9.1
2016	<b>88</b>	<b>2.0</b>	<b>4</b>	<b>3.8</b>

### 3.8 Seasonal Movement Patterns

Fish movement is likely influenced by a myriad of elements such as, but not limited to, thermal regime, hydrologic regime, life history cycle, attractant flow at the ladder, ladder operations (e.g., closures or weir mode), and/or other physical or biological factors. Although there are several potential factors working in concert to influence fish movement and behavior, the physical mechanisms, such as streamflow and water temperature as well as the biological mechanism, spawning preference (spring or fall spawners), are the three elements discussed in the following sections.

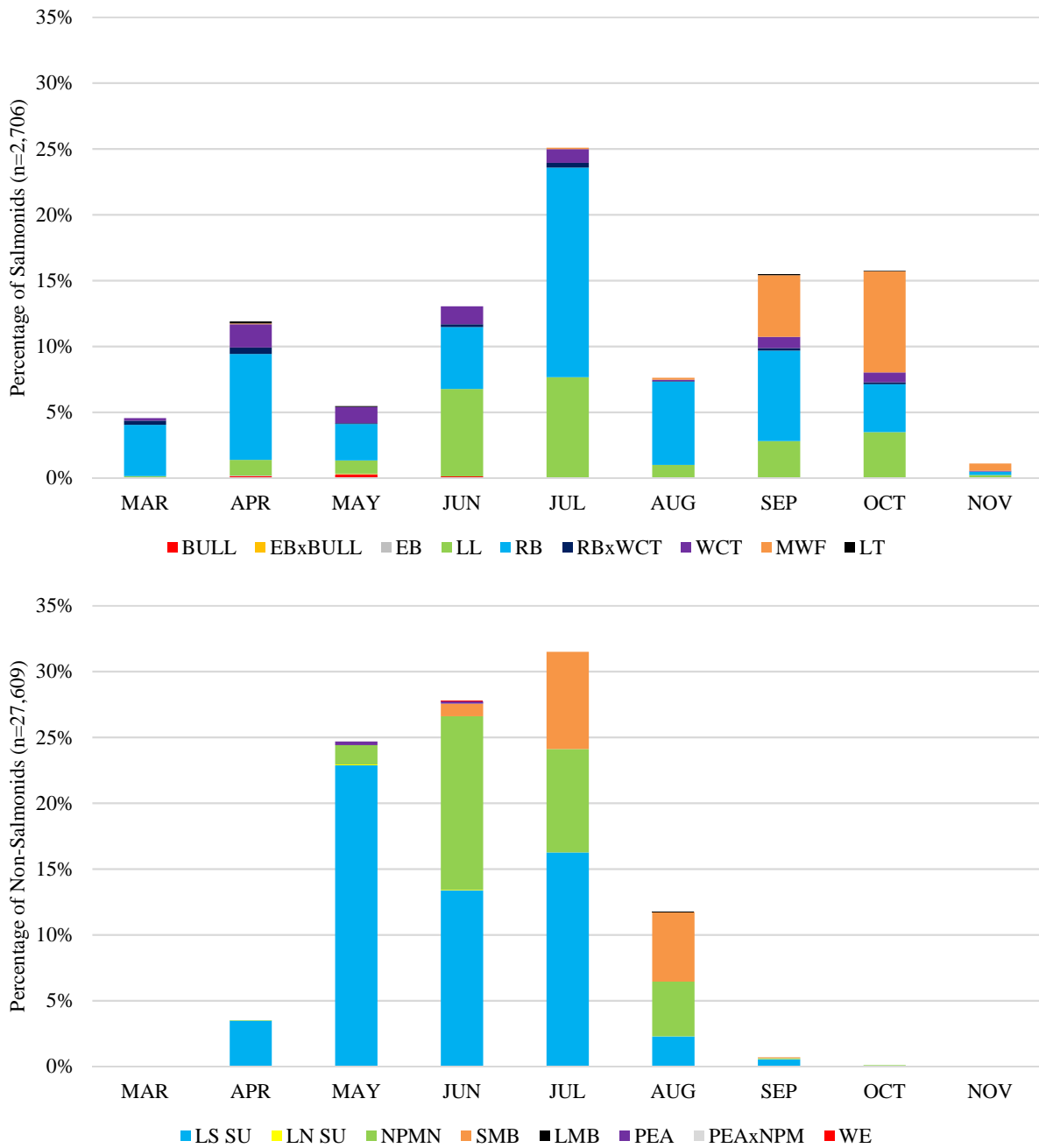
Salmonids include both spring and fall spawners. Spring spawning salmonids are represented by Rainbow Trout, Westslope Cutthroat Trout, and Rainbow x Westslope Cutthroat Trout hybrid. Fall spawning salmonids are represented by Bull Trout, Mountain Whitefish, Brown Trout, Brook Trout, Brook x Bull Trout hybrid, and Lake Trout. The non-salmonids recorded at the ladder are all categorized as spring spawners.

The seasonal movement analysis includes all fish collectively recorded at the ladder between 2011 and 2016. During the last 6 years of operation, approximately 30,315 fish were recorded at the ladder, representing 2,706 salmonids and 27,609 non-salmonids. The analysis of seasonal movement is limited to the period of time the ladder is in operation each year. In most years, the ladder is operational between mid-March and mid-October. In 2015, the ladder was operational until November 9 and in 2016, the ladder was in operation until the end of October.

The following sections evaluate fish movement patterns for salmonids and non-salmonids based on the time of year fish were recorded at the ladder, as well as the corresponding mean daily streamflow measurements and daily water temperature measurements. Streamflow measurements are taken at the USGS gage #12389000 in the Clark Fork River near Plains, Montana. Water temperature measurements reflect temperatures recorded in the ladder during each ladder check.

Seasonal trends in fish movement at the ladder are apparent even with the annual variability in the number of fish observed at the ladder and physical river conditions (streamflow and water temperatures). Salmonids and non-salmonids recorded at the ladder between 2011 and 2016 display distinct and different movement strategies. Over the last 6-years, salmonid movements in the ladder peaks in July with a steady presence in April and June and again in the autumn (September and October), while the majority (84%) of the non-salmonids ascend the ladder between May and July (Figure 3-8).

**Figure 3-8: Percentage of salmonids (top graph) and non-salmonids (bottom graph), recorded at the ladder each month for all years of ladder operations, 2011-2016.**

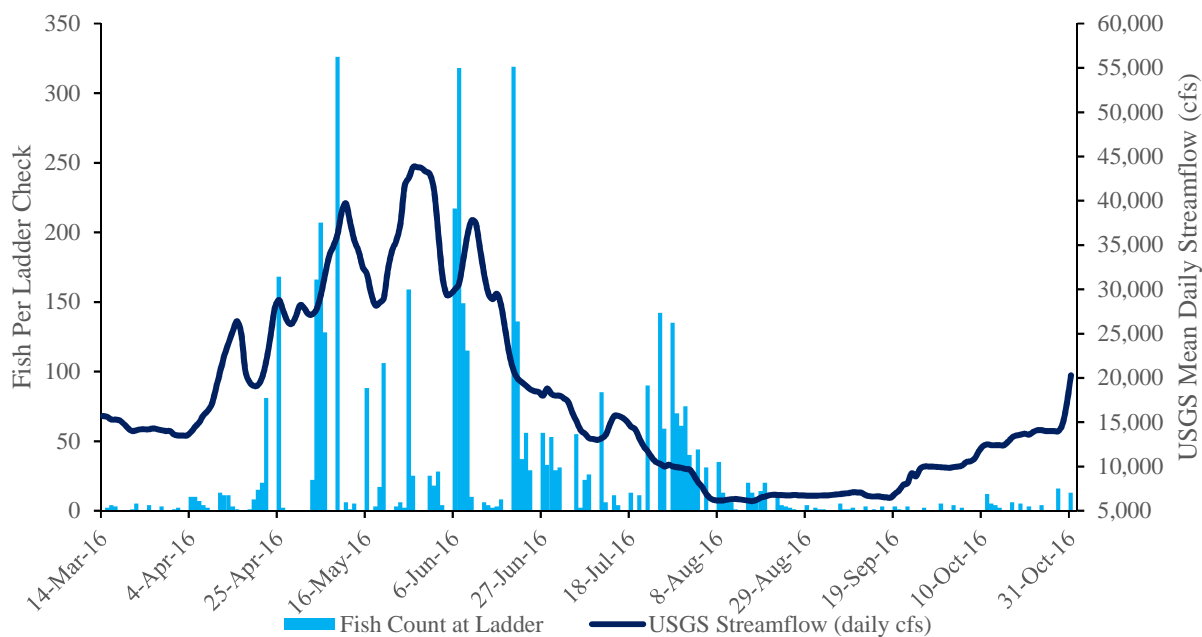


### 3.8.1 Streamflow and Fish Movement to the Ladder

Streamflows in the Clark Fork River varied considerably between 2011 and 2016 (*refer to* Section 3.3 for details). In 2016, streamflows in the Clark Fork River were below average with the peak flow just over 44,000 cfs compared to an average peak flow around 60,000 cfs. The fish

count per ladder check and corresponding mean daily streamflow (at the USGS gage #12389000) in 2016 is provided in Figure 3-9. Fish activity and frequency (salmonids and non-salmonids combined) at the ladder varied throughout the year with several pulses of fish occurring concurrently with increases in streamflow during the spring months, May and June, and other pulses of fish appearing at the ladder when streamflows decreased later in the summer (end of June and late-July).

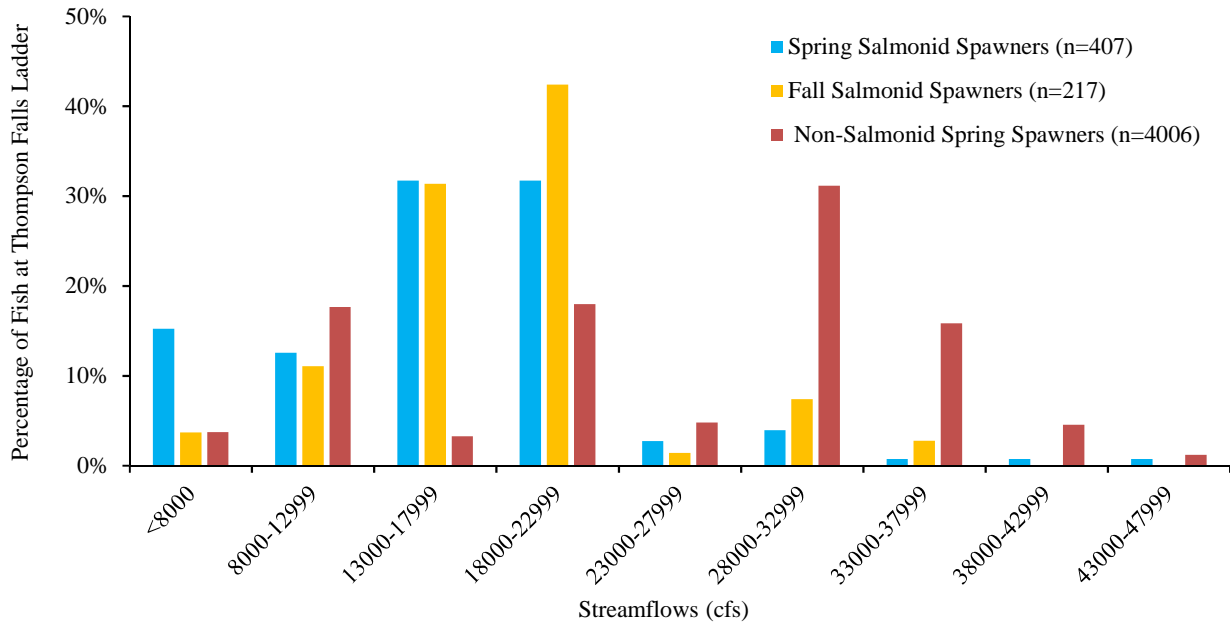
**Figure 3-9: Summary of fish recorded per ladder check and mean daily streamflow during the 2016 season, March 14-October 31.**



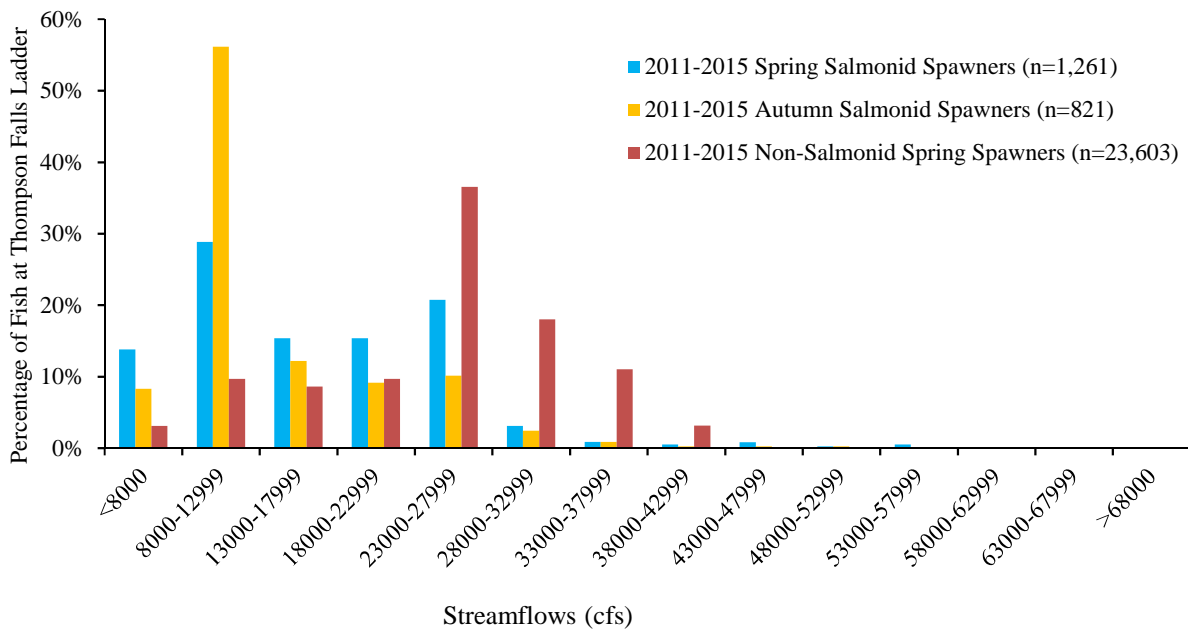
The percentage of salmonids (spring and fall spawners) and non-salmonids recorded at the ladder during various streamflows in 2016, and between 2011 and 2015, is presented in Figures 3-10 and Figure 3-11, respectively. Between 2011 and 2014, peak streamflow varied from 63,700 cfs to over 104,000 cfs. In 2015 and 2016, peak streamflow remained less than 44,100 cfs. Fish have been recorded in the ladder at flows up to and exceeding 68,000 cfs, however, the number of fish recorded at the ladder declines substantially once flows exceed 43,000 cfs (Figure 3-11).

While there is some year to year variability, salmonids and non-salmonids show general movement trends as they relate to streamflow over time. Non-salmonids were more often recorded in the ladder at a higher streamflows (23,000 to 38,000 cfs) than salmonids. In general, salmonids were most common at the ladder when flows were less than 28,000 cfs.

**Figure 3-10: Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded the Thompson Falls fish ladder in 2016 during various streamflows. Maximum flows less than 48,000 cfs.**



**Figure 3-11: Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded the Thompson Falls fish ladder between 2011 and 2015 during various streamflows. Maximum flows greater than 68,000 cfs.**

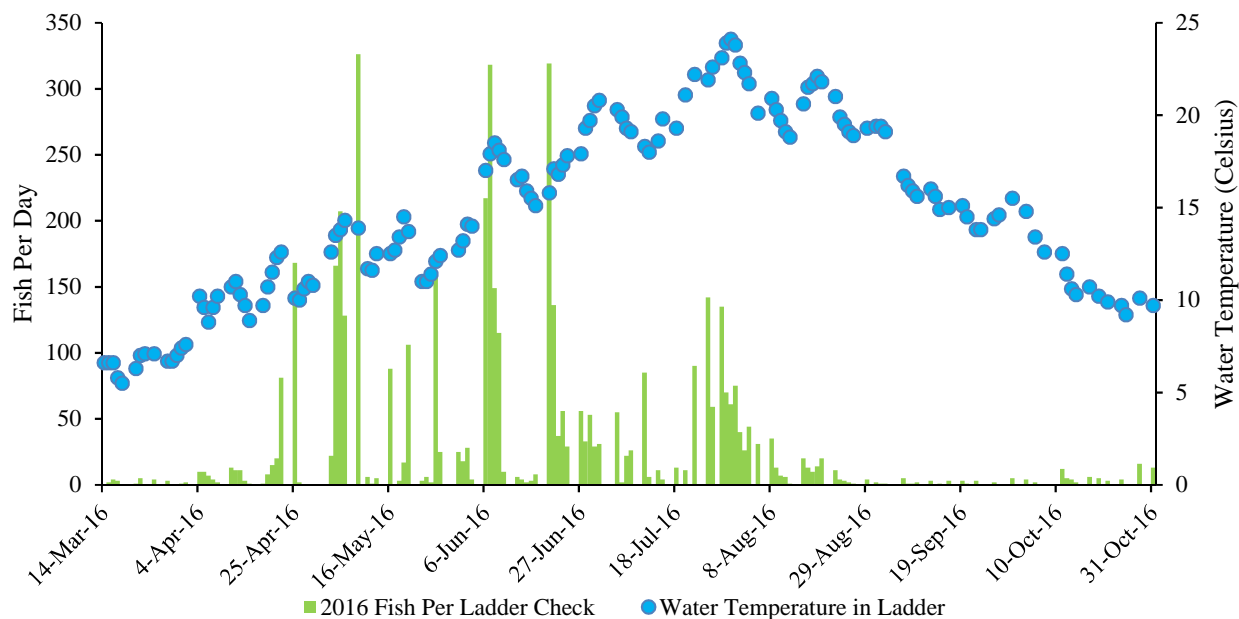


Fall spawners showed the most variability from 2016 compared to previous years. In 2016, more fall spawners were recorded at the ladder when flows were between 13,000 and 23,000 cfs, while between 2011 and 2015 the largest percentage of fall spawners were at the ladder when flows were between 8,000 and 13,000 cfs. The movement pattern observed by fall spawners between 2011 and 2015 was likely influenced by the 253-Mountain Whitefish (highest number of Mountain Whitefish recorded in all years) recorded in the ladder in September and October 2014 when streamflows were less than 13,000 cfs. This pulse of Mountain Whitefish in 2014 accounts for about one-third of the fall spawners recorded between 2011 and 2015.

### 3.8.2 Water Temperature and Fish Movement to the Ladder

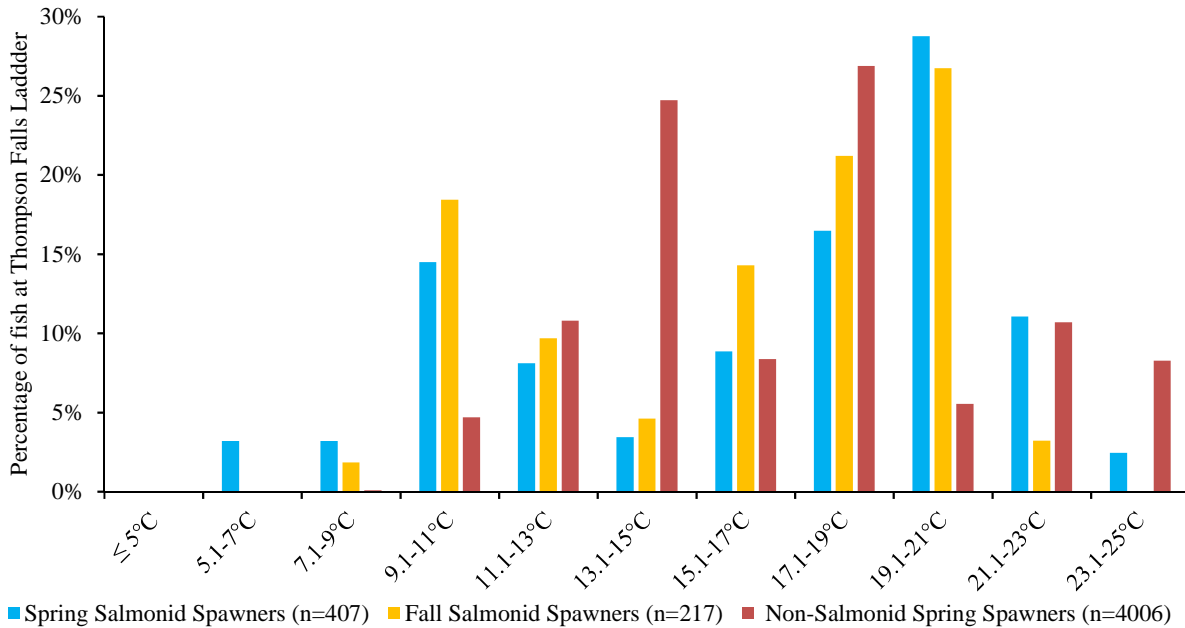
Water temperatures during the operational season generally range from about 5 to 6 °C when the ladder is opened in the spring and peak between 22 and 25 °C in the summer. Since operations began in 2011, the warmest water temperature recorded during a ladder check was 24.9 °C in 2015 and the coldest water temperature recorded was 4.3 °C in 2011. There were 4 days (1 day in March 2011 and 3 days in March 2012) when water temperatures were recorded less than 5 °C concurrent with fish recorded at the ladder. The water temperature regime and fish count per ladder check in 2016 is summarized in Figure 3-12.

**Figure 3-12: Summary of fish recorded and water temperature in the ladder during each ladder check in 2016 (March 14 – October 31).**

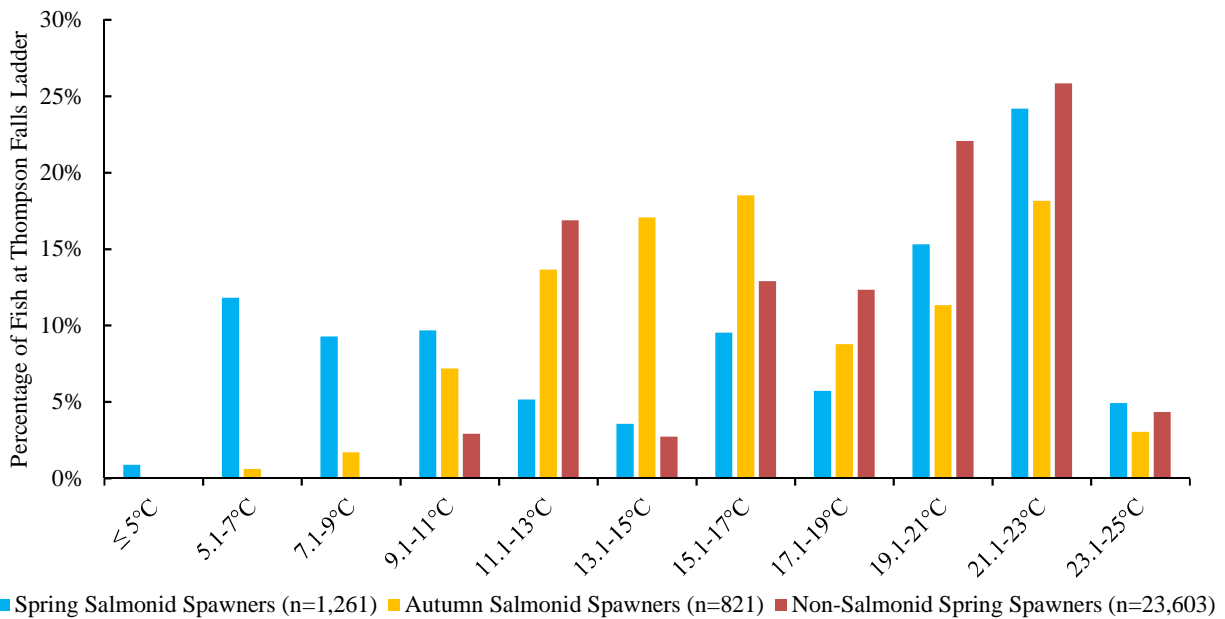


The abundance of salmonids and non-salmonids at various water temperature intervals recorded in the ladder in 2016 and between 2011-2015 is shown in Figures 3-13 and 3-14, respectively.

**Figure 3-13: Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded in the Thompson Falls fish ladder in 2016 during various water temperatures recorded at the ladder.**



**Figure 3-14: Percentage of salmonids (spring and fall spawners) and non-salmonids (spring spawners) recorded in the Thompson Falls fish ladder between 2011 and 2015 during various water temperatures recorded at the ladder.**



There are annual variations observed among salmonid and non-salmonid frequency in the ladder at various water temperature intervals. As with the streamflow evaluation, there are some general

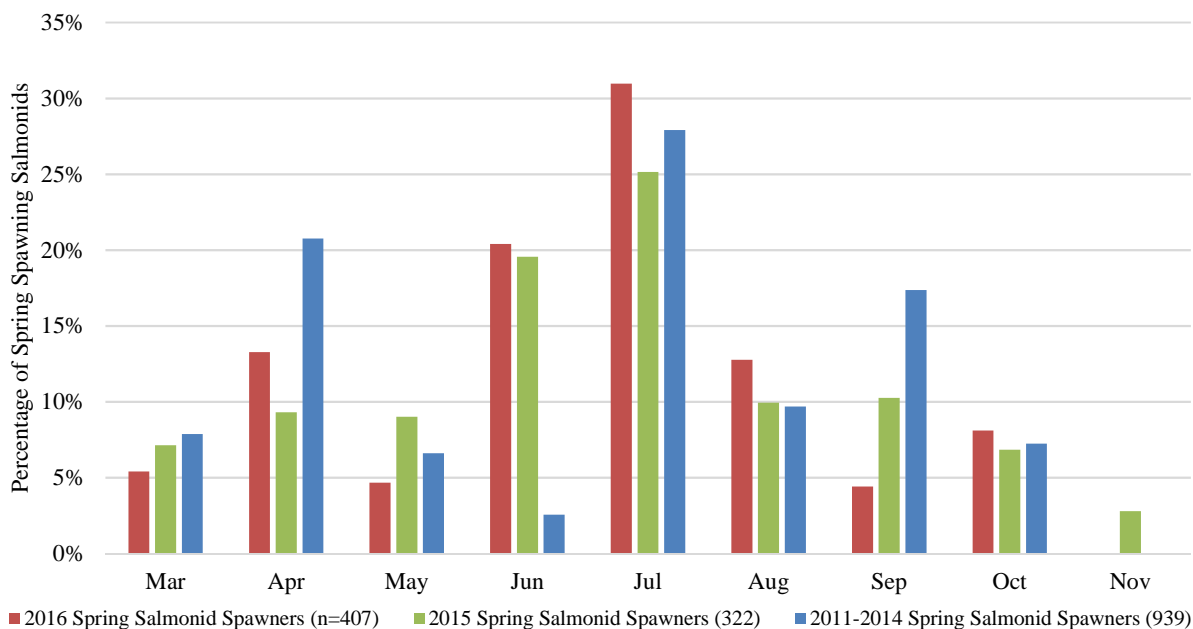


trends and patterns of fish movement related to water temperature identified over time (Figure 3-14). Fish activity at the ladder appears to start at cooler water temperatures for spring spawning salmonids than fall spawning salmonids or non-salmonids. Fall spawning salmonids appear to be most active and frequent at the ladder when temperatures range between 9 and 23 °C, while spring spawners are active during the same temperature regime plus cooler temperatures (5-23 °C). Non-salmonids are more common once water temperatures exceed 11 °C. The frequency of all fish declines substantially once water temperatures in the ladder exceed 23 °C.

### 3.8.3 Spring and Autumn Spawners

Spring spawning salmonids were recorded at the fish ladder during all months of operation between 2011 and 2016. In general, peak movements for spring spawners appear to occur in three pulses; the first pulse in the spring (April), a second pulse in the summer (June/July), and a third pulse in the autumn (September/October) as shown in Figure 3-15. These data indicate not all fish are moving upstream for purposes of spawning and other factors are likely influencing movement patterns and behaviors.

**Figure 3-15: Percentage of spring spawning salmonids recorded in Thompson Falls fish ladder between 2011 and 2014 (n=939), in 2015 (n=322), and in 2016 (n=407).**

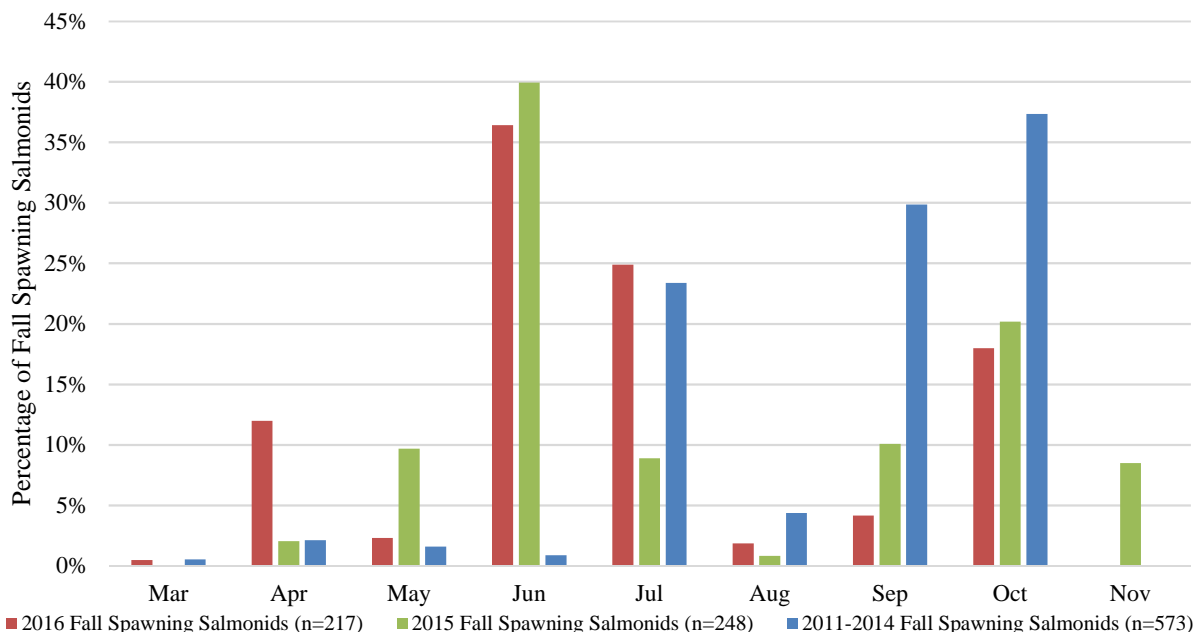


Although the majority of spring spawning salmonids recorded in the ladder were observed in July for all years, there was a substantial increase in spring spawning salmonids observed in June 2015 and in June 2016 compared to previous years (Figure 3-15). The increase in spring spawning salmonids in June in 2015 and 2016 may have been influenced by multiple factors including, but not limited to, the ladder operating the entire month of June in 2015 and 2016 (this

was not the case in 2011 or 2012), lower than normal streamflows allowing fish to navigate more easily to the ladder, and/or fish moving upstream to find thermal refugia due to warming water temperatures.

Fall spawning salmonids also displayed annual variability (Figure 3-16). Between 2011 and 2014, the majority of fall spawners were recorded in the ladder in July and in the autumn months (September-October). In 2015, fall spawners were more common in May than in other years and peaked in June. In 2016, the majority of the fall spawners were recorded at the ladder in June, July, and October. There was also a higher percentage of fall spawners observed in April 2016 compared to previous years.

**Figure 3-16: Percentage of autumn spawning salmonids recorded at the Thompson Falls fish ladder in 2016, in 2015, and between 2011 and 2014 and in 2016.**

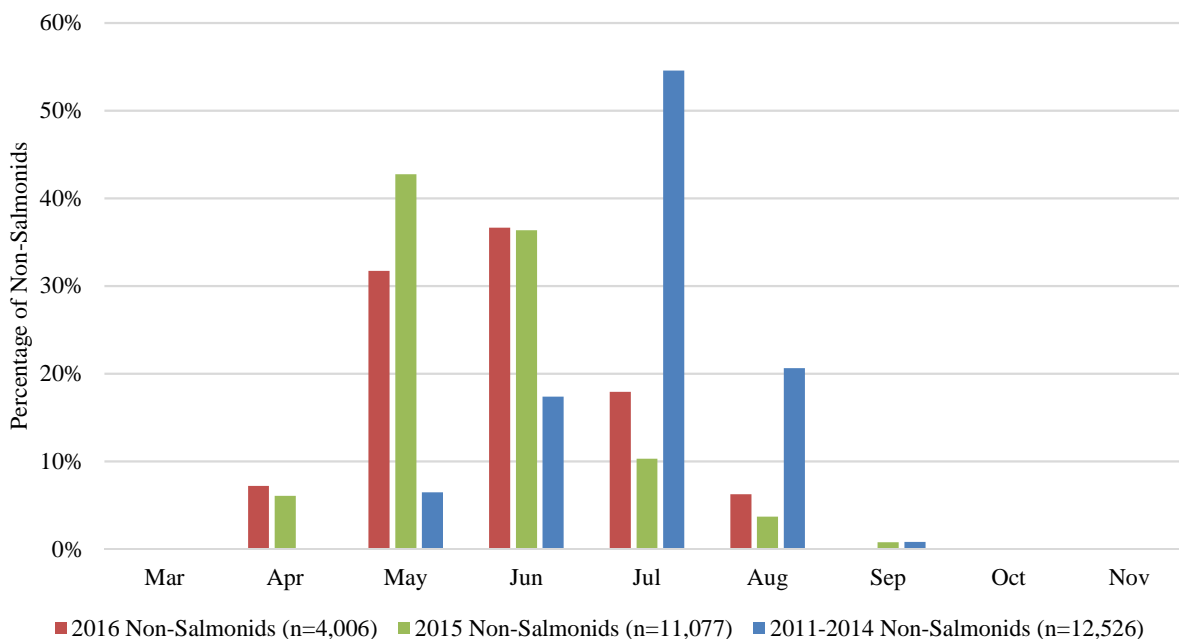


The variability of fall spawners recorded at the ladder in 2015 and in 2016 compared to previous years is likely related to the warmer than average water temperatures and lower than average streamflows. In 2016, spring water temperatures were warmer than previous years (*refer to* Figure 3-2), the spring freshet was lower than normal (*refer to* Figure 3-1), and baseline flows in the early autumn were also lower than normal. These conditions likely impacted fish movement and behavior as fish sought out favorable conditions.

As is the case for salmonids, not all non-salmonids recorded at the ladder were sexually mature fish (assessed by size of fish) and thus upstream migrations were not necessarily spawning related. Non-salmonid abundance in the ladder appears to coincide with warmer water temperatures and lower streamflows. Between 2011 and 2014, the greatest occurrence of non-salmonids at the ladder was in July in contrast to 2015 and 2016 when the majority of non-

salmonids were observed in May and June (Figure 3-17). The water temperatures in 2015 and 2016 warmed earlier than previous years (*refer to* Figure 3-2); streamflows were also much lower and more consistent in May and June than observed in previous years (*refer to* Figure 3-1). These atypical physical river conditions, which subsequently limit any ladder closures due to high flows, may have influenced the seasonal shift in non-salmonid movement observed in 2015 and 2016 compared to previous years.

**Figure 3-17: Percentage of non-salmonids recorded at the ladder between 2011 and 2014 (n=12,526), in 2015 (n=11,077), and in 2016 (n=4,006).**



### 3.9 Tagged Fish Returning to the Ladder

A total of 3,804 fish have been uniquely tagged (2,677 PIT and 1,127 Floy tags) either at the fish ladder or immediately downstream of Thompson Falls Dam. In 2016, salmonids were the only PIT-tagged at the ladder and there was no surveying or tagging of fish downstream of Thompson Falls Dam by the Licensee. A summary of the tagging history at the fish ladder and downstream of the Thompson Falls Dam and tagged fish returning to the ladder since 2011 is provided the following sections.

#### 3.9.1 Fish Tagged at the Ladder

Since 2011, a total of 3,199 individual fish (2,091 PIT and 1,108 Floy tags) were uniquely tagged at the ladder. These fish represent 10 species and one salmonid hybrid (Table 3-11). The total number of uniquely tagged fish represents nearly 77 percent of the 2,706 salmonids recorded at the ladder and about 4 percent of 27,609 non-salmonids recorded at the ladder between 2011 and 2016.

**Table 3-11: Summary of the number of fish, by species, with unique PIT or Floy tag implanted annually in fish at the Thompson Falls fish ladder prior to release upstream between 2011 and 2016.**

Species	Tag Type	2011	2012	2013	2014	2015	2016
BULL	PIT	2	-	4	1	2	3
EB	PIT				1	2	1
LL	PIT	27	40	97	67	153	169
RB	PIT	141	189	186	144	238	310
RBxWCT	PIT	9	7	12	11	1	4
WCT	PIT	20	20	45	34	33	32
MWF	PIT	17				54	6
N PMN	PIT	2					
N PMN	FLOY	1					
LN SU	PIT	1					
LS SU	PIT	6					
SMB	FLOY	73	30	7	23	974	-
<b>Subtotal</b>	<b>PIT</b>	<b>225</b>	<b>256</b>	<b>344</b>	<b>258</b>	<b>483</b>	<b>525</b>
<b>Subtotal</b>	<b>FLOY</b>	<b>74</b>	<b>30</b>	<b>7</b>	<b>23</b>	<b>974</b>	<b>-</b>
<b>TOTAL</b>	<b>All Tags</b>	<b>299</b>	<b>286</b>	<b>351</b>	<b>281</b>	<b>1,457</b>	<b>525</b>

For the last 6 years, most of the fish PIT-tagged at the ladder were salmonids (2,082 tagged salmonids out of 2,091 PIT-tagged fish) with approximately 85 percent of the PIT-tagged salmonids represented by Rainbow Trout (n=1,208 tagged fish) and Brown Trout (n=553 tagged fish). Non-salmonids have been primarily Floy-tagged with the majority (99%) of the tagged non-salmonids represented by Smallmouth Bass.

Between 2011 and 2016, approximately 10 percent of the individually PIT-tagged salmonids and nearly 6 percent of the Floy-tagged Smallmouth Bass released upstream of Thompson Falls Dam were later recorded returning to the ladder one or more times. A summary of the 280 returning fish, by species and the number of ladder ascents (ascent defined as a fish ascending the ladder and released upstream) is provided in Table 3-12. Two fish (1 Brown Trout, 1 Smallmouth Bass) have each ascended the ladder five times, the maximum number of ladder ascents recorded for an individual fish to date.

**Table 3-12: Summary of the number of ladder ascents (fish ascend ladder and are released upstream) for 280 returning fish, by species between 2011 and 2016.**

Species	Total Number of Individual Fish	Frequency of Ladder Ascents			
		2x	3x	4x	5x
BULL	1	1	-	-	-
LL	58	48	8	1	1
RB	139	120	14	5	-
RBxWCT	6	6	-	-	-
MWF	3	3	-	-	-
WCT	9	7	2	-	-
SMB	64	62	1	-	1
<b>TOTAL</b>	<b>280</b>	<b>247</b>	<b>25</b>	<b>6</b>	<b>2</b>

On an annual basis, between three and 10 percent of the salmonids PIT-tagged in a given year, return to the ladder the following year (Table 3-13). For example, in 2015 there were 483 salmonids PIT-tagged at the ladder and 48 fish (26 Rainbow Trout, 20 Brown Trout, and 2 Mountain Whitefish) returned to the ladder in 2016.

**Table 3-13: Summary of the number of salmonids PIT-tagged each year and the percentage of the PIT-tagged salmonids recorded at the ladder the following year, 2011-2016.**

Year	# of Salmonids PIT-tagged at Ladder	% of PIT-Tagged Salmonids Recorded in Ladder the Following Year
2011	216	3%
2012	256	7%
2013	344	9%
2014	258	10%
2015	483	10%
2016	525	to be calculated in 2017

In 2016, approximately 14 percent of the 624 salmonids (48 Rainbow Trout, 32 Brown Trout, 4 Westslope Cutthroat Trout, 2 Mountain Whitefish, and 1 Rainbow Trout x Westslope Cutthroat Trout hybrid) recorded at the ladder were fish previously tagged (between 2011 and 2016) and returning to the ladder. About 4 percent of the 1,007 Smallmouth Bass documented at the ladder in 2016 were initially tagged in 2015 and returning to the ladder.

### **3.9.2 Fish Tagged Below the Dam**

In 2011, 2012, and 2014, the Licensee and FWP electrofished downstream of Thompson Falls Dam and captured a total of 2,222 fish. During these efforts, a total of 605 fish (586 PIT and 19 Floy tags) representing 12 species and one hybrid were uniquely PIT or Floy-tagged. No tagging efforts below the dam were implemented in 2013, 2015, or 2016. A summary of the fish captured and fish tagged during the electrofishing efforts downstream of Thompson Falls Dam is provided in Table 3-14.

**Table 3-14: Summary of spring electrofishing efforts (March through June) completed in 2011, 2012, and 2014, including number of days, overall duration of electroshocking, number of fish recorded.**

<b>Electrofishing Efforts Below Dam</b>	<b>2011</b>	<b>2012</b>	<b>2014</b>	<b>TOTAL</b>
Total Duration of Shocking Effort (hrs)	6.0	10.8	4.3	21.1
Number of Fish Recorded	1,109	737	376	2,222
Number of Salmonids	464	565	173	1,202
Number of PIT Tagged Fish	206	344	36	586
<b>Number of Salmonids PIT Tagged</b>	<b>128</b>	<b>161</b>	<b>36</b>	<b>325</b>

Of the 605-tagged fish, 325 PIT-tagged fish represent salmonids. The tagged-salmonids included 169 Rainbow Trout, 83 Mountain Whitefish, 33 Brown Trout, 28 Westslope Cutthroat Trout, six Bull Trout, four Rainbow x Westslope Cutthroat Trout hybrids, one Brook Trout, and one Lake Whitefish. Approximately 8 percent (27 individual salmonids representing 18 Rainbow Trout, 4 Brown Trout, 3 Westslope Cutthroat Trout, 1 Bull Trout, 1 Mountain Whitefish) of the 325 PIT-tagged salmonids were recorded ascending the fish ladder at least once since 2011.

In 2016, there were three fish (2 Brown Trout, 1 Rainbow Trout) that ascended the Thompson Falls fish ladder that were initially tagged electrofishing below the dam. Two Brown Trout were initially tagged in 2012 and both fish previously ascended the ladder in 2013 and 2015, before returning for a third time in 2016. One Rainbow Trout was initially tagged in 2014 and ascended the ladder once in 2015 and then a second time in 2016. All three fish were detected in the Thompson River in 2015 and 2016 following their release upstream of the dam.

### **3.9.3 Monitoring PIT-Tagged Fish Entering the Ladder**

Data collected via the remote PIT-tag arrays in the ladder pools 7 and 8 and in the holding pool, as well as fish recorded at the ladder work station, were used to investigate how many tagged fish entering the ladder were ascending the ladder and entering the holding pool; how many fish ascending the ladder and entering the holding pool escaped the holding pool; and how many fish were only detected in the lower pools of the ladder. A summary of the findings from 2011 to 2015 are provided in Section 3.9.4 in the 2015 annual report (NorthWestern Energy, 2016). The results from 2016 are discussed in this report.

In 2016, a total of 120 individual fish, previously PIT-tagged, were detected entering the Thompson Falls fish ladder. A summary of the 120 fish, by species and whether the fish were detected ascending the ladder and entering the holding pool (the top of the ladder) is provided in Table 3-15. Approximately 73 percent of the fish detected entering the ladder ascended to the holding pool and were released upstream. There were 27 fish that were only detected in the lower pool(s) of the ladder. All but two of the fish were either initially tagged after ascending the ladder (and released upstream) earlier in 2016, or in a previous year(s) while the other two fish were initially tagged downstream of the Project and were entering the ladder for the first time. A

total of eight fish ascended the ladder, entered the holding pool, and escaped (left) the holding pool. It was determined that these eight fish “escaped” the holding pool if the fish was later detected in the lower pool(s) or if the fish was not recorded at the work station. Of the eight fish that escaped the holding pool, three fish (all Rainbow Trout) returned and ascended the ladder again and were ultimately released upstream. Thus, the three Rainbow Trout were not included in the total count for fish escaping the holding pool in Table 3-15.

**Table 3-15: Summary of individual PIT-tagged salmonids detected in the ladder in 2016 via the remote PIT tag arrays in the lower pools and the holding pool.**

2016 Fish	# of Individual Fish Detected Entering the Ladder	# of Fish Ascend and Released Upstream	# of Fish Escape Holding Pool	# Fish Only Detected in Lower Pools
BULL	3	-	-	3
LL	40	34	2	4
RB	51	43	-	8
RBxWCT	2	1	1	2
MWF	4	2	1	1
WCT	7	3	1	3
LS SU	11	4	-	7
Unknown	2	1	-	1
<b>Total</b>	<b>120</b>	<b>88</b>	<b>5</b>	<b>27</b>

All salmonids listed in Table 3-15, with exception of two Bull Trout, were returning to the ladder and were previously recorded and initially tagged at the Thompson Falls fish ladder. Of the three Bull Trout detected entering the ladder in 2016, one Bull Trout ascended the ladder for the first time in April 2016 where it was initially tagged and released upstream, while the other two Bull Trout were initially captured and tagged downstream by Avista personnel in previous years.

Of the two Avista-tagged fish, one Bull Trout (PIT #90022600625227) was initially captured as a juvenile in Graves Creek (Region 3) and transported downstream of Cabinet Gorge Dam to Lake Pend Oreille in November 2010. It was captured a second time during a gillnet survey in Lake Pend Oreille in September 2013. In 2014, this fish was captured a third time below Cabinet Gorge Dam in September and transported upstream to Graves Creek. It was detected entering the Thompson Falls fish ladder on September 7 and 8, 2016.

The second Bull Trout (PIT #900226000570921) was initially captured in Twin Creek (located downstream of Cabinet Gorge Dam) and tagged by Avista personnel on October 3, 2014 and transported upstream to Region 4 where it was released in the West Fork Thompson River on October 6, 2014. This bull trout was last detected via the remote array in the mainstem Thompson River on October 11, 2014 before entering the Thompson Falls fish ladder on May 5 and June 6, 2016.

All Largescale Suckers detected in the ladder were initially captured and tagged during electrofishing efforts downstream of Thompson Falls Dam in 2011 and 2012. It is unknown if these Largescale Suckers ascended the ladder in the past because Largescale Suckers are not checked for PIT tags at the work station. For the purposes of this evaluation and summary provided in Table 3-15, it is assumed that any Largescale Sucker detected in the holding pool was processed at the work station and released upstream.

### 3.10 Fallback

Fallback is defined as a fish that ascends the ladder, receives a PIT, Floy, or other unique identification tag, is released upstream, and then is later recaptured either downstream of 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 release into the Thompson Falls Reservoir.

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

Detecting a “fallback” is limited to when a fish returns to the ladder or when a fish is recaptured/detected during sampling efforts downstream of the Thompson Falls Dam. Therefore, the number of “fallback” fish reported represents a minimum value. Also, the duration between the time a fish is released upstream of the dam and when it moves downstream of the dam is an estimate since tags are not detected moving over the spillway or at the turbines.

**Table 3-16: Summary of the total number of “fallback” by fish by species in 2016 detected either downstream of the Thompson Falls Dam within 30 days, between 31 and 90 days, or greater than 90 days after being released upstream.**

2016 Fallback Species	Total Count	30 days detected downstream	31-90 days detected downstream	>90 days detected downstream
BULL	1	-	-	1
RB	8	3	1	4
LL	6	3	1	2
WCT	3	1	2	-
RBxWCT	1	1	-	-
<b>Total Salmonids</b>	<b>19</b>	<b>8</b>	<b>4</b>	<b>7</b>
<i>% of Tagged Salmonids Result in Fallback</i>	<i>3.6%</i>	<i>1.5%</i>	<i>0.8%</i>	<i>1.3%</i>
<b>SMB</b>	<b>1</b>	<b>1</b>	<b>-</b>	<b>-</b>



A total of 20 fish were identified as “fallback” in 2016 (Table 3-16). The majority were salmonids, representing about 3.6 percent of the salmonids PIT-tagged at the ladder in 2016. After the fish were released upstream of Thompson Falls Dam, approximately eight fish were detected below Thompson Falls Dam within 30 days, 4 fish were detected below the dam between 31 and 90 days and seven fish were detected below the dam after 90 days. The Smallmouth Bass identified as a fallback in 2016 was initially Floy-tagged in 2015 and returned to the ladder two additional times in 2015 and made two trips to the ladder in 2016.

In 2016, it is assumed that two fish (1 Rainbow Trout x Westslope Cutthroat Trout hybrid, 1 Smallmouth Bass) traveled downstream through the turbines because streamflows remained below 23,000 cfs between ladder detections of each fish. Streamflows exceeded 23,000 cfs between detections of the other 18 fallback fish recorded in 2016, thus it is unknown if these fish traveled downstream through the turbines or over the spillway.

In 2016, over half of the salmonid “fallback” fish (5 Rainbow Trout, 4 Brown Trout, 1 Westslope Cutthroat Trout) were detected via the remote array in the mainstem of the Thompson River in the same year. Two of the Rainbow Trout were first recorded at the ladder in March and April, respectively and moved upstream into the Thompson River within 1 to 4 days after their initial release upstream of Thompson Falls Dam before moving downstream below the dam and being redetected in the fish ladder again in October and June 2016, respectively. The other seven salmonids (4 Brown Trout, 2 Rainbow Trout, 1 Westslope Cutthroat Trout) all ascended the ladder two times, while the eighth salmonid (a Rainbow Trout) ascended the ladder three times before moving upstream and being detected in the mainstem Thompson River.

Between 2011 and 2015, the annual fallback for PIT-tagged salmonids ranged from less than 1 percent in 2012 to 6 percent in 2011 (NorthWestern, 2016). The only non-salmonid fallback fish documented were Smallmouth Bass that had either received a lower caudal punch or Floy-tag.

In total there were 33 salmonids categorized as fallback between 2011 and 2015 representing about 2 percent of the 1,657 salmonids PIT-tagged at the ladder during the same time period (Table 3-17). Approximately 15 salmonids were detected downstream of Thompson Falls Dam within 30 days, 10 salmonids were detected downstream of the dam within 31 to 90 days, and 8 fish were detected downstream after 90 days. Approximately 1,107 Smallmouth Bass were Floy-tagged between 2011 and 2015, resulting in 2.3 percent fallback. The majority of the Smallmouth Bass were detected returning to the ladder or downstream of Thompson Falls Dam within 30 days (21 Smallmouth Bass) and five fish were detected downstream of the dam between 31 and 90 days.

In general, the percentage of fallback fish each year has remained low, especially when evaluating the number of salmonids detected below Thompson Falls Dam within 30 days of being released upstream of the dam. The percentage of PIT-tagged salmonids between 2011 and

2016 detected below Thompson Falls Dam within 30 days of being released upstream of the fish ladder was 1.1 percent (23 salmonids out of 2,082 tagged-salmonids). The data show fallback fish are surviving downstream passage, either through the turbines or over the spillway, returning to the ladder (sometimes multiple times a year), and continuing to move upstream into the Thompson River.

**Table 3-17: Summary of the total number of “fallback” fish by species between 2011 and 2015, as well as when fish were detected after being released upstream of Thompson Falls Dam: either detected downstream of the Thompson Falls Dam within 30 days, between 31 and 90 days, or greater than 90 days.**

2011-2015 Fallback Species	Total Count	30 days detected downstream	31-90 days detected downstream	>90 days detected downstream
BULL	1	-	-	1
RB	25	10	8	7
LL	4	3	1	-
WCT	2	2	-	-
RBxWCT	1	-	1	-
<b>Total Salmonids</b>	<b>33</b>	<b>15</b>	<b>10</b>	<b>8</b>
<i>% of Tagged Salmonids as Fallback</i>	<i>2.0%</i>	<i>0.9%</i>	<i>0.6%</i>	<i>0.5%</i>
<b>SMB (only non-salmonid)</b>	<b>26</b>	<b>21</b>	<b>5</b>	<b>-</b>
<i>% of Floy Tagged SMB as Fallback</i>	<i>2.3%</i>	<i>1.9%</i>	<i>0.5%</i>	<i>-</i>

### 3.11 Fish Movement Upstream of Thompson Falls Dam

Since 2011, approximately 11 percent of the fish recorded at Thompson Falls fish ladder and released upstream of the dam were uniquely tagged at the ladder (2,091 PIT tags, 1,108 Floy tags). These fish are referred to as “ladder” fish. The detection of the uniquely tagged fish after being released upstream of the dam is limited to baseline fisheries surveys, angler reports, and the remote PIT-tag arrays in the Thompson River drainage.

#### 3.11.1 Angler Reports of Ladder Fish

Only a small portion of ladder fish were detected or recaptured during baseline surveys or by anglers. Since 2011, baseline fisheries surveys resulted in a total of 24 salmonids (20 Rainbow Trout, 3 Brown Trout, 1 Westslope Cutthroat Trout) recaptured (*refer to* Section 2.4 of this report). During the same period, anglers reported capturing 29 Smallmouth Bass with Floy-tags out of 1,107 Smallmouth Bass that were initially tagged and released upstream of Thompson Falls Dam (Table 3-18). Twenty-four of the Smallmouth Bass were captured upstream of the dam. Anglers have reported Smallmouth Bass as far upstream as the lower Flathead River near Buffalo Rapids Bridge (near Kerr Dam), approximately 100 miles upstream of Thompson Falls Dam.

**Table 3-18: Summary of Floy-tagged Smallmouth Bass captured by anglers and reported to FWP (2011-2016) that were initially tagged at the Thompson Falls fish ladder.**

#	FLOY Tag ID	Date Ascended TFalls Ladder	Date Located by Angler	Location Description	Upstream or Downstream of TFalls Dam
1	Y-Floy 0599	2-Aug-15	21-May-16	Thompson Falls Reservoir	Upstream
2	Y-Floy 1290	18-Jun-15	21-May-16	Thompson Falls Reservoir	Upstream
3	Y-Floy 16861	12-Aug-15	5-Jun-16	Flathead River- Between Buffalo Bridge and Sloans Bridge	Upstream
4	Y-Floy 0264	9-Jul-15	4-Jul-16	Mouth of Thompson River	Upstream
5	Y-Floy 0377	15-Jul-15	30-Jun-16	Flathead River- Moiese	Upstream
6	Y-Floy 16864	unknown	2-Jul-16	Flathead River- 7 mi. from Buffalo Bridge	Upstream
7	Y-Floy 1113	26-Aug-15	6-Aug-16	Wild Goose Landing	Upstream
8	Y-Floy 0760	8-Jul-15	13-Aug-16	Kookoosint FAS	Upstream
9	Y-Floy 16980	26-Jun-15	30-May-16	Dixon	Upstream
10	Y-Floy 0275	9-Jul-15	19-Jul-16	Dixon	Upstream
11	Y-Floy 1086	14-Aug-15	19-Jul-16	Dixon	Upstream
12	Y-Floy 0959	27-Jul-15	23-Aug-16	Plains	Upstream
13	Y-Floy 0342	13-Jul-15	4-Sep-16	Wild Goose Landing	Upstream
14	Y-Floy 1077	14-Aug-15	3-Sep-16	Plains bridge	Upstream
15	Y-Floy 0620	27-Jul-15	5-Sep-16	1 mile downstream Kookoosint	Upstream
16	Y-Floy 16055	14-Jul-12	27-Sep-12	Lower Flathead River (near Buffalo Rapids Bridge)	Upstream
17	Y-Floy 1262	9-Jun-15	12-Sep-15	Steamboat Island	Upstream
18	Y-Floy 1267	10-Jun-15	12-Jul-15	Near the town of Paradise	Upstream
19	Y-Floy 16575	29-Jun-15	10-Sep-15	Steamboat Island	Upstream
20	Y-Floy 0787	8-Jul-15	28-Aug-15	Steamboat Island	Upstream
21	Y-Floy 1541	13-Jul-15	7-Sep-15	Near the town of Paradise	Upstream
22	Y-Floy 1522	13-Jul-15	12-Sep-15	Above Thompson Falls Dam	Upstream
23	Y-Floy 0389	16-Jul-15	23-Aug-15	Lower Flathead River (0.5 km downstream of Kerr Dam)	Upstream

#	FLOY Tag ID	Date Ascended TFalls Ladder	Date Located by Angler	Location Description	Upstream or Downstream of TFalls Dam
24	Y-Floy 0954	28-Jul-15	15-Aug-15	Below confluence with the Thompson River	Upstream
25	Y-Floy 16577	29-Jun-15	30-May-16	Flat Iron FAS - Noxon	Downstream
26	Y-Floy 0602	27-Jul-15	9-Jul-16	Below Thompson Falls Dam	Downstream
27	Y-Floy 0568	2-Aug-15	27-Aug-16	Flatiron FAS	Downstream
28	Y-Floy 0642	27-Jul-15	27-Aug-15	Below Thompson Falls Dam - Near High Bridge	Downstream
29	Y-Floy 1543	13-Jul-15	1-Sep-15	Below Thompson Falls Dam - Near High Bridge	Downstream

### **3.11.2 Ladder Fish Detected in the Thompson River Drainage**

A remote PIT-tag antenna array was installed in the mainstem of the Thompson River on September 26, 2014. The periods of operation and data collection were between September 26 and December 22, 2014; between February and December 2015; and between January and December 2016. Data collection from 2017 will be summarized and included in next year's annual report.

Although the array cannot detect directionality of fish, the entry of fish into the drainage can be assumed by cross-referencing the release date upstream of the ladder and the first detection recorded in the Thompson River. A fish detection represents the first record of an individual fish in the Thompson River and is assumed to indicate entry into the Thompson River drainage. During the initial evaluation of tag detection efficiency by the array in 2014, it was concluded that the array in the mainstem Thompson River detected both HDX and FDX PIT tags, but the detection range for a FDX tag was greater than the HDX tag (J. Glaid, personal communication, December 4, 2014). Although tag detection is near 100 percent, there are still a few fish that go undetected thus evaluation of array detections provided in this section represent minimum values.

Most detections of ladder fish after release upstream of Thompson Falls Dam were via the remote PIT-tag array in the mainstem Thompson River, resulting in over 500 individual fish detected entering the drainage after release upstream of Thompson Falls Dam. This equates to approximately 25 percent of the PIT-tagged fish released upstream of Thompson Falls Dam (since 2011) detected in the Thompson River.

A summary of individual fish detected each year is provided in Table 3-20. Since the 2014 and 2015 annual reports, data revisions were made regarding the total number of individual fish detected in the Thompson River following additional review of the data files. The changes

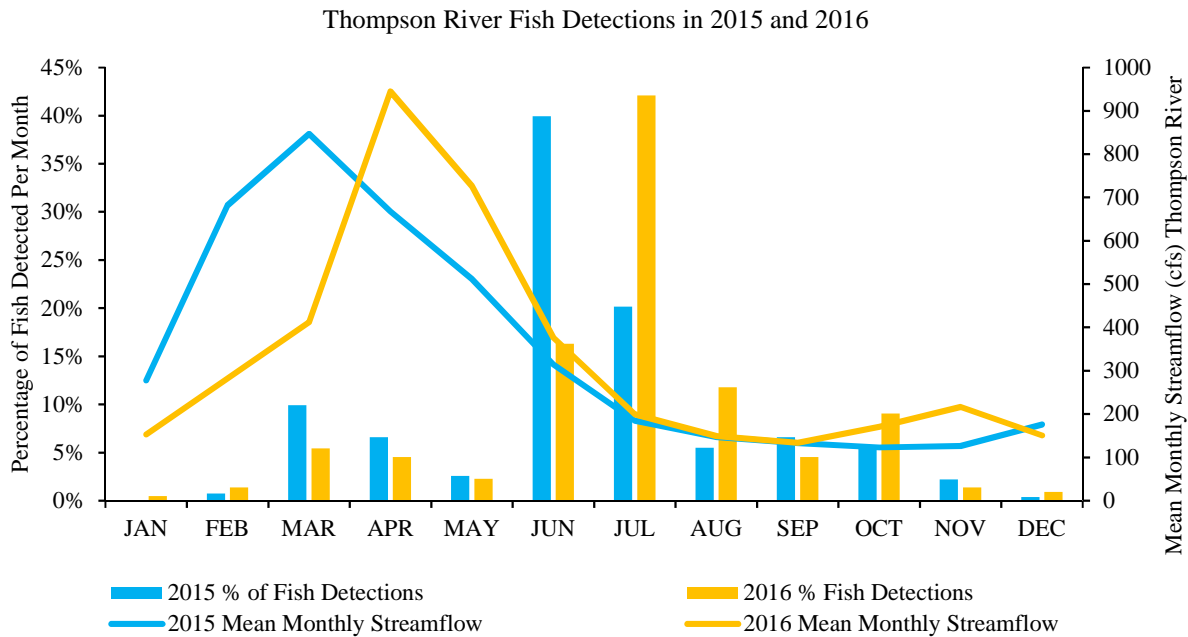
resulted in 19 additional ladder fish detected in the Thompson River; one additional fish in 2014 and 18 additional fish in 2015 (*updates reflected in Table 3-19*).

**Table 3-19: Summary of the number of individual ladder fish detected in the Thompson River each year, 2014 - 2016.**

Species	Year Fish Detected in the Thompson River			
	2014	2015	2016	Total
BULL	-	2	1	3
EB	-	1	1	2
LL	27	103	88	218
RB	16	146	100	262
RBxWCT	-	3	3	6
MWF	-	1	5	6
WCT	1	16	20	37
LS SU		1	1	2
Unknown			2	2
<b>Total</b>	<b>44</b>	<b>273</b>	<b>221</b>	<b>538</b>

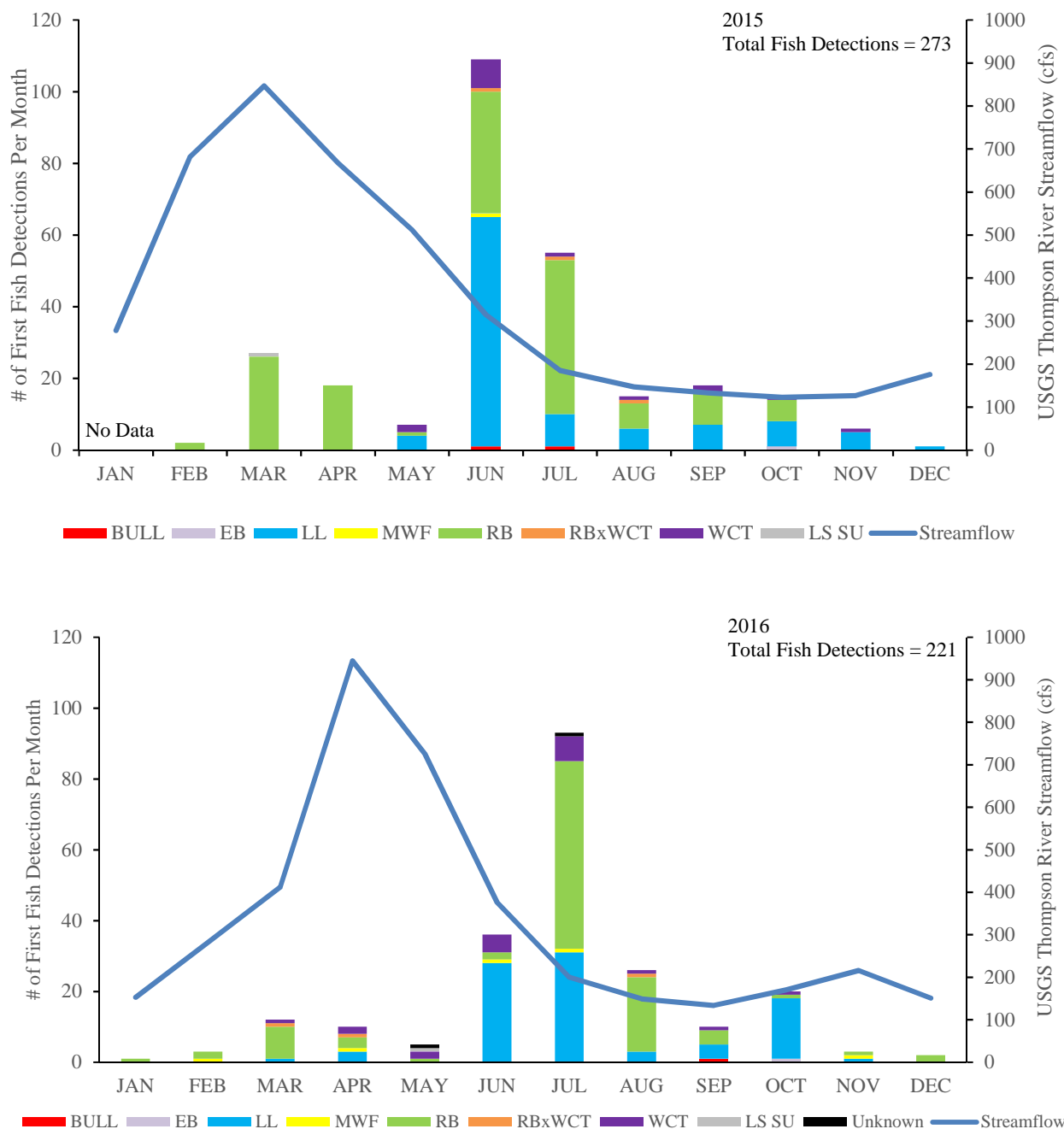
The monthly detections of ladder fish in the Thompson River (for the first time after being released upstream of Thompson Falls Dam) and the mean monthly streamflow recorded at the USGS gage #12389500 are displayed for 2015 and 2016 in Figure 3-18. Movement patterns were similar in both years with the majority of the fish detected entering the Thompson River in June or July. The spring freshet for both years was earlier than normal, and was particularly early in 2015. Stream temperatures in the Clark Fork River in June 2015 were also higher than normal nearing 25 °C based on temperature data collected in the ladder (NorthWestern, 2016). Stream temperatures in the Clark Fork River in 2016 were not as warm in June compared to 2015. The warmer than usual water temperatures and early spring flows in the Thompson River may influence the fish movement patterns. NorthWestern will continue to monitor the remote array in the Thompson River in 2017 to further investigate movement patterns of ladder fish upstream into the Thompson River.

**Figure 3-18: Monthly detections of ladder fish in the Thompson River and monthly mean streamflows in the Thompson River in 2015 and 2016.**



The number of fish (by species) detected in the Thompson River per day and the corresponding mean daily streamflow in the Thompson River (USGS gage #12389500) in 2015 and 2016 are depicted in Figure 3-19. Because the remote array was not installed in the Thompson River for the entire 2014 calendar year, information of the 44 fish from 2014 is not included in Figure 3-19.

**Figure 3-19: Monthly summary of the number of ladder fish, by species first detected in the Thompson River and mean monthly streamflow in the Thompson River in 2015 (top graph) and in 2016 (bottom graph).**



Nearly 80 percent (429 of 538 fish) of the fish detected in the Thompson River between 2014 and 2016 were passed upstream of Thompson Falls Dam in 2015 and 2016, while the other 20 percent of the fish were last released upstream of the fish ladder in 2014 or earlier (Table 3-20). A Mountain Whitefish detected in the Thompson River between 2014 and 2016

was last recorded ascending the Thompson Falls fish ladder in 2011. The fish detections indicate several fish are remaining upstream for multiple years after release upstream of Thompson Falls Dam.

**Table 3-20: Summary of the 538 fish detected in the Thompson River between 2014 and 2016 and the last record of the fish at the Thompson Falls fish ladder.**

Year Fish Last Detected at Thompson Falls Fish Ladder							
Species	2016	2015	2014	2013	2012	2011	Total
BULL	1	2					3
EB	1	1					2
LL	85	100	30	2	1		218
RB	89	108	42	12	11		262
WCT	16	14	5	2			37
RBXWCT	2	2	1	1			6
MWF	1	4				1	6
LS SU	1				1		2
UNK	1	1					2
<b>TOTAL</b>	<b>197</b>	<b>232</b>	<b>78</b>	<b>17</b>	<b>13</b>	<b>1</b>	<b>538</b>

Travel time for fish released upstream of Thompson Falls Dam and to the Thompson River were estimated for 446 individual fish (Table 3-21). All 446 fish were released upstream of Thompson Falls Dam after the installation of the remote array in the Thompson River on September 26, 2014. It is assumed that the period between December 2014 and February 2015, when the remote array in the Thompson River was not in operation, is negligible in this analysis because the ladder was not in operation (no new fish were being released upstream) and fish movement is minimal during the winter months.

**Table 3-21: The travel time once fish were released upstream of Thompson Falls Dam and then were first detected in the Thompson River.**

Year Detected in T. River	Number of Fish	Duration (days) between Release Upstream of Dam and Detected in the Thompson River			
		Median	Average	Min	Max
2014	12	7	16	< 1 day	67
2015	217	2	23	< 1 day	277
2016	217	6	50	< 1 day	619
<b>All Years</b>	<b>446</b>	<b>3</b>	<b>36</b>	<b>&lt; 1 day</b>	<b>619</b>

The majority of the 446 fish listed in Table 3-21 are represented by Rainbow Trout (46%), Brown Trout (44%), and Westslope Cutthroat Trout (7%). Other species such as Bull Trout, Mountain Whitefish, Brook Trout, Largescale Sucker, and Rainbow x Westslope Cutthroat Trout hybrid comprise five or fewer individuals. The median time of travel from Thompson Falls Dam



to the Thompson River was about 3 days with an estimated 160 fish traveling the distance within 24 hours after release upstream of Thompson Falls Dam and over half (57%) traveling the distance within 5 days. The maximum duration was about 619 days by one Westslope Cutthroat Trout (363g, 438mm) released upstream of dam on October 1, 2014 and first detected in the Thompson River on June 10, 2016.

In 2015 and 2016, the remote array in the Thompson River collected data concurrent with the ladder’s operational season and continued to collect data through the end of the calendar year. With these data, the percentage of fish PIT-tagged at the ladder in 2015 and in 2016 and the subsequent detections of tagged fish in the Thompson River was evaluated. In 2015, approximately 39 percent of the PIT-tagged salmonids released upstream of Thompson Falls Dam were detected in the Thompson River in the same year. In 2016, approximately 33 percent of the PIT-tagged salmonids released upstream of the Thompson Falls Dam were detected in the Thompson River in the same year. A summary of the PIT-tagged salmonids, by species released in 2015 and 2016 and detected in the Thompson River in the same release year is provided in Table 3-22.

**Table 3-22: Summary of the PIT-tagged salmonids released upstream of Thompson Falls Dam in 2015 and 2016 and detected in the Thompson River in the same year as they were released.**

Species	# of Tagged Salmonids Released Upstream and Detected in the Thompson River in the Same Year		% of All Tagged Salmonids Released Upstream of Dam and Detected in the Thompson River in the Same Year	
	2015	2016	2015	2016
BULL	2	1	100%	33%
EB	1	1	50%	100%
LL	97	85	56%	44%
RB	98	89	37%	25%
RBxWCT	2	2	50%	40%
WCT	12	16	32%	46%
MWF	-	1	-	17%
<b>Total</b>	<b>212</b>	<b>195</b>	<b>39%</b>	<b>33%</b>

The movement patterns observed from ladder fish released upstream of Thompson Falls Dam and later detected in the Thompson River (via the remote array) indicate some fish remain upstream of Thompson Falls Dam for multiple years following the release upstream of the fish ladder, while other individual fish repeat the cycle of ascending the fish ladder (annually or some other interval) before returning to the Thompson River. Thus, upstream fish passage can have the benefit of multiple spawning contributions by an individual fish.

A total of three Bull Trout tagged at the Thompson Falls fish ladder were detected in the Thompson River drainage in 2015 and 2016, but not all via the remote array in the Thompson

River. One Bull Trout recorded at the ladder in May 17, 2015 was recaptured via electrofishing by FWP in the Thompson River upstream of the remote array in June 2, 2015 and likely passed the remote array undetected. A second Bull Trout released upstream of the Thompson Falls Dam on June 3, 2015 was later detected via the remote array in the West Fork Thompson River (but was not detected in the mainstem Thompson River). In 2016, one Bull Trout released upstream of Thompson Falls Dam on May 18, 2016 was detected several times in the mainstem Thompson River via the remote array in mid-September 2016. More details on Bull Trout in the Project area is summarized in Section 4.0.

### **3.12 Weir Modes: Notch vs. Orifice**

In 2011 and 2012, the weir mode at the ladder alternated between orifice and notch modes on a weekly interval. Data results indicated more fish successfully ascended the ladder in orifice mode. During the annual TAC meeting held on December 5, 2012, the Licensee recommended and the TAC members (FWS, CSKT, and FWP) agreed that the ladder be set in orifice mode for the entire 2013 season. For the 2013, 2014, and 2015 seasons, the ladder operated entirely in the orifice mode.

In 2016, the ladder operated most of the season in orifice mode with two weeks in notch mode. During the 2015 annual TAC meeting, the TAC agreed to alternate weir modes weekly when water temperatures were at or exceeded 19 °C for a 4-week period to evaluate Smallmouth Bass movement up the ladder. Starting on June 30 and ending on July 28, the weir mode alternated weekly between orifice and notch.

Between June 30 and July 6 and between July 13 and July 20, the ladder operated in notch mode and a total of eight ladder checks were completed. There were 156 fish recorded at the ladder in notch mode, including 74 Rainbow Trout, 47 Brown Trout, 21 Smallmouth Bass, 10 Northern Pikeminnow, and four Westslope Cutthroat Trout.

Between July 7 and 12 and again between July 21 and 28, the ladder operated in orifice mode and eight ladder checks were completed. There were 565 fish recorded at the ladder in orifice mode, including 468 Smallmouth Bass, 43 Rainbow Trout, 24 Northern Pikeminnow, 13 Largescale Suckers, 15 Brown Trout, and two Westslope Cutthroat Trout. Substantially fewer Smallmouth Bass were recorded in the ladder operating in notch mode versus orifice mode during the 4-week period.

During the 2016 annual TAC meeting and subsequent group discussion, FWP proposed operating the ladder in notch mode for two seasons (2017 and 2018) to further assess which operating mode is most effective for Bull Trout (and salmonid) passage. Existing data includes 2 consecutive years (2011 and 2012) of alternating the weir mode weekly and 4 consecutive years (2013-2016) operating the entire season in orifice mode apart from 2 weeks in July 2016 when the weirs were switched to notch mode. FWP proposes additional testing in notch mode is

needed to further evaluate ladder operations and efficiency of fish passage. The Licensee and TAC members (FWS, CSKT, and FWP) agreed to operate the ladder in notch mode for one season (2017). Ladder operations, including weir mode(s) for 2018 will be discussed and determined following the review of the 2017 results during the next annual TAC meeting.

### **3.13 Attractant Flow**

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

Observations of tailrace conditions downstream of the Thompson Falls Dam indicate that, during non-spill periods, additional flow is needed to allow fish to migrate upstream through the natural falls that are present downstream of the Main Channel Dam (L. Mabbott, NorthWestern, personal communication, 2014). For this reason, both the AWS and the HVJ were operated throughout the non-spill season in 2016 (as has been implemented since 2012) to allow fish to reach the entrance to the ladder. In addition, starting in the autumn of 2014, half of one panel (panel #4 in the first bay), located closest to the fish ladder was modified to allow an estimated additional 100 cfs streamflow over the dam. The half panel remained opened during the 2015 and 2016 ladder seasons and NorthWestern proposes to continue this operating practice moving forward. The half panel reduces the issue of macrophytes occluding the traveling screen. The traveling screen protects and prevents large debris from entering the work station, the AWS, and the HVJ. If the traveling screen is occluded by macrophytic vegetation, flows may be reduced or even prevented from reaching the work station, the AWS, and the HVJ. The additional 100 cfs flow over the dam also appears to augment the attractant flow at the entrance of the ladder. NorthWestern proposes to continue to operate the attractant flow system in this manner in 2017 to ensure that there is sufficient flow downstream of the Project to allow fish to successfully transit the falls.

## 4.0 Bull Trout Sampled in the Project Area

---

Between 2011 and 2016, the Licensee sampled Bull Trout during annual spring and fall baseline fisheries surveys, electrofishing surveys immediately downstream of Thompson Falls Dam, and at the Thompson Falls fish ladder. Bull trout surveyed and/or sampled in the Thompson River, are related to FWP sampling efforts and are reported by FWP and not considered part of the Project area. Only fish initially tagged by NorthWestern in the Project area and subsequently recaptured/detected in the Thompson River are described in this section.

In 2016, the Licensee sampled four Bull Trout in the Project area (3 at the Thompson Falls fish ladder, 1 via spring electrofishing in the upper section of Thompson Falls Reservoir). All four Bull Trout were released live. Two of the four Bull Trout sampled by the Licensee had more than one sighting in 2016. One Bull Trout, recorded on May 18 in the Thompson Falls fish ladder, was later detected in the Thompson River for 7-days in mid to late September 2016. The second Bull Trout, recorded in the ladder on April 18 and released upstream was detected downstream of Thompson Falls Dam entering the lower pools of Thompson Falls fish ladder on October 2.

Since 2011, a total of 32 Bull Trout (representing 31 individuals) were sampled by the Licensee, 15 Bull Trout (representing 14 individuals) were documented after ascending the Thompson Falls fish ladder and released upstream, 10 Bull Trout were sampled during baseline fisheries surveys upstream of Thompson Falls Dam (6 Bull Trout during spring surveys and 4 Bull Trout during fall surveys), and 7 Bull Trout were recorded during electrofishing efforts immediately downstream of Thompson Falls Dam in 2011, 2012, and 2014. A summary of the 31 individual Bull Trout, including their respective genetic assignment is provided in Table 4-1. Genetic samples of Bull Trout collected in association with the Project, were submitted to Abernathy Fish Technology Center Conservation Genetics Laboratory for analysis. Although the genetic assignment for two Bull Trout recorded at the ladder in 2016 remain pending at the time of this report, most Bull Trout (58%) were genetically assigned to the Fishtrap Creek or West Fork Thompson River, both tributaries to the Thompson River drainage.

Since 2011, the Licensee only documented one Bull Trout mortality associated with the Project. In 2012, one Bull Trout returned to the ladder for a second ascent and jumped out of a pool and died (Table 4-1). Initially, a cover was placed over the holding pool and was later replaced with a screen installed around the railing above the holding pool to mitigate the potential for this to occur again.

**Table 4-1: Summary of Bull Trout genetics from the 31 individual Bull Trout sampled in the Project area between 2011 and 2016.**

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
<b>Year: 2011</b>							
4/13/2011	365	364	985121023302169	TFalls Ladder	West Fork Thompson River (R4)	Upper Rock Creek (R4)	1,770
4/26/2011 5/21/2012	547 563	1438 1404	985121023464730	TFalls Ladder	Fishtrap Creek (R4)	Monture Creek (R4)	500,000
5/31/2011	482	966	985121021877906	Spring EF Below TFalls Dam	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
5/31/2011	180	50	985121021907887	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	11,040,300
5/31/2011	247	130	985121021914545	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Cooper Gulch (R3)	10,424,600
<b>Year: 2012</b>							
4/10/2012	272	150	985121027393272	Spring EF Below TFalls Dam	Graves Creek (R3)	Rock Creek (R2)	10,698,400
4/16/2012	222	76	985121027360192	Spring EF Lower Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	1,000,000
4/17/2012	260	140	985121027402995	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	17,920,300
5/15/2012	510	1172	985121021877906/ 982000357016269	TFalls Ladder	Meadow Creek (R4)**	Fishtrap Creek (R4)	1.3
10/30/2012	472	800	982000357016135	Autumn EF Paradise – Plains	Monture Creek (R4)	Fish Creek (R4)	1.07
10/30/2012	444	678	982000357016066	Autumn EF Paradise – Plains	Fish Creek (R4)	Cooper Gulch (R3)	21.35
<b>Year: 2013</b>							
4/10/2013	260	108	982000357016097	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Upper Rock Creek (R4)	200,000
4/30/2013	598	2306	982000357016065	TFalls Ladder	Fish Creek (R4)	Cooper Gulch (R3)	6.87
5/6/2013	576	1694	982000357016109	TFalls Ladder	Fishtrap Creek (R4)	EF Bull River (R2)	500,000
5/7/2013	478	978	982000357016155	TFalls Ladder	Fishtrap Creek (R4)	EF Bull River (R2)	3,000,000

Date Captured	Length (mm)	Weight (g)	PIT Tag #	Method & Location	Most Likely Population of Origin	Second Most Likely Population of Origin	Confidence
6/7/2013	596	1926	HDX PIT tag not recorded	TFalls Ladder	Fishtrap Creek (R4)	Rock Creek (R2)	147,622,000
8/9/2013	482	1058	982000357016151	TFalls Ladder	Fishtrap Creek (R4)	Cooper Gulch (R3)	46,247,900
<b>Year: 2014</b>							
4/7/2014	520	1500	No PIT Tag (no genetics)	Spring EF Below TFalls Dam	NA	NA	NA
4/15/2014	577	1446	900226000035846	Spring EF Upper Section – TFalls Reservoir	Fishtrap Creek (R4)	Monture Creek (R4)	2,000,000
5/16/2014	523	1264	982000357016169	TFalls Ladder	Fish Creek (R4)	Rattlesnake Creek (R4)	343.3
5/28/2014	567	1640	985121021203256/ 982000357016106	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	200,000
6/3/2014	509	1224	982000357016241	Spring EF Below TFalls Dam	Fishtrap Creek (R4)	Upper Rock Creek (R4)	26,000
10/28/2014	315	260	982000357016111	Autumn EF Paradise – Plains	NF Jocko (R4)	SF Jocko (R4)	6,000,000
<b>Year: 2015</b>							
4/13/2015	219	88	989001004067249	Spring EF Upper Section – TFalls Reservoir	Fishtrap Ck (R4)	NA	
5/17/2015	519	1334	982000363519407	TFalls Ladder	Fishtrap Ck (R4)	NA	1.0
6/3/2015	520	1112	982000357016242 982000357016210	TFalls Ladder	Fishtrap Ck (R4)	NA	
10/20/2015	651	1966	900226000730577	CFR – Above Islands	Fishtrap Ck (R4)	EF Bull River (R2)	135.2
<b>Year: 2016</b>							
4/11/2016	247	124	989001005372235	Spring EF Upper Section – TFalls Reservoir	EF Bull River (R2)		1.0
4/18/2016	413	602	989001005372232	TFalls Ladder	118-080		
5/18/2016	615	1934	989001005372387	TFalls Ladder	NF Fish Creek (R4)		
6/6/2016	618	1950	989001005372405	TFalls Ladder	118-047		1.0

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

## 4.1 Bull Trout Movement Patterns at the Ladder 2011-2016

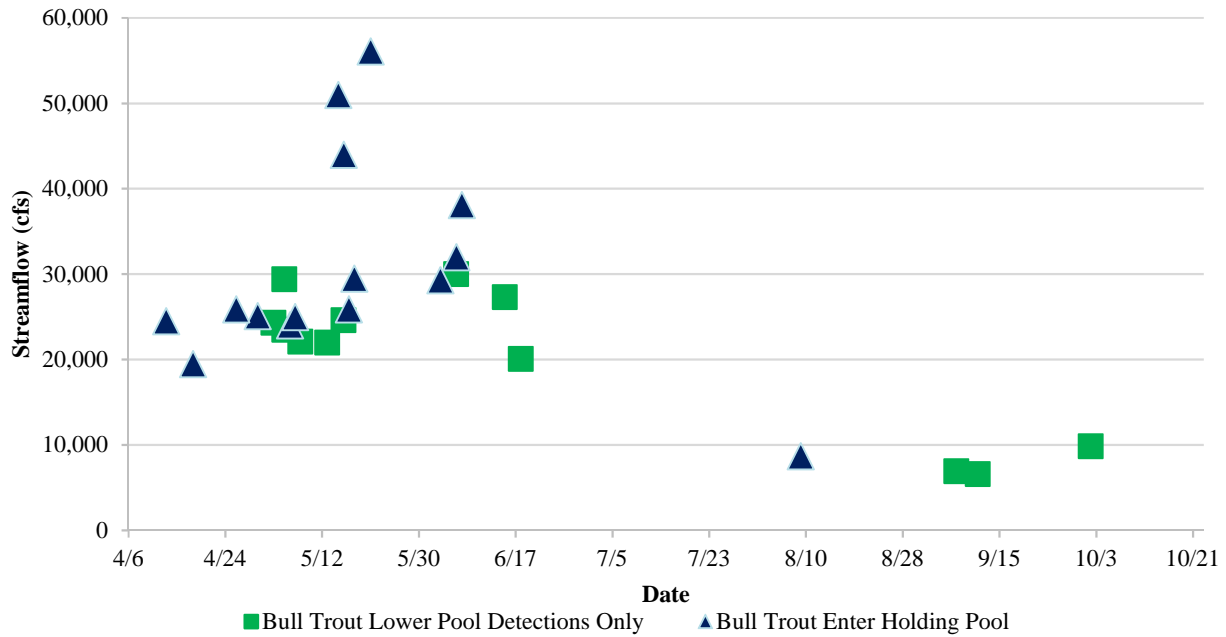
Bull trout data collected at the Thompson Falls fish ladder includes the number of Bull Trout entering the ladder that were previously PIT-tagged and detected by the remote arrays in the lower pools (pools 7 and 8) or in the holding pool (pool 45), or Bull Trout recorded at the work station that received a PIT-tag.

Streamflow and water temperature data are recorded for each corresponding day that a Bull Trout is detected entering the ladder or recorded at the work station after ascending the ladder. Streamflows reflect the mean daily streamflow measured at the USGS gage #12389000 (near Plains), but do not include contributions from tributary streams, including the Thompson River located between Plains and Thompson Falls Dam. Therefore, actual streamflows at the Project are likely higher. Water temperatures reflect the temperature data collected at the time the ladder was checked and does not reflect the daily maximum.

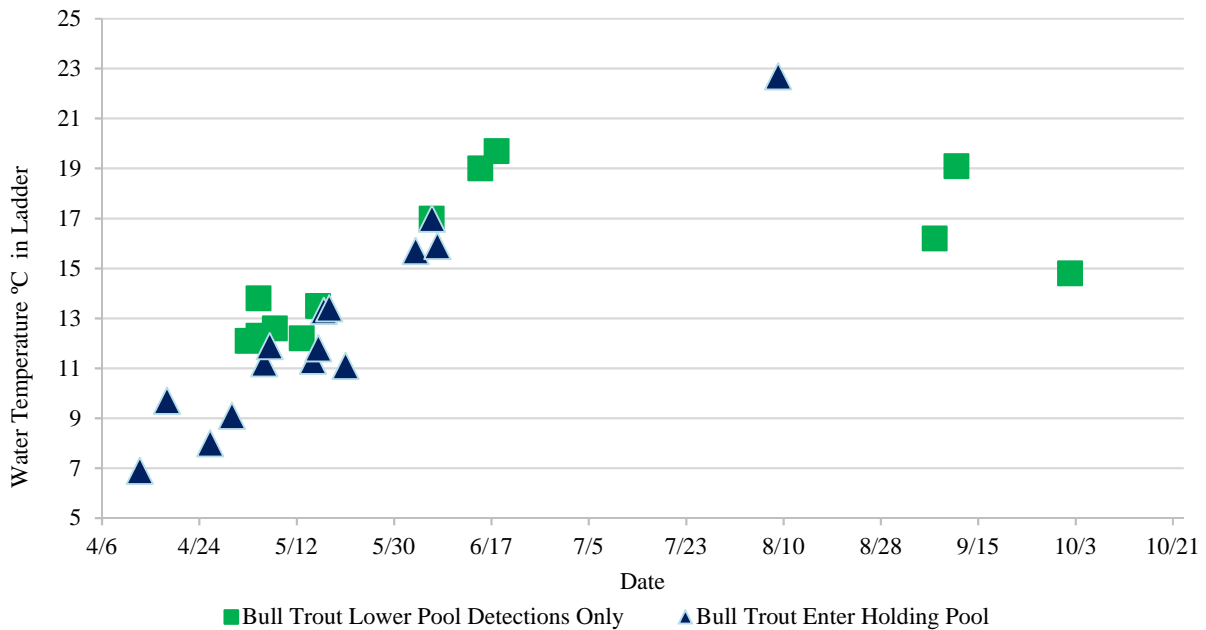
Bull trout were recorded in the Thompson Falls fish ladder in nearly all months of operation except for March, July, and November. Based on data collected between 2011 and 2016, the peak ladder use for Bull Trout occurs in May. Bull trout were recorded during the month of May in the ladder when streamflows ranged from approximately 22,000 to 56,100 cfs and water temperatures ranged from 11.1 to 13.8 °C. Since 2011 and throughout the entire operational season, Bull Trout were documented entering the ladder with streamflows ranging from 6,600 to 56,100 cfs (Figure 4-1) and water temperatures ranging from approximately 6.9 to 22.7 °C (Figure 4-2).

Since 2011, 15 Bull Trout (representing 14 individuals) were recorded ascending to the top of the ladder, while eight Bull Trout (5 in 2015 and 3 in 2016) were only detected entering the lower pools of the ladder. Of the eight individual Bull Trout detected entering the ladder, two were initially tagged at the ladder and were returning fish. The other six fish were previously captured downstream of Thompson Falls Dam by Avista personnel and were visiting the ladder for the first time. Many of the Bull Trout, only detected in the lower pools, entered the ladder multiple times at various intervals and some were detected multiple times in the same month while others visited in different months. A summary of the eight Bull Trout, including the dates they were detected in the ladder and detection history is provided in Table 4-2.

**Figure 4-1: Clark Fork River streamflow (USGS gage #12389000) corresponding to when Bull Trout were detected either entering the lower pools and did not ascend (some Bull Trout display multiply entries) or ascended to the holding pool between 2011 and 2016.**



**Figure 4-2: Water temperature in the ladder (based on single daily measurement) corresponding to the date when Bull Trout were detected either entering the lower pools and did not ascend (some Bull Trout display multiply entries) or ascended to the holding pool between 2011 and 2016.**





**Table 4-2: Summary of the 8 Bull Trout detected in the Thompson Falls fish ladder via the remote antennas that did not ascend to the holding pool in 2015 and 2016, including the date(s) of detection, PIT tag identification, most likely population of origin, previous detection(s), other detections in ladder (if any), most recent length (mm).**

Year	Detections in Lower Pools	PIT Tag (Genetic Assignment & Region)	Previous Detection(s)	Last Recorded L (mm)
2016	5-May 6-Jun	900226000570921 (WF Thompson R4)	10/3/2014 twin weir below CGD transported to WF Thompson	570
2016	7&8-Sep	985121025935363/ 900226000625227 (Graves Creek R3)	11/2/2010 juvenile in Graves Creek; 9/27/2013 LPO /gillnet; 9/17/2014 below CGD transported to Graves Creek	694
2016	2-Oct	989001005372232 (pending)	4/18/2016 Thompson Fall Ladder (released upstream)	413
2015	3-May 8-May 16-May	900226000035613 (Thompson River R4)	8/28/2012 Prospect Creek Weir (Avista); 8/5 – 9/14/2013 detected sporadically on the lower Prospect Creek PIT tag array station (Avista)	585
2015	5-May 13-May	982000357016109 (Fishtrap Creek R4)	TFalls Ladder 5/6/2013; 9/21/2014 Prospect Creek (Avista)	576
2015	16-May 11-Sep	900226000116250 (Thompson River R4)	9/14/2013 Twin Creek ID weir, 9/18/2013 transported and released to WF Thompson River by Avista	616
2015	15-Jun	900226000730558 (Graves Creek R3)	4/30/2015 captured below CGD - released into Graves Creek on 5/6/2015 (Avista)	651
2015	18-Jun	985120019650279 900226000570831 (Rock Creek R2)	8/22/08 captured as juvenile in Prospect Creek and transported downstream to Idaho (by Avista); 8/28/13 captured below CGD, released in Prospect Creek by Avista; 9/13/13 captured in Prospect Creek weir; 7/28/14 captured below CGD and transported to Prospect Creek	718

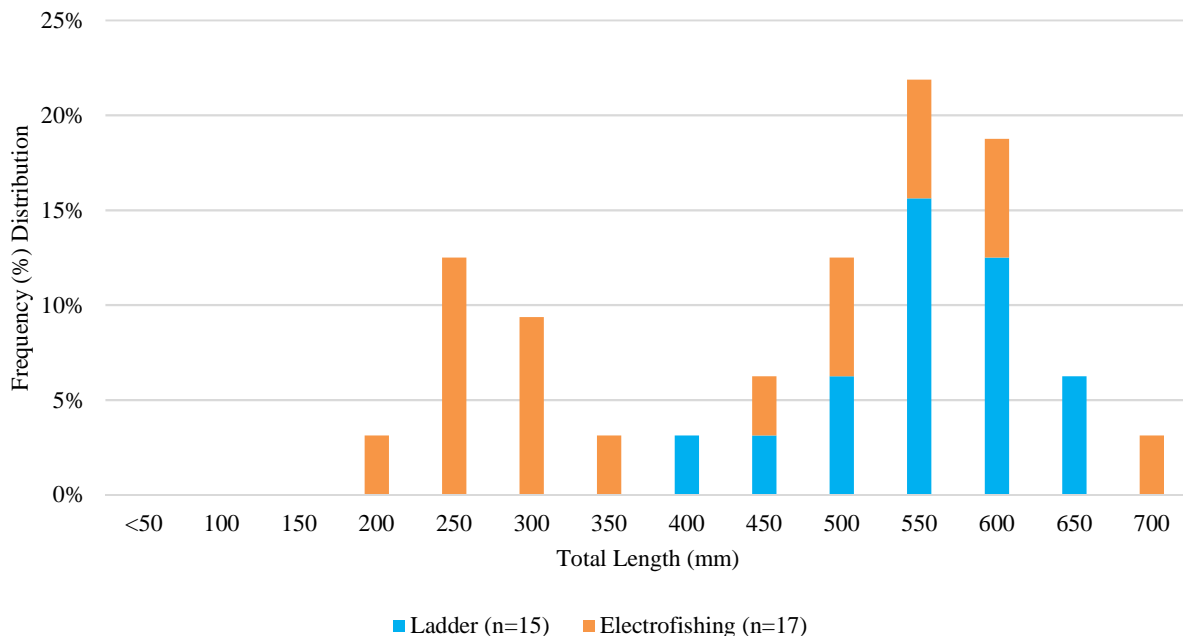
## 4.2 Bull Trout Length Frequency and Length-Weight Relationship

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

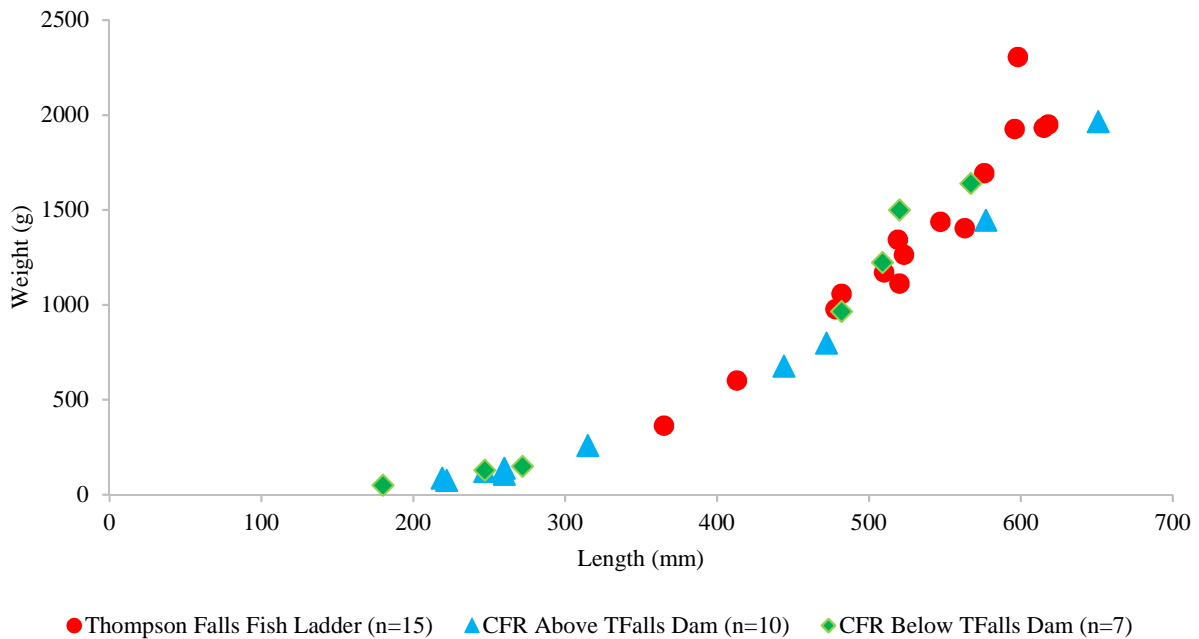
Due to the small sample size of recaptured Bull Trout in the Project area, other metrics instead of a growth rate were evaluated. A summary of length and weight of Bull Trout recorded at the ladder between 2011 and 2016 is provided in Section 3.5.2.1. For this section, length frequency and length-weight relationship for Bull Trout sampled by the Licensee in the Project area between 2011 and 2016 were evaluated.

Between 2011 and 2016, the Licensee sampled 32 Bull Trout (representing 31 individuals, *refer to* Table 4-1) in the Project area, including seven Bull Trout captured via electrofishing immediately below Thompson Falls Dam, 15 Bull Trout recorded at the fish ladder, and 10 Bull Trout recorded upstream of Thompson Falls Dam (5 Bull Trout in the upper Reservoir section, 1 Bull Trout in the lower Reservoir section, 1 Bull Trout in the above islands section, 3 Bull Trout in the Paradise to Plains section). The length frequency and length-weight relationship for the Bull Trout sampled in the Project area is illustrated in Figures 4-3 and 4-4 respectively.

**Figure 4-3: Frequency distribution of the total lengths (mm) measured for 32 Bull Trout sampled in the ladder and electrofishing in the Thompson Falls Project area between 2011 and 2016.**



**Figure 4-4: Weight (g) vs. length (mm) of Bull Trout data collected in the Project Area (n=32), including 15 Bull Trout at Thompson Falls fish ladder, 10 Bull Trout in the Clark Fork River (CFR) upstream of Thompson Falls Dam, and 7 Bull Trout in the CFR immediately downstream of Thompson Falls Dam between 2011 and 2016.**



Bull trout recorded during electrofishing efforts in the Clark Fork River upstream and downstream of Thompson Falls Dam ranged in size from 180 mm to 651 mm in length, indicating these sampling efforts captured both juvenile and adult Bull Trout. Bull trout recorded at the ladder ranged in size from 365 mm to 618 mm indicative of primarily adult Bull Trout. The distribution of sizes for bull trout sampled in the Project area show that both juvenile and adult Bull Trout are in the Project area, but primarily adult Bull Trout are ascending the ladder.

## 5.0 Bull Trout Passage from Downstream Facilities

Avista continued their trap and haul upstream fish passage program in 2016. Bull trout captured downstream of Cabinet Gorge Hydroelectric Project were genetically tested using rapid response genetic identification methodology (Adams et al., in prep). The rapid response genetic testing provides population assignment within 24 hours after receipt of fish tissue samples. The analysis predicts, with varying degrees of confidence, the natal stream of origin of each Bull Trout. Bull trout are then either transported to their genetically assigned region of origin, or released downstream of Cabinet Gorge Hydroelectric Project. Bull trout with a genetic assignment upstream of the Thompson Falls Hydroelectric Project are referred to as “Region 4” fish.

A summary of the total number of Bull Trout captured annually since 2009 below Cabinet Gorge Dam, genetically assigned to Region 4, and transported to Region 4 (Thompson River drainage or other locations) is provided in Table 5-1 (S. Bernall, Avista, personal communication, 2016). The number of individual Bull Trout recorded ascending the Thompson Falls fish ladder between 2011 and 2016 is also included in Table 5-1.

**Table 5-1: Summary of Bull Trout captured by Avista below Cabinet Gorge Dam, genetically assigned to Region 4 (R4) and transported to Region 4, and Bull Trout ascending Thompson Falls fish ladder.**

Year	# Below Cabinet Gorge Dam	# Genetically Assigned R4	# Transported to R4 (Between TFalls Dam and the Thompson River Drainage)	# Transported R4 Locations upstream of Thompson River	# of Bull Trout ascending TFalls Ladder
2016	26	2	2	-	3
2015	54	11	7	2	2
2014	75	15	10	2	1
2013	47	12	7	1	5
2012	40	11	8	-	2
2011	64	18	4	1	2
2010	35	11	9	-	NA
2009	47	13	6	6	NA
<b>Average</b>	<b>47.8</b>	<b>11.6</b>	<b>6.6</b>	<b>1.5</b>	<b>2.5</b>
<b>Total</b>	<b>382</b>	<b>93</b>	<b>53</b>	<b>12</b>	<b>15</b>

Not all Bull Trout genetically assigned to Region 4 were transported to Region 4. For example, some Bull Trout were initially captured by Avista as juveniles in other regions (downstream of Region 4) and thus after being recaptured below Cabinet Gorge Dam were transported and released to their natal stream even if the genetic assignment was Region 4 (S. Bernall, Avista,

personal communication, 2017). In 2011, there were 11 Bull Trout assigned to Region 4, but these fish were transported and released to Region 3 (near the Vermilion River), approximately 22 river miles downstream of Thompson Falls Dam, to monitor and evaluate movement to the Thompson Falls fish ladder. About half of the Bull Trout (n=5) were never detected again after their release in Region 3. Of the six Bull Trout redetected via radio telemetry in 2011, four Bull Trout moved downstream of the release location (one fish detected near Marten Creek, one fish detected near Graves Creek, two fish detected downstream of Noxon Rapids Dam) and two Bull Trout moved upstream and were detected in/near Prospect Creek (located immediately downstream of Thompson Falls Dam). One of the Bull Trout detected in Prospect Creek was also detected downstream of Thompson Falls Dam when flows exceeded 70,000 cfs in early June 2011 and the fish ladder was closed.

## **5.1 Avista's 2016 Upstream Fish Passage Program**

In 2016, Avista captured 26 unique adult Bull Trout ( > 350mm) downstream of the Cabinet Gorge Hydroelectric Project. Of the 26 Bull Trout, 21 fish were assigned to Montana tributaries and transported upstream of Cabinet Gorge Dam to either Region 2 (Cabinet Gorge Reservoir [n=14]); upstream to Region 3 (Noxon Reservoir [n=5]); or upstream to Region 4 (upstream of Thompson Falls Dam [n=2]) (S. Bernall, Avista, personal communication, October 2016).

The two Bull Trout transported upstream of the Thompson Falls Dam (Region 4) were transported and released in April and May 2016. One fish was genetically assigned to the Fishtrap Creek and the second Bull Trout was genetically assigned to the South Fork Little Joe Creek (n=1). Both fish were released upstream of the Thompson Falls Dam at the Cherry Creek boat ramp. One Bull Trout (PIT #900228000078368) genetically assigned to Fishtrap Creek was detected in the mainstem of the Thompson River via the remote array 9 days after its release in the reservoir.

A summary of the two Bull Trout captured downstream of Cabinet Gorge Dam in 2016 assigned and transported to Region 4 as well as other Bull Trout captured, genetically assigned, and transported to Region 4 between 2009 and 2016 is provided in Table 5-2. A summary of Avista's Upstream Fish Passage Program from 2016 is available in Bernall and Duffy (in prep.).

**Table 5-2: Summary of the Bull Trout captured by Avista below Cabinet Gorge Dam in 2016 as well as previous years (since 2009) assigned to Region 4 and released in Region 3 or 4 (S. Bernal, Avista, personal communication, 2016). Note: EF = electrofishing, LCFR = Lower Clark Fork River.**

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
4/21/2016	LCFR-ID Night EF	900228000078378	592	2466	4/27/2016	Thompson Falls Reservoir @ Cherry Creek boat ramp	SF Little Joe Creek	NA	99%
5/26/2016	LCFR-ID Night EF	900228000078368	650	3629	6/2/2016	Thompson Falls Reservoir @ Cherry Creek boat ramp; detected in TRiver 6/4/2016	Fishtrap Creek	NA	99%
4/14/2015	LCFR-ID Night EF	900226000730577	653	3062	4/17/2015	1 km downstream of Thompson River confluence	Fishtrap Creek	East Fork Bull River	135.3
4/14/2015	LCFR-ID Night EF	900226000730599	558	2041	4/17/2015	1 km downstream of Thompson River confluence	Fishtrap Creek	Little Joe Creek	50,000
5/31/2015	LCFR-ID Night EF	900226000730509	604	2608	6/4/2015	Thompson River @ ACM road bridge 1 mile above mouth	West Fork Thompson River	Fishtrap Creek	239,783,000
6/11/2015	LCFR-ID Night EF	900226000592474	631	2863	6/17/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	Rock Creek	8,990
8/3/2015	LCFR-ID Night EF	900228000078399	557	1585	8/10/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	East Fork Bull River	658,402,000
8/6/2015	LCFR-ID Night EF	900226000570690	531	1446	8/10/2015	Thompson River @ ACM road bridge 1 mile above mouth	West Fork Thompson River	Upper Rock Creek	25.008
8/11/2015	LCFR-ID Night EF	982000357016301	616	2275	8/16/2015	St. Regis River (RM 0.25)	West Fork Fish Creek	Rattlesnake Creek	11.107

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
8/11/2015	LCFR-ID Night EF	982000357016316	637	2551	8/16/2015	St. Regis River (RM 0.25)	North Fork Little Joe Creek	Upper Rock Creek	1.131
8/27/2015	LCFR-ID Night EF	900228000078389	735	4082	8/31/2015	Thompson River @ ACM road bridge 1 mile above mouth	Fishtrap Creek	Upper Rock Creek	16,708,300
4/20/2014	LCFR-ID Night EF	900226000501515	528	1304	4/23/2014	WF Thompson River	WF Thompson River	Cooper Gulch (R3)	1,060,820,000
4/22/2014	LCFR-ID Night EF	900226000113597	572	2126	4/25/2014	St. Regis	Little Joe Creek	MF East River (R1)	300,000
4/29/2014	LCFR-ID Night EF	900226000501522	525	1247	5/2/2014	WF Thompson River	WF Thompson River	Cooper Gulch (R3)	11,877,400,000
5/11/2014	LCFR-ID Night EF	900226000035849	718	3629	5/14/2014	Clark Fork River near Paradise	South Fork Jocko River	NF Jocko River (R4)	1.8
6/15/2014	LCFR-ID Night EF	900226000501561	540	1360	6/18/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	2,000,000
7/2/2014*	LCFR-ID Night EF	985121011605005/ 900226000501514	648	2523	7/3/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	248,402,000
7/13/2014	LCFR-ID Night EF	900226000592716	614	2211	7/16/2014	WF Thompson River	WF Thompson River	Fishtrap Creek (R4)	129,901,000,000
7/17/2014	LCFR-ID Night EF	900226000570596	532	1304	7/23/2014	WF Thompson River	WF Thompson River	Rock Creek (R2)	4,000,000
7/24/2014	LCFR-ID Night EF	900226000570799	566	1644	7/30/2014	Fishtrap Creek	Fishtrap Creek	WF Thompson River (R4)	6,393,510,000

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
9/6/2014	LCFR – ID Ladder	900226000570258	684	2721	9/10/2014	Fishtrap Creek	Fishtrap Creek	Upper Rock Creek (R4)	10,639,100
9/24/2014	LCFR – ID Ladder	900226000626007	614	2324	9/26/2014	Fishtrap Creek	Fishtrap Creek	Fish Creek (R4)	48,000
10/3/2014	LCFR – ID Twin Weir	900226000570921	570	1531	10/6/2014	WF Thompson River	WF Thompson River	Upper Rock Creek (R4)	41,000
6/9/2013	LCFR-ID Night EF	900226000035846	567	2211	6/12/2013	Just downstream of confluence of Fishtrap Creek & Thompson River	Fishtrap Creek	Monture Creek	2,000,000
6/13/2013	LCFR-ID Night EF	900226000035886	607	2324	6/19/2013	Mouth of Fishtrap Creek	Fishtrap Creek	EF Bull River	29,000
6/19/2013	Hook-n-line sampling	900226000035877	606	2154.8	6/26/2013	Fishtrap Creek 100 m above mouth	Fishtrap Creek	EF Bull River	7,437,370,000
6/23/2013	LCFR-ID Night EF	900226000035863	651	2806	6/26/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Rattlesnake Creek	600,000
9/4/2013	LCFR-ID Ladder	900226000570790	554	1361	9/9/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Cooper Gulch	500 billion
9/14/2013	LCFR-ID Weir	900226000116250	616	2466	9/18/2013	~ 0.1 mile up WF Thompson River	WF Thompson River	Cooper Gulch	13,525,800,000
9/26/2013	LCFR-ID Ladder	900226000570690	475	851	9/30/2013	WF Thompson River 1/4 mile above mouth	WF Thompson River	Upper Rock Creek	25.008
9/27/2013	LCFR-ID Twin Creek Ladder	985121001925944/ 900226000570887	744	4082	9/28/2013	In Fishtrap by campsite upstream from lower bridge	Fishtrap Creek	Rock Creek	254.1



Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
4/26/2012	LCFR-ID Night EF	380180914261084	585	1928	5/2/2012	Fishtrap Creek	Fishtrap Creek	Cedar Creek	26,000
5/1/2012	LCFR-ID Night EF	900226000035832	616	2324	5/4/2012	Clark Fork River @ St. Regis boat ramp	Cedar Creek	North Fork Jocko River	18.7
5/13/2012	LCFR-ID Night EF	985121025905128, 900226000035851 (recap from 8/30/2011)	637	2154	5/14/2012	Fishtrap Creek	Fishtrap Creek	Vermilion River	2.5
5/13/2012	LCFR-ID Night EF	900226000035807	520	1190	5/17/2012	Fishtrap Creek	Fishtrap Creek	East Fork Bull River	16,000
5/13/2012	LCFR-ID Night EF	900226000035860	575	2211	5/17/2012	Fishtrap Creek	Fishtrap Creek	North Fork Jocko River	468.7
5/17/2012	LCFR-ID Night EF	985121021199577, 900226000035789 (recap from 4/29/2010)	620	2580	5/18/2012	Fishtrap Creek	Fishtrap Creek	East Fork Bull River	63,000
6/26/2012	LCFR-ID Night EF	900226000035803	815	6010	7/2/2012	Fishtrap Creek	Fishtrap Creek	Prospect Creek	2,830
6/28/2012	LCFR-ID Night EF	900226000035797	575	1870	7/5/2012	Thompson River below WF Thompson River	WF Thompson River	Upper Rock Creek	77,196,300
4/19/2011	LCFR-ID Night EF	985121021183536	586	2126	4/22/2011	Released upstream from Vermilion Bay (Region 3)	Meadow Creek	Fishtrap Creek	3.98
4/24/2011	LCFR-ID Night EF	985121021159735	627	2835	4/27/2011	Released upstream from Vermilion Bay (Region 3)	South Fork Jocko River	North Fork Jocko River	300,000

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
5/17/2011	LCFR-ID Night EF	985121021199621	530	1360	5/25/2011	Released upstream from Vermilion Bay (Region 3)	WF Thompson River	Upper Rock Creek	48,193,900
5/22/2011	LCFR-ID Night EF	985121021152977	710	3856	5/20/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	5.54
6/2/2011	LCFR-ID Night EF	985121021203256	500	1049	6/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	200,000
6/5/2011	LCFR-ID Night EF	985121001919071	585	1814	6/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	1,000,000
6/19/2011	LCFR-ID Night EF	985121021146823	570	1729	6/23/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	14,000
6/21/2011	LCFR-ID Night EF	985121021183908	701	3685	6/24/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Upper Rock Creek	3,390
6/21/2011	LCFR-ID Night EF	985121021184737	462	907	6/24/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Cedar Creek	2.44
6/26/2011	LCFR-ID Night EF	985121021186461	470	907.3	6/29/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	East Fork Bull River	4,250
7/3/2011	LCFR-ID Night EF	985120015892614	513	1191	7/5/2011	Bull River old bridge site downstream of EFBR (Region 2)	Upper Rock Creek	East Fork Bull river	1.09
7/5/2011	LCFR-ID Night EF	985121021157243	669	1948	7/8/2011	Released upstream from Vermilion Bay (Region 3)	Fishtrap Creek	Prospect Creek	2.89

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
7/24/2011	LCFR-ID Night EF	985120029222140	496	1190	7/25/2011	Graves Creek just upstream of USFS bridge (Region 3)	Rattlesnake Creek	North Fork Jocko River	9.96
7/28/2011	LCFR-ID Night EF	985121021156804	516	1021	8/3/2011	One mile up Thompson River (Region 4)	Fishtrap Creek	Thompson River	55.196
8/30/2011	LCFR-ID Night EF	985121025905128	650	2892	9/2/2011	Fishtrap Creek, just up from mouth (Region 4)	Fishtrap Creek	Vermilion River	2.51
9/21/2011	Twin Creek Weir	985121001907073	613	2268	9/22/2011	Just upstream of the mouth of Thompson River (Region 4)	Fishtrap Creek	Grouse Creek	1,050
9/22/2011	Twin Creek Weir	985121025914593	592	1701	9/26/2011	Just upstream of the mouth of Thompson River (Region 4)	Fishtrap Creek	Rock Creek	10,000
9/22/2011	LCFR-ID Ladder	985121025758989	606	1871	9/26/2011	South Fork Jocko River, upstream of last diversion (Region 4)	South Fork Jocko River	Graves Creek	1.38
6/25/2010	LCFR-ID Night EF	985121021187084	535	1587	6/30/2010	Thompson River (Region 4)	Fishtrap Creek	Graves Creek	58.624
5/13/2010	LCFR-ID Night EF	985121016753895	621	2778	5/19/2010	Thompson River (Region 4)	Char Ck	Rattlesnake Creek	1.8
5/5/2010	LCFR-ID Hook-n-line sampling	985121016700474	534	1247	5/12/2010	Thompson River (Region 4)	Fishtrap Creek	Upper Rock Creek (R4)	2,640
5/16/2010	LCFR-ID Night EF	985121015963939	643	2665	5/19/2010	Thompson River (Region 4)	Fishtrap Creek	Copper Creek	2,000,000

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
4/29/2010	LCFR-ID Night EF	985121021199577	547	1389	5/5/2010	Thompson River (Region 4)	Fishtrap Creek	East Fork Bull River	63,000
7/6/2010	LCFR-ID Night EF	985121021185451	724	4366	7/13/2010	West Fork Thompson River (mouth)	Fishtrap Creek	Copper Creek	500,000
7/25/2010	LCFR-ID Night EF	985121001907073	598	2211.5	No Data	West Fork Thompson River (mouth)	Fishtrap Creek	Grouse Creek	1050
8/18/2010	LCFR-ID Night EF	985121021156358	535	1190	8/20/2010	Thompson River (ACM road bridge)	WF Thompson River	Rock Creek (R2)	57,173,700
8/31/2010	LCFR-ID Night EF	985121021141387	614	1842	9/3/2010	Thompson River (ACM road bridge)	WF Thompson River	Cooper Gulch	1,052,470,000
5/26/2009	LCFR-ID Night EF	985121001907962	516	1361	5/29/2009	Thompson River	Fishtrap Creek	Upper Rock Creek (R4)	3,000,000
6/7/2009	LCFR-ID Night EF	985121001829048	580	1616	6/10/2009	Paradise MT - LCFR	Monture Creek	Cedar Creek	7.93
6/11/2009	LCFR-ID Hook-n-line sampling	985120029215361	710	3686	6/15/2009	Thompson River	Fishtrap Creek	Copper Creek	18,731,200
6/11/2009	LCFR-ID Night EF	985121001869178	660	2722	6/15/2009	Thompson River	Fishtrap Creek	Upper Rock Creek (R4)	3,000,000
9/15/2009	LCFR-ID Fish Ladder	985121017314384	563	1815	9/18/2009	St. Regis	Cedar Creek	Morris Creek (R1)	1.14
9/21/2009	LCFR-ID Fish Ladder	985121015961762	600	1845	9/23/2009	St. Regis	Fish Creek	Rattlesnake Creek	2.21

Capture Date	Capture Method	PIT Tag Number	Length (mm)	Weight (g)	Release Date	Release Site	Most Likely Pop. of Origin	Second Most Likely Pop. of Origin	Confidence
9/21/2009	LCFR-ID Fish Ladder	985121017312262	610	2041	9/23/2009	St. Regis	Upper Rock Creek (R4)	Cedar Creek	22.95
9/21/2009	LCFR-ID Hook-n-line sampling	985121016754113	585	1701	9/23/2009	St. Regis	Rattlesnake Creek	Cedar Creek	1.83
9/22/2009	LCFR-ID Fish Ladder	985121015942027	646	2382	9/25/2009	Fishtrap Creek	Fishtrap Creek	Cooper Gulch	207,537,000
9/22/2009	LCFR-ID Hook-n-line sampling	985121015639163	490	964	9/25/2009	Fishtrap Creek	WF Thompson River	Cooper Gulch	2,000,000
9/23/2009	LCFR-ID Fish Ladder	985121001925944	592	2100	9/25/2009	Fishtrap Creek	Fishtrap Creek	Rock Creek (R2)	254.1
9/28/2009	LCFR-ID Fish Ladder	985121016755149	700	3289	9/30/2009	Clark Fork River ~ 400m below the mouth of St. Regis	Cedar Creek	Upper Rock Creek (R4)	1.3

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

## 6.0 Thompson Falls Reservoir Monitoring Plan

---

In 2010, the Licensee developed and submitted the *5-Year Reservoir Monitoring Plan, 2011-2015* (PPL Montana, 2010b) to the Commission in compliance with Term 5a of the FWS's BO TCs (*refer to Section 9.5.1 for details*). The Commission issued an Order on February 9, 2011 approving the 5-Year Reservoir Monitoring Plan, and the Licensee began implementation in 2011 and included annual progress updates in subsequent annual reports (PPL Montana, 2012, 2013, 2014, and NorthWestern, 2015, 2016).

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile Bull Trout survivorship and evaluate the site-specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS along with the proposed changes, were filed with the Commission on December 17, 2014. FERC approved the modifications in a letter dated February 25, 2015. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement has been achieved through the annual reports since 2011. The development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" was postponed until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of juvenile Bull Trout from the Thompson River.

The juvenile Bull Trout out-migration study was implemented by a Montana State University graduate student in 2014 and 2015. The results from 2014 are summarized in the 2014 annual report (NorthWestern Energy, 2015) and the 2015 results are summarized in the 2015 annual report (NorthWestern Energy, 2016). A detailed analysis of the results from the 2014 and 2015 field data collection are anticipated to be submitted to the TAC in 2017 and will be posted to the Project website (<http://thompsonfallsfishpassage.com/reference.html>).

## 7.0 Total Dissolved Gas Monitoring

---

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

In 2016, the Licensee implemented the following protocol for TDG monitoring:

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

In April 2016, NorthWestern consulted with the TAC agencies and provided a summary of the snowpack data for the Lower Clark Fork basin, which indicated runoff forecasts were less than the 125 percent of normal. Therefore, due to the low runoff forecast, monitoring TDG was not implemented in 2016.

NorthWestern proposes to implement the protocol described above in 2017 for TDG monitoring.

## 8.0 TAC-Funded Projects in 2016

---

In 2016, six projects were approved and funded by the TAC:

1. Cedar Creek Phase 2 Road Relocation and Large Woody Debris Enhancement Project (\$30,000)
2. Beartrap Fork Culvert Removal Project (\$11,000)
3. Rattlesnake Creek Fish Screen Project, Phase I (\$13,125)
4. Bull Trout Genetics Analysis (\$10,000)
5. Final Year of Thompson Falls Reservoir Study of Juvenile Bull Trout Out-Migration (\$24,669)
6. Watershed coordinator for the Thompson River drainage (\$16,500)

The first three projects listed above are ongoing and anticipated to be complete in 2017 with all approved funds allocated. Approximately \$2,940 of the \$10,000-approved Bull Trout genetics analysis funding was utilized in 2016 for samples taken from Albert Creek. Results from the 2-year Thompson Falls Reservoir study of juvenile Bull Trout out-migration is anticipated to be submitted to the TAC in the form of a Master's Thesis in 2017. In 2016, the watershed coordinator for the Thompson River drainage collaborated with USFS and FWP to successfully execute two agreements. The two agreements secure additional funding sources for ongoing and future work focused on restoration and stream enhancements opportunities in the Thompson River drainage.



## 9.0 Compliance with the Terms and Conditions of the Biological Opinion

---

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

### 9.1 Term and Condition TC1 – Upstream Passage

#### 9.1.1 Requirement

The Biological Opinion states that:

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

natal origin of Bull Trout at the project, PPL Montana will institute a permanent fish tagging system for all Bull Trout handled during monitoring and for other fisheries investigation activities in the Project area.

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

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

h. During the entire Phase 2 evaluation period (2010-2020), the TAC, subject to approval of the Service and with PPL Montana support, will provide adequate oversight of scientific aspects, surveys, studies, and protocols associated with the fish passage aspects of the Project. At the end of the Phase 2 evaluation period (2010-2020), and upon completion and adequate distribution and consideration of a comprehensive ten-year report (due December 31, 2020), PPL Montana will convene a structured scientific review of the project, guided by the TAC. This scientific review will be completed by April 1, 2021 and will develop a set of recommendations to be submitted to the Service for evaluation, modification, and approval; including specific conclusions as to whether the fishway is functioning as intended and whether major operational or structural modifications of the fishway are needed. The review process will culminate, by December 31, 2021, in a revised operating plan for the fishway during the remainder of the existing term of the FERC license (2022 through 2025).

## **9.1.2 Compliance**

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

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

The Licensee developed and submitted the FWS-approved *Fish Passage Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) to the FERC on October 14, 2010. FERC issued an Order approving the Fish Passage Evaluation Plan on June 9, 2011. Between 2011 and 2016, the Licensee implemented the Fish Passage Evaluation Plan, which complies with TC1 (e, f, g, h). NorthWestern will continue to implement the Fish Passage Evaluation Plan through 2020.

## **9.2 TC2 – Downstream Passage**

### **9.2.1 Requirement**

The Biological Opinion states that:

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

### **9.2.2 Compliance**

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

The terms of the renewed MOU (2014-2020) are similar to the first MOU (2009-2013). The adaptive management funding account (AMFA) started with \$150,000 on January 1, 2014. The

Licensee will provide \$100,000 annually for 7 years and allow a maximum of \$250,000 to accrue in the account from unspent or transferred annual TAC funds. The AMFA is designated for implementation of downstream passage minimization measures in addition to Licensee-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.

Following the annual TAC meeting held on December 6, 2016, two proposals for the 2017 calendar year were submitted via email to the TAC for review. One proposal requested funding (\$10,000) for Bull Trout genetics analysis and the second proposal requested funding (\$16,500) for the Thompson River Watershed Coordinator in 2017. Both proposals were unanimously approved by the voting TAC members (NorthWestern, FWS, FWP, and CSKT). NorthWestern will continue to collaborate and coordinate with agencies and other entities to support projects in compliance with TC 2a. As proposals are submitted, NorthWestern will distribute the information to the TAC for review and approval.

### **9.3 TC3 – Gas Supersaturation**

#### **9.3.1 Requirement**

The Biological Opinion states that:

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

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

### **9.3.2 Compliance**

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

The Licensee has collected TDG and GBT data between 2008 and 2014. TDG levels appear to level off once flows exceed 60,000 cfs. Monitoring efforts for signs of GBT in fish below Thompson Falls Dam have been implemented during variable flow conditions (57,700-104,000 cfs) that cover a wide range of TDG levels, including the higher TDG levels, recorded in the Project area. Past GBT monitoring in the Project area has resulted in limited findings of fish with symptoms indicating GBT. Bull trout recorded at the ladder or downstream of the Thompson Falls Dam annually between 2011 and 2014 have not shown any external symptoms of GBT. The TAC agreed that continuing GBT monitoring provided minimal gains and the existing dataset (2008-2014) was adequate and no additional GBT monitoring was implemented in 2016 or proposed for 2017. TDG monitoring will be implemented when the spring forecast is for runoff at or above 125 percent (conditions outlined in Section 10.4). In 2016, the forecast for spring runoff was below 125 percent, thus no TDG monitoring was implemented. In 2017, NorthWestern will monitor TDG, if appropriate, based on the protocol provided in Section 10.4.

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

## **9.4 TC4 – MOU and TAC**

### **9.4.1 Requirement**

The Biological Opinion states that:

- a. Upon completion of construction of the Thompson Falls Fish Ladder (currently scheduled for 2010) and concurrent with initiation of the Phase 2 review period (mid-2010 through 2020) PPL Montana will review the Thompson Falls MOU and collaborate with the signatory agencies as to the need to revise and restructure the MOU. Any such revision should be developed around the 2010-2020 Phase 2 evaluation period and may include appropriate changes to the TAC and its operation. Subsequent revision may occur again in 2021, or as needed based on adaptive principles and subject to approval of the Service and PPL Montana.

### **9.4.2 Compliance**

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

## **9.5 TC5 – Thompson Falls Reservoir**

### **9.5.1 Requirement**

The Biological Opinion states that:

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

b. Based on the interim Thompson Falls Reservoir Assessment (a., above), a timely evaluation of the site specific need for a nonnative species control program in Thompson Falls Reservoir will be conducted by PPL Montana, in collaboration with the TAC agencies (*see* TC7b., below), no later than the end of 2015, with final recommendations to be approved by the Service.

### **9.5.2 Compliance**

In compliance with TC 5a, the Licensee collaborated with TAC members and prepared the 5-Year (2011-2015) Reservoir Monitoring Plan, which was approved by FWS and submitted to the FERC on June 17, 2010. FERC issued an Order approving the 5-Year Reservoir Monitoring Plan on February 9, 2011. NorthWestern implemented the reservoir monitoring plan and because

of an ongoing study in 2014 and 2015 requested modifications to the initial filing requirements outlined in FWS' BO.

In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS, along with the proposed changes, was filed with the Commission on December 17, 2014. FERC issued a letter approving the proposed modifications on February 25, 2015.

The approved modifications include: 1) removing the 5-year comprehensive summary of activities associated with the Reservoir Monitoring Plan (due in 2015) and combining the final report (due in 2020) required by TC 5a with reporting requirements in TC 5b; 2) postponing the reporting deadline for the nonnative species (in the Thompson Falls Reservoir) control recommendations in TC 5b to December 31, 2020; and 3) waive the 5-year interim reporting requirement under TC 7b while continuing annual reporting required by TC 7a until 2019. After the 2019 ladder season is complete, NorthWestern will be responsible for compiling conclusions and recommendations per TC 5a and 5b reporting requirements and compiling the findings from the annual reports (2011-2019) into one comprehensive report that will be filed with FWS and the Commission by December 31, 2020.

## **9.6 TC6 – System-wide Monitoring**

### **9.6.1 Requirement**

The Biological Opinion states that:

- a. For the remainder of the license (through 2025), PPL Montana will ensure that actions at the Thompson Falls Fish Ladder, including tagging, transport, and any tracking of fish movement, are adequately funded and fully coordinated with the Avista project and the management agencies FWP, CSKT, and the Service. This coordination will include routine communications through the TAC and may require participation in special meetings or discussions to ensure that there is a single seamless fish passage effort for the lower Clark Fork projects.
- b. For the remainder of the license (through 2025) PPL Montana will contribute a proportional amount of funding to ensure that fish sampled at the Thompson Falls Fish Passage Facility are processed, analyzed, and integrated into annual updates of the system wide Clark Fork River genetic database.
- c. In consultation with the TAC and with approval of the Service, for the remainder of the license (through 2025), PPL Montana will fund the technology required to track transmittered fish that pass the project as they move through the system. This may include an integrated PIT-Tag scanner at the fishway, mobile PIT-Tag scanning capabilities (wand(s) for use in the

field), and radio implantation and tracking of Bull Trout that move through the sample loop in the ladder. Obligations for tracking transmitted fish by PPL Montana will include at a minimum the portions of the Lower Clark Fork Core Area upstream of Thompson Falls Dam (i.e., mainstem Clark Fork River from Thompson Falls Dam to the confluence of the Flathead River, including tributaries such as the Thompson River) Note: in the lower Flathead River, Jocko River, and other Flathead Reservation waters primary responsibility for tracking is assumed by the CSKT, but close coordination with the Tribes will be maintained by PPL Montana. Broader tracking needs upstream will be determined through cooperation with other entities in the basin (as in TC6a, above).

### **9.6.2 Compliance**

The Licensee complied with these requirements through continuous collaboration with TAC members throughout the year to proactively address the adaptive needs of the operations of the ladder, as well as holding an annual TAC meeting (December 6, 2016) where the Licensee provided an overview of findings at the ladder for the year and an open forum for the TAC and FWS to discuss any needs for changes in operations.

With the construction of the fish ladder, three remote antennas were installed on the weirs (pools) that detect HDX and FDX PIT-tagged fish. These remote antennas detect PIT tags as fish move through the ladder. A remote PIT-tag array was also installed on the mainstem of the Thompson River in 2014 and continues to be utilized to track PIT-tagged fish released upstream of Thompson Falls Dam. These data are compiled annually and summarized in the respective annual report.

NorthWestern will continue to collaborate and coordinate with local biologists regarding the need to track fish movement. NorthWestern continues to support Bull Trout genetic sampling efforts in the Clark Fork River drainage with funding approved by the TAC during the 2016 annual meeting in support of genetic analysis of Bull Trout samples.

## **9.7 TC7 – Reporting**

### **9.7.1 Requirement**

The Biological Opinion states that:

- a. Annually, by April 1 of each year for the remainder of the license (expires 2025), PPL Montana will prepare and submit to the Service for approval a report of the previous year's activities, fish passage totals, and next year's proposed activities and other fisheries monitoring that may result in intentional as well as incidental take of Bull Trout. The report will quantify the number of Bull Trout proposed to be incidentally taken by each activity



and summarize the cumulative extent of incidental take from all previous year activities.

b. By December 31, 2015, after the first five years of the Phase 2 evaluation period (as described per TC1g., above), PPL Montana will present to the TAC and the Service a comprehensive written assessment of the first five years of fishway operation. This report is partially for the purpose of assessing the need for major mid-Phase 2 modifications to the facility and its operations as well as for consideration of the need for supporting additional Bull Trout passage or transport above the dam.

c. Annually, by April 1 of each year beginning in 2010 and for the remainder of the license (expires 2025), PPL Montana will archive electronic versions of all biological progress reports (described in TC 1 through TC 7 and dating back to 2005) generated through the Thompson Falls Project. PPL Montana will provide to TAC agencies at no cost, upon request, updated CDs or web-based access to those reports.

d. For the remainder of the license (expires 2025), upon locating dead, injured, or sick Bull Trout, or upon observing destruction of redds, notification must be made within 24 hours to the Service's Division of Law Enforcement Special Agent (Richard Branzell, P.O. Box 7488, Missoula, MT, 59807-7488; (406) 329-3000). Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Dead, injured, or sick Bull Trout should also be reported to the Service's Kalispell Field Office (406-758-6882).

e. For the remainder of the license (expires 2025), during project implementation the FERC or applicant shall promptly notify the Service of any emergency or unanticipated situations arising that may be detrimental for Bull Trout relative to the proposed activity.

### **9.7.2 Compliance**

NorthWestern complied with TC 7a requirements by preparing this annual report for the work completed in 2016. NorthWestern will continue to submit annual reports of the previous year's activities, fish passage totals, next year's proposed activities, and other fisheries monitoring that may result in intentional as well as incidental take of Bull Trout. The annual reports will be approved by the TAC and submitted to the FERC by April 1 of each year for the remainder of the License.

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

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

In 2014, NorthWestern consulted with FWS to review the needs of a 5-year comprehensive report of the ladder's performance in compliance with TC 7b. FWS and NorthWestern concurred that the annual reports have provided sufficient and on-going comprehensive summaries that negate the need for a separate 5-year report. NorthWestern filed a letter, with FWS's support, to the Commission on December 17, 2014 proposing TC 7b no longer be required because the comprehensive reporting that has been continually provided in the annual reports. FERC approved this modification in a letter dated February 25, 2015.

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

### **9.7.3 Bull Trout Incidental Take Summary 2011-2016**

In compliance with TC 7a, this section provides a summary of the cumulative extent of incidental take from previous years' activities (2009-2016) in support of the upstream fish passage at the Project (Table 9-1). Between 2009 and 2016, 33 individual Bull Trout have been sampled by the Licensee. Since operations at the ladder commenced in 2011, 31 individual Bull Trout have been sampled annually by the Licensee in the Project area with approximately four to seven individual Bull Trout sampled annually. In 2016, the Licensee sampled four Bull Trout (3 at the Thompson Falls fish ladder, 1 via electrofishing in the upper section of the Thompson Falls Reservoir), all of which were released live.

Sampling has included collecting Bull Trout via electrofishing efforts upstream and downstream of Thompson Falls Dam as well as Bull Trout recorded at the Thompson Falls fish ladder. Since 2011, 15 Bull Trout, representing 14 individual fish were recorded at the Thompson Falls fish ladder. One Bull Trout ascended the ladder twice and during the second ascent in 2012, the Bull Trout jumped out of one of the pools and died. This mortality has been the only occurrence in the Project area and subsequently, a cover was placed over the holding pool to mitigate the potential for this to occur again. In 2014, the Bull Trout that ascended the ladder was released alive upstream of the dam, but was later captured downstream of Thompson Falls Dam and the Project area during the annual reservoir monitoring activities led by FWP in Noxon Reservoir. The Bull Trout was captured via gillnet on October 13, 2014 resulting in a mortality. Additional details regarding Bull Trout sampled by the Licensee between 2011 and 2016 are provided in Section 4.0.

**Table 9-1: Cumulative incidental “take” of Bull Trout for the Thompson Falls Project area located in the Lower Clark Fork River drainage, since January 1, 2009. Note: 2016 fish are listed in bold; EF = electrofishing; L = length; Wt = weight.**

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
<b>6/6/16</b>	<b>Ladder</b>	<b>TFalls Dam</b>	<b>Fish Passage Studies</b>	<b>Licensee FWP</b>	<b>618</b>	<b>1950</b>	<b>989001005372405</b>	<b>118-047</b>	<b>Alive</b>
<b>5/18/16</b>	<b>Ladder</b>	<b>TFalls Dam</b>	<b>Fish Passage Studies</b>	<b>Licensee FWP</b>	<b>615</b>	<b>1934</b>	<b>989001005372387</b>	<b>NF Fish Creek (R4)</b>	<b>Alive</b>
<b>4/18/16</b>	<b>Ladder</b>	<b>TFalls Dam</b>	<b>Fish Passage Studies</b>	<b>Licensee FWP</b>	<b>413</b>	<b>602</b>	<b>989001005372232</b>	<b>118-080</b>	<b>Alive</b>
<b>4/11/16</b>	<b>EFISH</b>	<b>Upper TFalls Reservoir (CFR)</b>	<b>Long-term Population Monitoring</b>	<b>Licensee FWP</b>	<b>247</b>	<b>124</b>	<b>989001005372235</b>	<b>EF Bull River (R2)</b>	<b>Alive</b>
10/20/15	EFISH	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee FWP	651	1966	900226000730577	Fishtrap Creek (R4)	Alive
6/3/15	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	520	1112	982000357016242 982000357016210	Fishtrap Creek (R4)	Alive
5/17/15	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	519	1334	982000363519407	Fishtrap Creek (R4)	Alive
4/13/15	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	219	88	989001004067249	Fishtrap Creek (R4)	Alive
10/28/14	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	315	260	982000357016111	NF Jocko (R4)	Alive
6/3/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	509	1224	982000357016241	Fishtrap Creek (R4)	Alive
5/28/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	567	1640	985121021203256 982000357016106	Fishtrap Creek (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/16/14	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	523	1264	982000357016169	Fish Creek (R4)	Alive (later captured via gillnet in Noxon Reservoir resulting in a mortality)
4/15/14	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	577	1446	900226000035846	Fishtrap Creek (R4)	Alive
4/7/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	520	1500	No tag implanted/ no genetic sample taken	NA	Alive
8/9/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	482	1058	982000357016151	Fishtrap Creek (R4)	Alive
6/7/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	596	1926	HDX tag not recorded (Genetics 118-073)	Fishtrap Creek (R4)	Alive
5/7/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	478	978	982000357016155	Fishtrap Creek (R4)	Alive
5/6/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	576	1694	982000357016109	Fishtrap Creek (R4)	Alive
4/30/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	598	2306	982000357016065	Fish Creek (R4)	Alive
4/10/13	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	260	108	982000357016097	Fishtrap Creek (R4)	Alive
10/30/12	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	472	800	982000357016135	Monture Creek (R4)	Alive
10/30/12	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	444	678	982000357016066	Fish Creek (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	PIT tag	Genetic Assignment	Condition at time of release
5/21/12	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	563	1404	985121023464730	Fishtrap Creek (R4)	Mortality (2012)
4/26/11					547	1438			Alive (2011)
5/15/12	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	510	1172	985121021877906 982000357016269	Meadow Creek (R4)	Alive
4/17/12	EFISH	TFalls Reservoir (Upper Section)	Long-term Population Monitoring	Licensee FWP	260	140	985121027402995	Fishtrap Creek (R4)	Alive
4/16/12	EFISH	TFalls Reservoir (Lower Section)	Long-term Population Monitoring	Licensee FWP	222	76	985121027360192	Fishtrap Creek (R4)	Alive
4/10/12	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	272	150	985121027393272	Graves Creek (R3)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	482	966	985121021877906	Meadow Creek (R4)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	180	50	985121021907887	Fishtrap Creek (R4)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	247	130	985121021914545	Fishtrap Creek (R4)	Alive
4/13/11	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	365	364	985121023302169	Thompson River (R4)	Alive
10/12/10	EFISH	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee	325	240	N/A	SF Jocko River (R4)	Alive
5/1/09	Gillnet	TFalls Reservoir	Long-term Population Monitoring	Licensee	271	174	985121009494278	Fishtrap Creek (R4)	Alive

## 10.0 Proposed Activities for 2017

---

### 10.1 Baseline Fisheries Data Collection

NorthWestern and FWP reviewed baseline fisheries data and propose to continue autumn gillnetting surveys on an annual basis and alternate electrofishing (both spring and autumn surveys) every other year. Thus, electrofishing efforts will not be implemented in 2017, but will commence again in 2018. In 2018, electrofishing efforts will include the Thompson Falls Reservoir (spring sampling), above the island complex (autumn sampling), and Paradise to Plains (autumn sampling). The sample locations and methods will remain unchanged. Gillnetting efforts in 2017 will be summarized 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 2017 autumn gillnetting efforts will be no more than five Bull Trout. Any fish evaluations in the Thompson River drainage will be managed by FWP, thus any incidental take of Bull Trout will be reported by FWP.

### 10.2 Upstream Adult Fish Passage Studies

In 2017, NorthWestern will continue to implement 10-year *Fish Passage Facility Evaluation Plan, Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010c) (Fish Passage Evaluation Plan) that was developed and submitted to the FERC on October 18, 2010 and approved on June 9, 2011. NorthWestern will collect biological and operational data during ladder operations in 2017. NorthWestern will summarize the following information, as available, for next year's annual report:

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

In 2017, NorthWestern proposes to check the ladder at a minimum of once a day when and if water temperatures reach or exceed 23 °C. NorthWestern also proposes to operate the ladder in notch mode throughout the duration of the 2017 season.

Several studies outlined in the Fish Passage Evaluation Plan will occur over multiple years (2011-2020). A list of the studies and their respective schedule is provided in Table 10-1. Based on prior year's sampling in the Thompson Falls tailrace it is conservatively estimated that incidental take of Bull Trout during 2017 upstream adult fish passage studies will be no more than 10 Bull Trout.

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

Objective	Study	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Effectiveness of the Ladder	Annual Fish Passage	x	x	x	x	x	x	x	x	x	x	
	Annual Movement Patterns (timing)	x	x	x	x	x	x	x	x	x	x	
	Bull Trout Genetic Testing	x	x	x	x	x	x	x	x	x	x	
Operational Procedures for Effectiveness	Weir Modes Notch vs. Orifice	x	x	Orifice Mode Only			Orifice; then alternating modes 4 weeks when water > 19 °C	Notch Mode Only	TBD	TBD	TBD	
	Attractant Flow (AF) & Radio Telemetry (RT)	x (no RT)	x (no RT)	x (max AF, no RT)								
Length of Delay	Upstream Movement Patterns, Timing & Behavior (Delay)	x	x	x	x	x	x	x	x	x	x	
Fallback	Fallback	x	x	x	x	x	x	x	x	x	x	
Reporting Requirements	Annual Reporting (April 1 – FERC Submittal)	x	x	x	x	x	x	x	x	x	x	
	5-year Fish Passage Evaluation Plan Report	Accomplished through Annual Reports – No Longer a Separate Requirement for 2015 <sup>1</sup>						-	-	-	-	-
	10-year Fish Passage Evaluation Plan Report (Dec 31, 2020 – TAC/FWS Submittal)	-	-	-	-	-	-	-	-	-	x	

<sup>1</sup> NorthWestern and FWS concur that the 5-year Fish Passage Evaluation Plan, per TC 7b and scheduled for submittal in 2015, was not necessary due to the comprehensive annual reporting. NorthWestern filed a letter to the Commission on December 17, 2014 summarizing the modifications that FWS and NorthWestern discussed and agreed to implement with regards to the upstream fish passage terms and conditions described in the BO. FERC issued a letter on February 25, 2015 approving the modifications.

### **10.2.1 Effectiveness of the Ladder and Operations**

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

The ladder was initially designed to operate with flows up to 48,000 cfs. Subsequently, the ladder has operated with streamflows exceeding 75,000 cfs and the ladder has also recorded fish ascending the ladder when flows were approximately 69,000 cfs. However, the ability to attract fish appears to decline when streamflows exceed 43,000 cfs. Ladder operation during spring flows is primarily dependent on debris and sediment loading. As in previous years, the ladder will be operated in 2017 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, as well as a short 4-week period in July 2016. In 2011 and 2012, weir modes were alternated weekly. The results from 2011 and 2012 (PPL Montana 2012, 2013) indicate fish ascend the ladder in both modes, but more fish and a greater variety of species are likely to pass in orifice mode. During the 2013, 2014, and 2015 seasons, the ladder operated in orifice mode with a greater number of fish ascending each year. In 2016, NorthWestern began the season with the ladder operating in orifice mode and then alternated weir mode (orifice and notch) weekly when water temperatures were equal to and exceeded 19 °C for a 4-week period in July. The 2016 results supported findings from 2011 and 2012 that more fish ascended the ladder in orifice mode and fewer non-salmonids (specifically Smallmouth Bass) ascended the ladder in notch mode. In 2017, NorthWestern will operate the ladder in notch mode for the entire season to further evaluate fish movement in the ladder.

The attractant flow study began in 2011. The Licensee originally proposed to use the first 3 years of ladder operations (2011-2013) to test variable attraction flows and learn operations. Based on observations in the first 2 years of study, the Licensee concluded that during non-spill time periods, the HVJ and AWS should be operated at maximum capacity to provide sufficient flow to allow fish to migrate upstream through the natural falls which is present downstream of the Main Channel Dam. NorthWestern proposes to continue to use near maximum attractant flow during 2017 operations.

### **10.2.2 Evaluation of Fish Movement Patterns, Timing, and Behavior**

Fish movement patterns, timing, and behavior are evaluated through biological data collected at the ladder and radio telemetry data, when available. Bull trout captured in 2017 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) and released in Region 4; Region 3 fish will be released in Region 3, accordingly.

In 2014, there was a substantial influx of Smallmouth Bass and Mountain Whitefish recorded at the Thompson Falls fish ladder. During the annual TAC meeting in 2014, the TAC agreed that NorthWestern will PIT tag Mountain Whitefish and Floy tag Smallmouth Bass (equal or greater than 275 mm) recorded at the ladder in 2015. The tagging efforts in 2015, resulted in 1,107 Smallmouth Bass Floy-tagged and 54 Mountain Whitefish PIT-tagged at the ladder. In 2015, the TAC agreed to discontinue Floy tagging Smallmouth Bass in 2016, but continue PIT tagging Mountain Whitefish in 2016. The same protocol implemented in 2016 is proposed for 2017.

The TAC has concluded that no radio telemetry studies will be conducted by NorthWestern in 2017. Therefore, assessment of fish movement patterns, timing, and behavior will be conducted by monitoring fish PIT-tagged at the ladder and monitoring PIT tag detections via the remote array in the mainstem of the Thompson River. These studies will allow for an assessment of the length of time for Bull Trout to ascend the ladder and movement patterns. In addition, no electrofishing or tagging of fish below Thompson Falls Dam is proposed for 2017.

### **10.2.3 Evaluation of Fallback**

The potential fallback of Bull Trout after ascending the ladder and moving into the Thompson Falls Reservoir will be evaluated on an annual basis. Bull trout are PIT tagged at the ladder prior to being released upstream. The remote arrays in the ladder will be used to monitor for previously PIT-tagged fish and to evaluate fallback.

## **10.3 5-Year Reservoir Monitoring Plan**

The Licensee was scheduled to submit a comprehensive report to FWS in 2015 to summarize data collected between 2010 and 2015, as well as provide recommendations for improving emigrating juvenile Bull Trout survivorship and evaluate the site-specific need for a nonnative species control program in the Thompson Falls Reservoir per the TCs 5a and 5b in the BO. However, the schedule for the summary report in 2015 and recommendations for any additional programs and/or efforts was modified. In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BO TCs 5a, 5b, and 7b. A letter of concurrence from FWS along with the proposed changes, were filed with the Commission on December 17, 2014. FERC approved the proposed modifications in a letter dated February 25, 2015. The modifications include removing the comprehensive summary of activities associated with the 5-Year Reservoir Monitoring Plan (due at the end of 2015) because this requirement was achieved through the annual reports since 2011 and postponing the development of any recommendations "*for a nonnative species control program in the Thompson Falls Reservoir*" from the end of 2015 until December 31, 2020 (formal filing to the Commission) to allow for the completion and full review of the results from the 2014 to 2015 study evaluating out migration of

juvenile Bull Trout from the Thompson River. A detailed analysis of the results from the 2014 and 2015 field data collection are anticipated to be submitted to the TAC in 2017 in the form of a Master's of Science (M.S.) thesis.

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

## **10.4 Total Dissolved Gas Control Plan and Gas Bubble Trauma Monitoring**

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

In 2017, the Licensee will implement the following protocol for TDG monitoring:

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

In 2017, NorthWestern will monitor TDG, if appropriate, based on the above protocol. In addition, NorthWestern will operate the spillways in accordance with the TDG Control Plan. Minor modifications of the spillway operating schedule may be made to enhance fish attraction to the fish ladder during the low flow season.

Past GBT monitoring (2008-2014) in the Project area over various flows (57,000-104,000 cfs) and TDG levels resulted in limited findings of fish with symptoms indicating GBT. Therefore, the TAC agreed that continuing GBT monitoring provided minimal gains and the existing dataset (2008-2014) was adequate and no additional GBT monitoring was implemented in 2015-2016 or proposed for 2017. Therefore, no GBT monitoring in fish downstream of Thompson Falls Hydroelectric Project is proposed for 2017.

## **10.5 TAC Proposals for 2017 Funding**

Following the annual TAC meeting held on December 6, 2016, two proposals for the 2017 calendar year were submitted via email to the TAC for review. One proposal requested funding (\$10,000) for Bull Trout genetics analysis and the second proposal requested funding (\$16,500)

to continue to support the Thompson River Watershed Coordinator position in 2017. Both proposals were unanimously approved via email by the voting TAC members (NorthWestern, FWS, FWP, and CSKT). NorthWestern will distribute any new proposal(s) submitted during the year to the TAC members for review and approval. Any proposals approved by the TAC for implementation and funding in 2017 will be described in next year's annual report.

## 11.0 Acknowledgements

---

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

## 12.0 References

---

- Bernall, S. and K. Duffy. *In progress*. Upstream Fish Passage Studies Annual Progress Report – 2016, Fish Passage / Native Salmonid Program, Appendix C. Report to Avista Corporation, Corporation, Noxon, Montana.
- Adams, B., J. Von Bargen, and B. Prom. *In progress*. Genetic Analysis of Native Salmonids from the Lake Pend Oreille and Clark Fork River System, Idaho and Montana - Annual Report for Calendar Year 2016. U.S. Fish and Wildlife Service, Abernathy Fish Technology Center, Conservation Genetics Program. Report to Avista Corporation, Noxon, Montana.
- Federal Regulatory Energy Commission (FERC). 2015. Modifications of reporting requirements of Commission’s February 12, 2009 Order Approving Construction and Operation of Fish Passage Facilities.
- 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.

NorthWestern Energy. 2016. 2015 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869. Submitted to FERC, Washington D.C.

NorthWestern Energy. 2015. 2014 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869. Submitted to FERC, Washington D.C.

PPL Montana. 2014. 2013 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869. Submitted to FERC, Washington D.C.

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. 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.