NWE-THF-4691

Electronically filed

Debbie-Anne A. Reese
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

March 27, 2026

Re: NorthWestern Energy Files 2025 Annual Activity, Fish Passage, and Bull Trout Take Report for Thompson Falls Hydroelectric Project (1869)

Dear Secretary Reese,

Pursuant to Item D of the Commission Order issued February 12, 2009, NorthWestern Energy (NorthWestern) hereby submits its 2025 Annual Activities, Fish Passage, and Bull Trout Take Report for the Thompson Falls Project. This report was completed in consultation with the U.S. Fish and Wildlife Service (USFWS), Montana Fish, Wildlife and Parks (MFWP), and the Confederated Salish and Kootenai Tribes (CSKT).

The USFWS approval signature, provided under its Section 7 Terms and Conditions authority, is included on page two of the report and documents USFWS concurrence with the report and its filing with the Commission.

Please contact Jon Hanson at 406-542-5961 or Jon.Hanson@NorthWestern.com with any questions.

Sincerely,

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The U.S. Fish and Wildlife Service has reviewed and by signature below, approves this Thompson Falls Project 2025 Annual Activity, Fish Passage and Bull Trout Take Report filing with the Commission.

By: JACOB MARTIN Digitally signed by JACOB MARTIN Date: 2026.03.26 16:56:13 -06'00'

Jacob Martin

Title: Deputy Office Supervisor, USFWS

Montana Ecological Services

2025 Annual Report
Fish Passage Project

Thompson Falls Hydroelectric Project

FERC Project Number 1869

NorthWestern® Energy

Delivering a Bright Future

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

Submitted by:
NorthWestern Energy Corporation
Butte, Montana

March 2026

NorthWestern would like to thank the Technical Advisory Committee for their review of this report. We appreciate their collaborative efforts in monitoring and reporting 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 at https://northwesternenergy.com/clean-energy/hydropower/thompson-falls-hydro-project/annual-reports-ferc-orders

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Acronyms

%	Percent
Avista	Avista Corporation
AWS	auxiliary water system
BiOp	Biological Opinion
BULL	Bull Trout
BL BH	Black Bullhead
BL CR	Black Crappie
°C	degrees Celsius
CFR	Clark Fork River
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
EBx BULL	Brook x Bull Trout hybrid
EF	electrofishing
FERC	Federal Energy Regulatory Commission
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
hrs	hours
HP	holding pool
kg	kilogram
km	kilometer
L	length
fish ladder or ladder	Thompson Falls Upstream Fish Passage Facility
Licensee	NorthWestern Energy Corporation
LL	Brown Trout
LP	lower pool
LWF	Lake Whitefish
LT	Lake Trout
LMB	Largemouth Bass
LS SU	Largescale Sucker
LN SU	Longnose Sucker
MOU	Memorandum of Understanding
mm	millimeter
MDEQ	Montana Department of Environmental Quality
MWF	Mountain Whitefish
N	number

NorthWestern	NorthWestern Energy Corporation
NP	Northern Pike
NPMN	Northern Pikeminnow
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
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
Wt	weight
WCT	Westslope Cutthroat Trout
WF	West Fork
YP	Yellow Perch
YL BL	Yellow Bullhead

Section 1.0 – Introduction

NorthWestern Energy Corporation (NorthWestern) is owner and operator of the Thompson Falls Hydroelectric Project FERC No. 1869 (Project). The Project is located on the Clark Fork River, near Thompson Falls in Sanders County, Montana. Preliminary development of the Project began in June 1912, by the Thompson Falls Power Company. Construction commenced in May 1913 and the first generating unit was placed in service on July 1, 1915. The sixth generating unit was placed in service in May 1917 (the addition of a new powerhouse and a seventh generating unit in 1993). Montana Power Company acquired the Thompson Falls Project in 1929.

The Federal Energy Regulatory Commission (FERC or Commission) License was issued to Montana Power Company in 1979 (purchased by PPL Montana, LLC in 1999 and subsequently purchased by NorthWestern in 2014) and expired on December 31, 2025. An annual operating license was issued by FERC on January 16, 2026 in accordance with the terms and conditions of the prior license. In 2009 and 2010, the Licensee constructed the Thompson Falls Upstream Fish Passage Facility (fish ladder or ladder). Operations of the fish ladder commenced in 2011 and continue seasonally between March and October.

NorthWestern has prepared this report to fulfill the annual compliance reporting requirement per Term and Condition (TC) 7a of the 2008 U.S. Fish and Wildlife Service (FWS) Biological Opinion (BiOp). A summary of the 2025 operational season at the fish ladder, baseline fisheries monitoring, summary of compliance with the 2008 FWS's BiOp, and summary of incidental take for Bull Trout is provided in this report.

This document will be made available on the Project website and distributed to theThompson Falls Technical Advisory Committee (TAC) members. Previous annual reports are available on the Project website, https://www.northwesternenergy.com/clean-energy/hydropower/thompson-falls-hydro-project/annual-reports-ferc-orders. NorthWestern will continue to prepare and submit annual reports to the Commission through the term of the existing license.

Section 2.0 – Upstream Fish Passage Facility

Section 2.1 – Ladder Operations and River Conditions

The 2025 fish ladder operational season began March 21 and ended October 30. Peak flows were well below average (<60,000 cfs), which allowed ladder operations to continue throughout the spring. The facility was operated for 224 days, and checked 160 times. The ladder operated in orifice mode during the entire season. The peak discharge in the Clark Fork River was approximately 35,700 cubic feet per second (cfs) on May 13, as measured by the United States Geological Survey (USGS) gage at Plains, Montana station #12389000.

In 2025, the water temperature in the ladder (pool 48) was recorded as a single measurement coinciding with each ladder check. The warmest water temperature recorded was 24 degrees Celsius (°C) on August 1. The mean daily streamflow (USGS station #12389000) is presented in Figure 1.

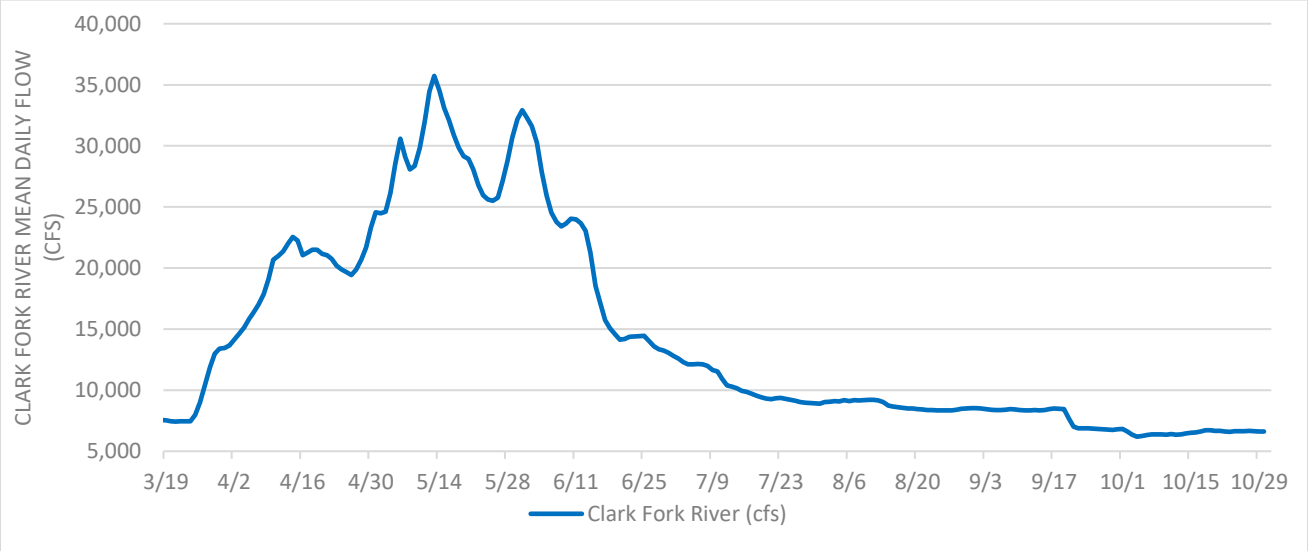


Figure 1. Mean daily streamflow in the Clark Fork River (USGS station#12389000), March – October 2025.

Section 2.2 – Upstream Fish Passage Results

Since the ladder opened in 2011, over 48,125 fish representing 16 species, and three hybrids have ascended the ladder (Table 1) and 41,699 fish have been released upstream (Table 2). A total of 4,369 fish ascended the ladder in 2025 representing 553 salmonids and 3,816 non-salmonids (Figure 2).

Table 1. **Total fish count, by species, for each year the ladder operated, 2011-2025.**
"-" indicate zero fish recorded for that year. * - fish were not passed upstream so fish count includes fish returning and ascending the ladder multiple times during the season.

Species by Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Grand Total
Largescale Sucker	418	1403	3041	2802	6327	2270	34	6	1018	805	823	631	441	1337	**2021**	**23,377**
Northern Pikeminnow	1000	926	387	1003	3356	707	66	10	180	41	150	35	24	21	**76**	**7,982**
Smallmouth Bass	135	34	8	1356	1244	1007	123	5	339	347*	856*	953*	839*	1105*	**1714***	**10,065**
Rainbow Trout	164	208	213	187	281	366	181	124	186	222	213	191	221	267	**223**	**3,247**
Brown Trout	28	42	111	81	184	204	108	63	210	123	249	195	236	238	**307**	**2,379**
Mountain Whitefish	17	24	2	254	54	8	-	4	4	11	3	6	-	1	**-**	**388**
Westslope Cutthroat Trout	21	21	48	36	37	36	14	14	21	33	20	9	15	21	**12**	**358**
Peamouth	-	-	-	-	122	2	-	-	-	-	-	-	-	-	**-**	**124**
Rainbow x Cutthroat hybrid	9	7	13	12	4	5	1	1	1	2	8	3	3	-	**2**	**71**
Longnose Sucker	10	-	2	1	26	6	-	-	-	-	-	-	-	1	**1**	**47**
Peamouth x Northern Pikeminnow hybrid	-	-	-	-	-	13	2	-	-	-	-	-	-	-	**-**	**15**
Bull Trout	2	2	5	1	2	3	1	-	1	1	1	2	2	-	**-**	**23**
Lake Trout	1	1	-	1	6	-	-	-	2	1	2	1	-	-	**-**	**15**
Brook Trout	-	-	-	1	2	1	-	-	-	1	1	-	-	-	**-**	**6**
Walleye	-	-	-	-	2	-	-	-	1	-	1	-	-	-	**4***	**8**
Largemouth Bass	-	-	-	-	-	1	-	-	-	-	-	-	-	-	**-**	**1**
Brook Trout x Bull Trout hybrid	-	-	-	-	-	1	-	-	-	-	-	-	-	-	**1**	**2**
Kokanee	-	-	-	-	-	-	-	-	-	-	1	-	-	7	**8**	**16**
Northern Pike	-	-	-	-	-	-	-	-	-	-	-	-	1	-	**-**	**1**
Salmonids	**242**	**305**	**392**	**573**	**570**	**624**	**305**	**206**	**425**	**394**	**498**	**407**	**477**	**534**	**553**	**6,505**
Non-Salmonids	**1,563**	**2,363**	**3,438**	**5,162**	**11,077**	**4,006**	**225**	**21**	**1,538**	**1,193**	**1,830**	**1,619**	**1,305**	**2,464**	**3,816**	**41,620**
Grand Total	**1,805**	**2,668**	**3,830**	**5,735**	**11,647**	**4,630**	**530**	**227**	**1,963**	**1,587**	**2,328**	**2,026**	**1,782**	**2,998**	**4,369**	**48,125**

Table 2. Total number of fish (salmonids and non-salmonids) released upstream of Thompson Falls Dam each year, 2011-2025.

Year	Fish Released Upstream		
	Salmonids	Non-Salmonids	Total
2011	239	1,484	1,723
2012	302	2,358	2,660
2013	386	3,432	3,818
2014	572	5,161	5,733
2015	558	11,062	11,620
2016	611	4,000	4,611
2017	297	225	522
2018	205	21	226
2019	414	1,188	1,602
2020	377	840	1,217
2021	489	971	1,460
2022	356	665	1,021
2023	456	464	920
2024	533	1,357	1,890
2025	**553**	**2,093**	**2,646**
Total	**6,348**	**35,321**	**41,669**

Cumulatively, most fish recorded at the ladder are Largescale Sucker followed by Smallmouth Bass (Table 1). Since 2017, Northern Pikeminnow numbers have declined substantially. Smallmouth Bass captures appear to be trending upward since 2019. Rainbow and Brown Trout, represent the largest group of salmonids with over 5,500 fish recorded at the ladder since 2011. Rainbow Trout counts remain relatively constant since 2011 and Brown Trout counts are trending up since 2011. Annual Brown Trout captures surpassed Rainbow Trout in 2025 for the fourth time in the last five years.

A total of 2,646 fish were released upstream of Thompson Falls Dam in 2025. The fish released upstream included 553 salmonids and 2,093 non-salmonids (including one Largescale Sucker that ascended the ladder twice in 2025), (Table 2). Fish not released upstream this year included 1,714 Smallmouth Bass, 4 Largescale Sucker (mortality), 1 Northern Pikeminnow (mortality) and 4 Walleye.

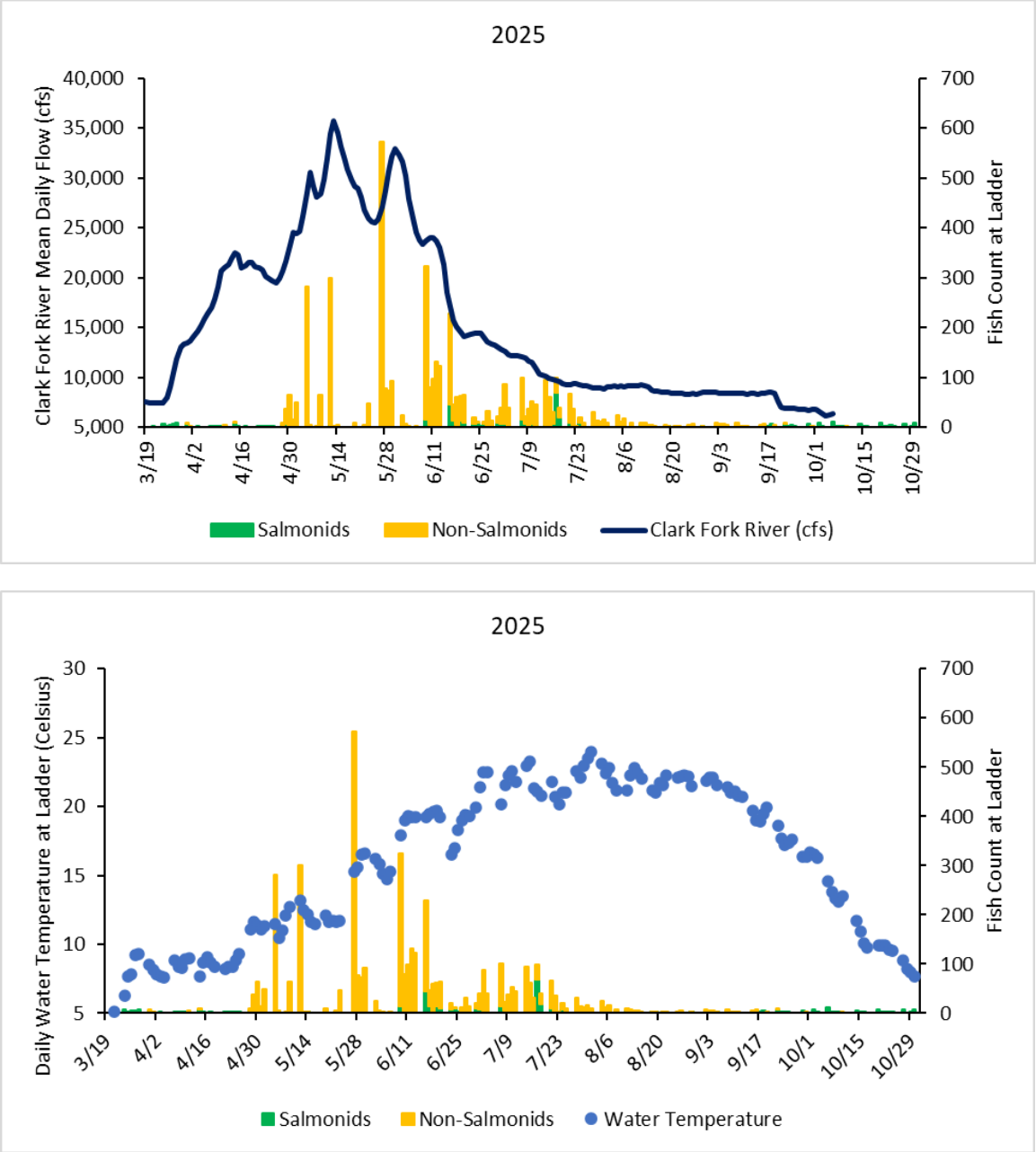


Figure 2. **Number of salmonids and non-salmonids recorded at the workstation each ladder check and the mean daily streamflow in the Clark Fork River (USGS station#12389000), top figure, and the corresponding water temperature in the ladder (degrees Celsius), bottom figure, March 19 through October 29, 2025.**

Section 2.3 – Bull Trout Detections in Project Area

In 2025, NorthWestern did not handle any Bull Trout in the Project Area. One hybrid Bull x Brook Trout was captured in the fish ladder on June 9th. The hybrid measured 297 mm in total length and weighed 218 grams, it was PIT tagged (#989001045667929) and released upstream. At the

time it was identified as a Bull Trout and released upstream. A genetic sample was taken and when results came back it was genetically identified as a hybrid. This is the first time a hybrid EBxBULL has been misidentified and passed upstream at the fish ladder. This hybrid was detected on the Thompson River PIT array on June 10, 2025.

Since the ladder opened in 2011, a range of zero to five Bull Trout (maximum of 5), has ascended the ladder annually. In 2025, one Bull Trout was detected entering the ladder and was detected at the ladder entrance and in pools 7/8. The Bull Trout was initially captured in 2021 in a gillnet in Lake Pend Oreille, and then in 2022 by Avista downstream of Cabinet Gorge Dam, transported upstream of Thompson Falls, and released in Region 4. The fish genetically assigned to the Thompson River drainage, Fishtrap Creek (Table 3).

Table 3. Summary of the Bull Trout detection and movement history for the Bull Trout detected entering the ladder in 2025.

BULL ID	Dates	Location/ Event	Length (mm)	Most Likely Population of Origin
	12/6/21	LPO Gillnet	621	Fishtrap Ck (R4)
	5/24/22	LCFR-ID Below CGD		
	5/27/22	Transport to Thompson River		
	6/20/22	Thompson River Array		
	9/14/22	Fishtrap Creek Array		
	9/17/22	Thompson River Array		
989001030299617/ 900228000078303	5/12/24	TFalls Ladder Entrance & LP		
	5/14/24	TFalls Ladder LP		
	5/15/24	TFalls LP & Entrance		
	6/22/24	TFalls Entrance		
	7/29/24	Prospect Creek Array		
	7/30/24	Prospect Creek Array		
	8/08/24	Prospect Creek Array		
	9/14/24	Prospect Creek Array		
	6/7/25	TFalls Ladder Entrance & LP		
	6/8/25	TFalls Entrance		
	8/6/25	Prospect Creek Array		
	9/14/25	Prospect Creek Array		

In total, during the 14 years of operation, 23 Bull Trout (representing 21 individuals) averaging 501 mm in length (range 285-620 mm) have ascended the ladder. Approximately 67 percent of the 21 unique individual Bull Trout ascending the ladder were genetically assigned to the Thompson River drainage (Fishtrap Creek or West Fork Thompson River) and approximately 29 percent of the Bull Trout ascending the ladder were genetically assigned to Fish Creek. Many of the Bull Trout assigned to the Thompson River drainage were subsequently detected in the Thompson River drainage via remote PIT tag array systems located in the mainstem and tributaries.

Section 2.4 – Fallback

Fallback is defined as a fish that ascends the ladder, receives a PIT, Floy, or other unique identification tag, is released upstream, and is later detected downstream of Thompson Falls Dam

over a short interval of time. The interval of time has been evaluated on a calendar year in past annual reports. TAC members have recommended a smaller interval of two weeks or one month as the threshold for evaluating fallback. However, detecting 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.

In 2025 no fallback fish were detected less than 30 days after passing the ladder. Six fish (4 RB, 1 NPM, 1 LSSU) were detected between 40 and 65 days downstream of the dam after their initial ladder ascent and release upstream (Table 4).

Table 4. Summary of 2025 fallback fish and the number of days between initial release upstream of the dam and subsequent detection downstream of the dam.

2025 Fallback	# of Days Between Release and Detection Downstream			
Species	**≤14 days**	**15 to 30 days**	**> 30 days**	**Total**
RB	-	-	4	4
NPMN	-	-	1	1
LSSU	-	-	1	1
Total	**0**	**0**	**6**	**6**

Section 2.5 – Fish Tagging at the Ladder

As per ladder operations protocol, salmonids are implanted with a PIT tag at the ladder workstation until temperatures reach and exceed 20°C. Once temperatures exceed 20°C, salmonids are checked for existing PIT tags, but no new tags are implanted. Tagging Bull Trout at these warmer temperatures is at the discretion of the ladder operators.

Remote PIT arrays are located at the fishway entrances (upper and lower), in the lower pools (Pool 7 and 8), and the top of the ladder or holding pool (Pool 45). These arrays detect fish as they swim through. The efficiency of these remote arrays is not 100 percent but is assumed to be very high. Most PIT-tagged fish detected were initially tagged after their first ladder ascent. Other potential sources of PIT-tagged fish in the system originate from:

- Avista's tagging efforts downstream of Cabinet Gorge Dam,
- Glaid's (2017) study of juvenile Bull Trout in the Thompson River, upstream of the Project,
- FWP PIT tagging activities in tributaries (upstream and downstream of the Project), and
- Fish behavior study of Brown and Rainbow trout in the Project area with PIT tagging (and radio tagging) occurring during fish collection activities upstream of the dam and at the ladder in 2021, 2022, and 2023.
- Submersible tag array study below dam in near field included PIT tagged fish downstream of Thompson Falls Dam in 2024 and 2025.

In 2025, there were 486 newly PIT-tagged fish at the ladder and 58 fish previously tagged recorded ascending the ladder. In total, 544 PIT-tagged fish were released upstream of the dam in 2025 (Table 5). The fish totals in Table 5 represent individual fish. There were 6 fish (5 RB, 1 NPMN, 1 LSSU) that ascended the ladder twice (referred to as "fallback" fish) in 2025. These fish are accounted for one time in Table 5. A summary of the number of PIT-tagged and non-tagged fish released upstream of the dam in 2025 is provided in Table 5.

Table 5. Summary of PIT-tagged fish at the Ladder in 2025, new individuals tagged at the ladder, returning fish to the ladder, and un-tagged fish released upstream.

Species	PIT Tagged in 2025	Tagged in Previous Year at Ladder	Total # PIT-Tagged Fish Released Upstream	Total # Non-tagged Fish Released Upstream	Total # of Individual Fish Released Upstream
BULL	-	-	-	-	-
EBxBULL	1	-	1	-	1
LL	177	18	195	112	307
RB	124	18	142	81	223
RBxWCT	2	-	2	-	2
WCT	11	1	12	-	12
MWF	-	-	-	-	-
KOK	5	-	5	3	8
Salmonids	**320**	**37**	**357**	**196**	**553**
N PMN	48	2	50	25	75
LS SU	117	19	136	1,880	2,016
LN SU	1	-	1	-	1
Non-Salmonids	**166**	**21**	**187**	**1,905**	**2,092**
TOTAL	**486**	**58**	**544**	**2,101**	**2,645**

Section 2.5.1 – Internal Fishway Efficiency

The Licensee has monitored movement of PIT-tagged-fish entering and ascending the ladder since 2011. Between 2011 and 2020, one limitation of the system was the first detection of a fish required the fish to enter the ladder and swim through the lower seven pools. Prior to the 2021 season, a PIT tag antenna was installed in the two entrances at the ladder and remained operational throughout the season. The 2021 data provide a more complete view of the number of tagged fish entering the ladder, moving to the lower pools (LP) seven and/or eight, and ascending to the top holding pool (HP). The first seven pools in the ladder operate in notch mode in contrast to the rest of the ladder that operates in orifice mode.

In 2025, the ladder operated in orifice mode for the entire season (including the lower seven pools). PIT arrays in the ladder detected a total of 171 individual fish. The majority of fish were either Largescale Sucker, Brown Trout or Rainbow Trout. Other species detected included Northern Pikeminnow, Bull Trout, Westslope Cutthroat Trout, and Longnose Sucker.

Salmonids are PIT-tagged at the ladder workstation annually. A total of 4,389 salmonids have been tagged since 2011, ranging from 175 to 525 tagged at the ladder per season. Non-salmonids were tagged at a lower frequency with a total of 281 fish PIT-tagged (NPMN, LSSU, LNSU) during four seasons (2011, 2017, 2018, 2019) and 298 PIT-tagged (LSSU, LNSU, NPMN) in 2024 and 2025.

Internal efficiency at the ladder evaluates what proportion of the PIT-tagged fish detected entering the ladder continued to the lower pools and holding pool (Table 6). Internal efficiency at the ladder has been measured using two different calculations. From 2011 through 2020, the remote PIT tag array system in the ladder provided detection information for the lower pools (LP) seven and/or eight and the holding pool (HP), also referred to as the top of the ladder. This initial calculation provided a quantitative assessment of the proportion of fish detected in the LP continuing to the HP (referred to as the *Initial Calculation Method* in Table 6). The new calculation method was implemented after the remote PIT-tag arrays were installed in the lower and upper entrances to the fish ladder in 2021 (referred to as the *New Calculation Method* in Table 6). The new calculation method quantifies the proportion of PIT-tagged fish detected entering the ladder and continuing to the LP and/or HP.

Since 2021, the calculation method accounts for fish entering the ladder. The initial calculation method (using LP and HP detection data) likely overestimates ladder efficiency for fish with a disproportionately higher overestimation for non-salmonids. Based on the new calculation method (using entrance, LP and HP detection data), the data indicate that after a fish enters the ladder, those fish that continue to the LP have a higher likelihood of continuing to HP.

The 2025 season is the first time the lower pools have been operated in orifice mode for the full season of fish capture. It is planned to continue to be operation in this configuration for the next couple of seasons to compare efficiencies in the lower section of the ladder between notch and orifice panel modes. Comparing the proportion of fish that made it from the fish entrance to the lower pool array between 2024 and 2025 indicates an increase in efficiency between the two different modes. Seventy five percent to 89% for salmonids and 42% to 61% for non-salmonids, respectfully. As additional information is collected in future years more robust analysis will be completed with the increasing sample size.

Salmonids appear to have a higher likelihood of reaching the LP compared to non-salmonids entering the ladder. In 2025, about 89 percent of tagged salmonids entering the ladder continued to the LP in contrast to nearly 61 percent of tagged non-salmonids entering the ladder reaching the LP (Table 6). Salmonids, primarily represented by Rainbow and Brown trout continue to display a higher level of internal passage efficiency compared to non-salmonids.

Table 6. Summary of 2025 PIT-tagged fish entering the ladder and proportion fish ascending the ladder, including the number of fish recorded in the entrance, lower pool (LP), top holding pool (HP); the percentage of all fish detected entering the ladder detected in the LP and HP; and the percentage of fish detected in the LP continuing to the HP.

Ladder detects	# Fish @ Entrance	# Fish in LP	# Fish in HP	New Calculation Method (since 2021)		Initial Calculation Method (2011-2020)
				% Fish in LP	% Fish in HP	% Fish in LP to HP
Salmonids	71	63	53	88.7%	74.6%	84.1%
Non-salmonids	99	60	35	60.6%	35.4%	58.3%
Unknown	1	0	0	None	None	None
Total	171	123	88	71.9%	51.5%	71.5%
Species	**# Fish @ Entrance**	**# Fish in LP**	**# Fish in HP**	**% Fish in LP**	**% Fish in HP**	**% Fish in LP to HP**
BULL	1	1	0	100.0%	0.00%	0.0%
LL	39	35	28	89.7%	71.8%	80.0%
RB	28	24	23	85.7%	82.1%	95.8%
WCT	3	3	2	100.0%	66.7%	66.7%
NPMN	8	3	3	37.5%	37.5%	100.0%
LS SU	89	57	32	64.0%	36.0%	56.1%
LN SU	2	0	0	None	None	None
Unknown	1	0	0	None	None	None
Total	171	123	88	71.9%	51.5%	71.5%

Section 2.5.2 – Ascent Times in Ladder

In 2025, a total of 84 ascent times were recorded via the remote tag arrays in the fish ladder (entrance and pool 45). The ascent time is determined by calculating the duration between the last detection at the entrance array and the first detection at the holding pool array (Table 7). A few fish were not detected by the entrance array; thus, no data were available for the calculation.

In 2025, the median ascent times for 50 salmonids was 2.4 hours, which is similar to previous years.

Table 7. Summary ascent information for 84 ladder fish in 2025, calculating the minimum, maximum, median, average time between the last entrance detection until the first holding pool detection by species.

Species	Number of Fish	Ascent Time (hours)			
		Min	Max	Median	Mean
LL	25	1.0	48.5	2.3	7.1
RB	23	1.2	23.3	2.7	4.2
WCT	2	1.3	2.6	2.0	2.0
Salmonids	**50**	**1.0**	**48.5**	**2.4**	**5.5**
NPMN	2	3.7	3.9	3.8	3.8
LS SU	32	2.7	60.6	4.3	7.0
Non-Salmonids	**34**	**2.7**	**60.6**	**4.2**	**4.2**

Section 2.6 – Ladder Fish Detections in the Thompson River Drainage

The Thompson River is located approximately six miles upstream of Thompson Falls Dam. A remote PIT-tag antenna array was installed in the mainstem of the Thompson River on September 26, 2014. In 2025, the mainstem Thompson River array operated continuously for most of the year but was offline from August 13 to August 20 due to power-source issues. The array does not detect fish directionality, but the fish's entry into the drainage can be inferred by cross-referencing the release date upstream of the ladder with the first detection recorded in the Thompson River.

In 2025, there were 292 unique individual fish detections in the Thompson River. The majority (~92%) of these fish ascended the ladder in 2025 or previous years, while 25 individuals had no ladder history (Table 8). Fish with no ladder history (25 individual fish) included those of South Fork Jocko origin (6 WCT), and those tagged during FWP electrofishing efforts in Thompson River (5 LS SU). Other fish were either tagged upstream of Thompson Falls Dam (10 BULL, 1 WCT) or transported by Avista upstream of Thompson Falls Dam from below Cabinet Gorge Dam (2 BULL). Brown and Rainbow Trout represent most ladder-fish detected in the Thompson River (64% LL, 32% RB). Similar proportions were documented in 2023 and 2024, which is expected because most salmonids recorded and PIT-tagged at the ladder comprise these two species. Of the 267 ladder-fish detected in the Thompson River in 2025, over half (61%) ascended the ladder in 2025, 27 percent last ascended the ladder in 2024, 6 percent last ascended in 2023, and 6 percent last ascended in the combined years of 2022, 2021, 2020, and 2017 (Table 9).

Table 8. Summary of 2025 Thompson River individual fish detections.

	Individual Fish Detected (2025)	
Fish Species	**# With Ladder History**	**# Without Ladder History**
EBxBULL	1	-
BULL	-	12
LL	172	-
RB	85	-
RBxWCT	2	-
WCT	6	7
LS SU	1	5
Unknown	-	1
Total	**267**	**25**

Table 9. Summary of the most recent year a fish was recorded at the ladder (2017, 2020, 2021, 2022, 2023, 2024, or 2025) for 267 individual fish detected in the Thompson River in 2025.

Fish Species	2017	2020	2021	2022	2023	2024	2025
BULL	-	-	-	-	-	-	-
EBxBULL	-	-	-	-	-	-	1
WCT	-	-	1	-	-	2	3
RB	-	1	2	2	6	36	38
RBxWCT	-	-	-	1	-	-	1
LL	1	4	-	5	9	34	119
MWF	-	-	-	-	-	-	-
LSSU	-	-	-	-	-	-	1
Total	**1**	**5**	**3**	**8**	**15**	**72**	**163**

There were 1430 daily detections at the mainstem Thompson River array representing the 267 unique ladder fish. The majority of the detections are from tagged Brown and Rainbow Trout. In 2025, a total of 544-tagged fish were released upstream of Thompson Falls Dam and 195-tagged fish were Brown Trout and 142-tagged fish were Rainbow Trout. Approximately 61 percent of the tagged-Brown Trout (119 of 195 LL) and 26 percent of tagged-Rainbow Trout (38 of 142 RB) released upstream of Thompson Falls Dam in 2025 were later detected in the Thompson River the same year. Additionally, one Bull Trout–Brook Trout Hybrid captured at the ladder was detected in the Thompson River.

A summary of the daily detections representing the 267-ladder fish (by species) and mean daily streamflow in the Thompson River (USGS gage #12389500) is provided in Figure 3. Spring runoff flow in the Thompson River peaked on May 5, 2025, at approximately 831 CFS. Flow in the Thompson River peaked on December 11, 2025, at 1800 cfs. Flows peaked in December due to

a significant rainfall event, followed by widespread flooding in Western Montana. Rainbow and Brown Trout were observed in the mainstem Thompson River year-round. Peak daily detections for Rainbow Trout occurred in September, while those for Brown Trout were highest in June (Figure 3).

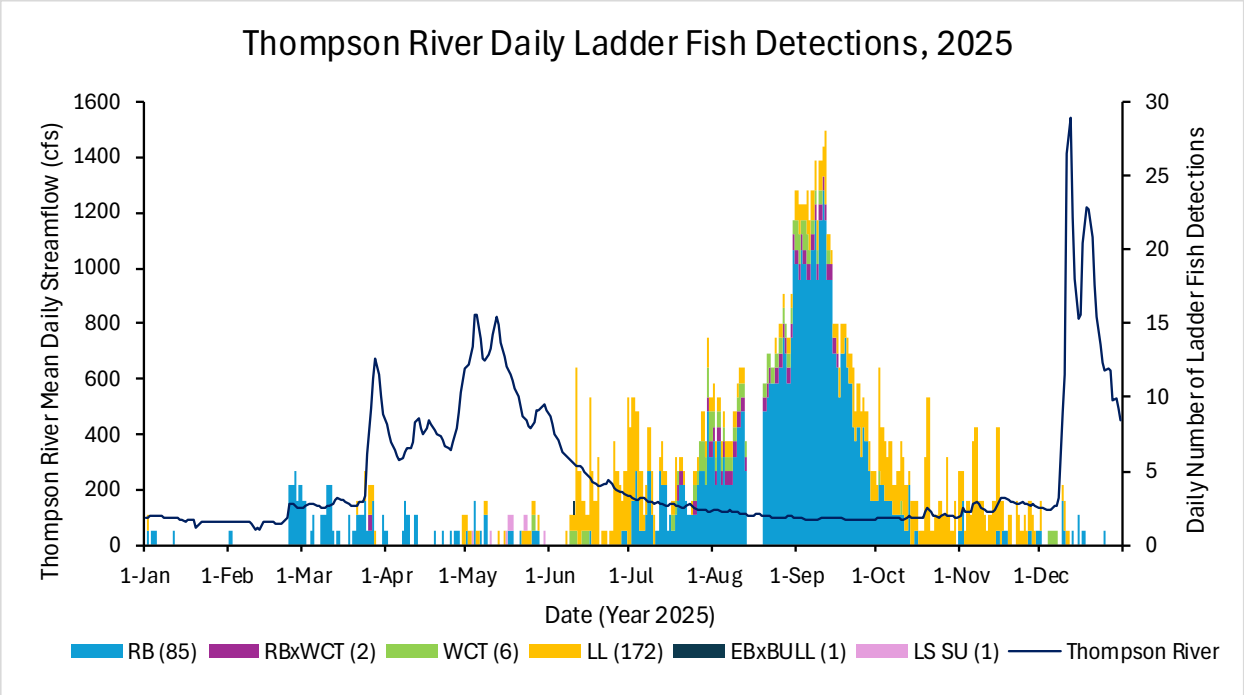


Figure 3. Summary of daily PIT tag array detections representing 267 individual ladder fish and the mean daily streamflow in Thompson River, 2025.

Section 2.6.1 – West Fork Thompson River and Fishtrap Creek

FWP also operates one PIT-tag array in Fishtrap Creek and one array in West Fork Thompson River, both Bull Trout spawning tributaries in the Thompson River drainage. These arrays have functioned sporadically since installation (2014 in West Fork Thompson River; 2015 in Fishtrap) due to various challenges with batteries and access. Data collection has been more continuous since 2021. The number of ladder fish detected in the tributaries remains relatively low, one to eight salmonids a year (Table 10), compared to the number of PIT-tagged fish released upstream annually, 175 to 525 salmonids a year.

In 2025, there were eleven individual ladder fish detected in the tributaries: six fish in West Fork Thompson River (1 RB, 5 LL), and five fish in Fishtrap Creek (1 RB, 1 RBxWCT, 3 LL). Six Brown Trout and one Rainbow-Westslope Cutthroat Trout hybrid ascended the Thompson Falls fish ladder in 2025, one Rainbow Trout ascended the ladder in 2024, and the other Rainbow Trout ascended the ladder in 2022, 2023, and 2024.

Table 10. Summary of ladder fish, by species detected in Fishtrap Creek and West Fork Thompson River, 2014 – 2025.

Year	BULL	WCT	RBxWCT	RB	LL	Total
2014	-	-	-	-	1	**1**
2015	1	-	-	-	1	**2**
2016	-	-	-	2	5	**7**
2019	-	1	-	1	2	**4**
2020	-	1	-	3	-	**4**
2021	1	2	-	3	2	**8**
2022	2	1	-	3	1	**7**
2023	1	-	-	1	3	**5**
2024	1	2	-	2	1	**6**
2025	**0**	**0**	**1**	**2**	**8**	**11**

Section 2.7 – Ladder Fish Detections in Prospect Creek

Prospect Creek is located about one-half mile downstream of Thompson Falls Main Dam. In August 2018, NorthWestern Energy and Avista partnered to fund and install a remote PIT-tag array system in Prospect Creek (near the confluence with the Clark Fork River) with the capability of detecting directionality of upstream and downstream fish movement. There were some technical challenges with the array system, and it is unclear how efficient the system was at detecting PIT-tagged fish.

In 2025, the Prospect Creek array recorded 59 daily detections representing 23 individual fish (12 WCT, 6 RB, 2 BULL, 3 LL), shown in Figure 4. Approximately half of the fish (6 RB, 1 BULL, 3 LL) had a ladder history, either ascending the ladder or entering the ladder with no ascent. The Westslope Cutthroat Trout were part of a salvage and transport program MFWP implements annually in Prospect Creek.

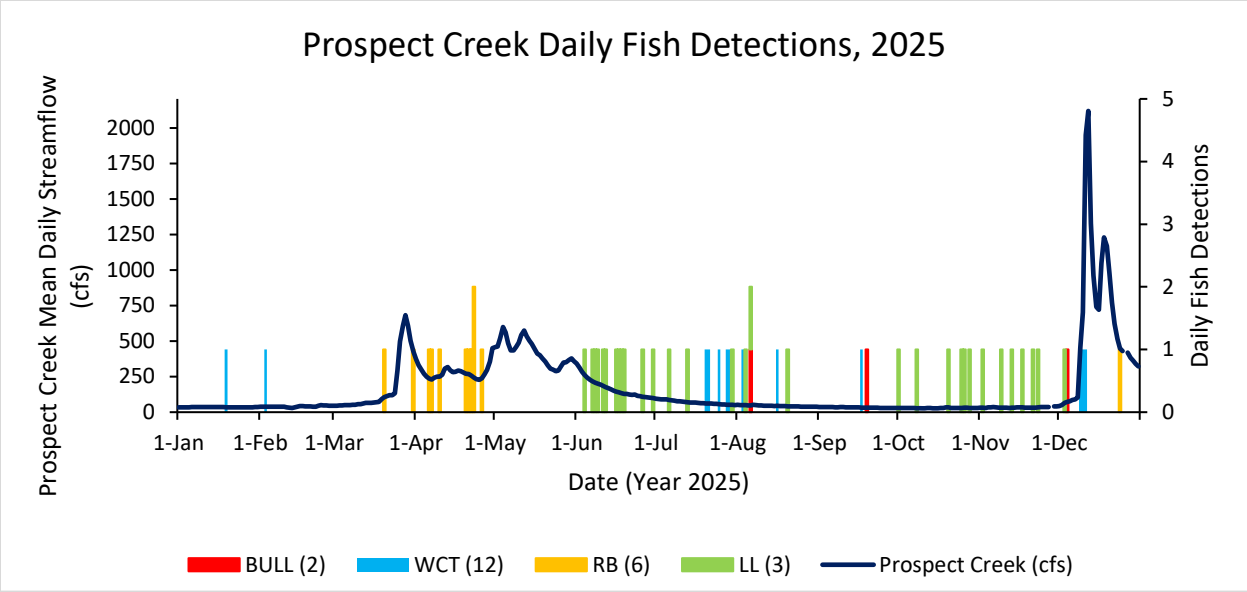


Figure 4. Summary of all daily PIT tag array detections by species (with number of individual fish) in Prospect Creek and mean daily streamflow, 2025.

The daily detections of the 23 individual fish with the mean daily stream flow for Prospect Creek (USGS gage #12390700) is provided in Figure 4. Peak mean daily flow was approximately 2120 cfs on December 12, nearly four times the mean daily peak flow in 2024 (612 cfs). Flows peaked in December due to a significant rainfall event, followed by widespread flooding in Western Montana. Rainbow Trout are detected at the mainstem array in the spring, March through early May, and Bull Trout are detected in the summer (August and September) when mainstem Clark Fork River temperatures exceed optimal temperatures for Bull Trout.

Section 2.8 – Ladder Fish Detections by Angler Reports

Beginning in 2017, salmonids recorded at the ladder workstation receive a Floy tag that is visible to anglers, prior to being released upstream of the dam. FWP contact information is provided on each Floy tag. This section summarizes salmonid recaptures reported by anglers to FWP following passage at the ladder.

Since 2017, anglers have reported catching 145 salmonids that have ascended the fish ladder at the Thompson Falls Dam. In 2025, anglers reported capturing 22 salmonids with Floy tags and history ascending the Thompson Falls fish ladder (Table 11).

In 2025, anglers reported catching 22 individual Floy-tagged fish. All captures occurred upstream of Thompson Falls Dam, with 54 percent from the Thompson River drainage (10 LL, 1 RB, 1 WCT). One rainbow trout was captured at the mouth of Cherry Creek, a relatively short distance above Thompson Falls Dam. Additional reported fish (5 RB, 1 WCT, 1 LL) were captured further upstream in the Clark Fork River near St. Regis and Missoula, as well as near middle Clark Fork tributaries, including Dry Creek, Tamarack Creek, and Petty Creek. One Rainbow Trout was captured near the Russel Gates Fishing Access Site on the Blackfoot River. Another Rainbow was captured nearby, at the confluence of the Blackfoot River and the Clark Fork River near the old Milltown Dam.

Table 11. Summary of Floy-tagged salmonids reported by anglers since 2017 (FWP, unpublished). Angler reports include fish caught upstream and downstream of Thompson Falls Dam.

Species	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
LL		1	3	6	5	7	5	14	11	52
RB	1		9	12	15	15	9	14	9	84
WCT		1	1	2	1	1		4	2	12
RBxWCT							1			1
Total	**1**	**2**	**13**	**20**	**21**	**23**	**15**	**32**	**22**	**145**

Angler reported data continue to demonstrate the large geographical area fish are utilizing, both upstream and downstream of Thompson Falls Dam (Figure 5). Angler reports from the past include a geographical extent of 190 miles upstream of the dam to the confluence of the Clearwater in the Blackfoot River as well as other long forays to the Jocko River in the Lower Flathead River, and to the middle Clark Fork River near the towns of St. Regis, Alberton, and Missoula.

The majority of angler reports are from upstream of Thompson Falls Dam, in the mainstem Clark Fork River and Thompson River drainages (Figure 5). Downstream, fish historically have been caught at the mouth of Prospect Creek extending downstream in Noxon Reservoir to Vermilion Bay and White Pine Creek, including downstream of Cabinet Gorge Dam.

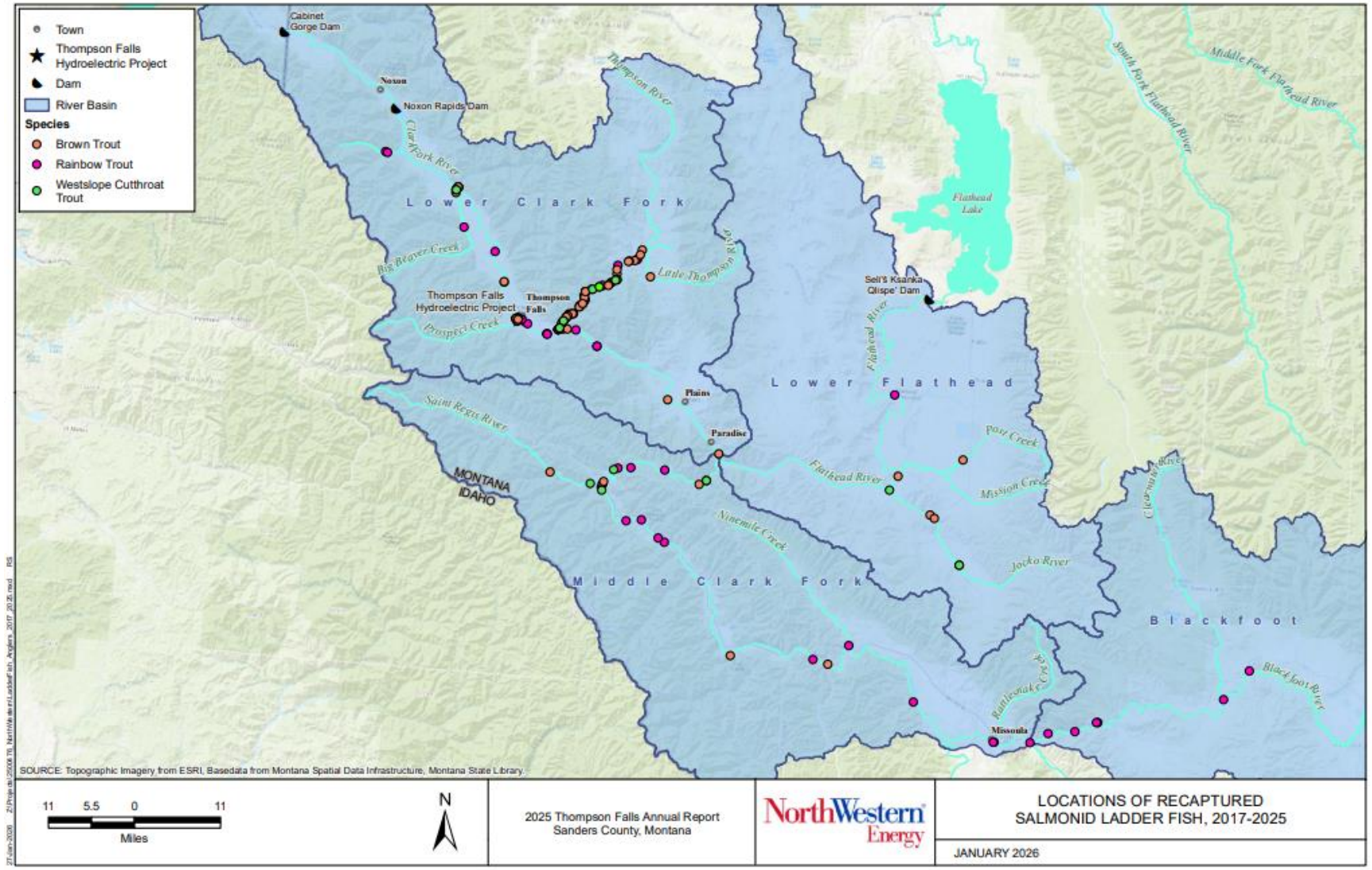


Figure 5. Summary of angler reports of recaptured salmonid ladder fish, 2017-2025.

Section 3.0 – Baseline Fisheries Surveys

The baseline fisheries surveys were set up with the intention of monitoring the impact of fishes passed upstream of Thompson Falls Dam. The objective for these sampling efforts is to establish baseline information on species composition and relative abundance within and upstream of the Thompson Falls Reservoir. This information helps track annual and long-term changes to the fish community, and if there is a measurable relation to the operation of the full-height fish ladder at the Project and upstream passage of over 41,000 fish since 2011 (*refer to* Table 2).

Baseline fisheries data collection includes electrofishing the Thompson Falls Reservoir (upper and lower sections) in the spring, electrofishing two reaches in the Clark Fork River (above the islands and between Paradise and Plains, Montana) in the fall, and fall gillnetting in Thompson Falls Reservoir. Monitoring via electrofishing began in 2009 in the Thompson Falls Reservoir and in 2010 in the Clark Fork River. Gillnetting in the Thompson Falls Reservoir has occurred annually each October, since 2004. In 2016 the TAC agreed to modify the frequency of the baseline surveys starting in 2017. Gillnet sampling continues to be annual, while electrofishing occurs every other year. A schedule of baseline fisheries monitoring is provided in Table 12. This section provides a summary of the 2025 fall gillnetting survey.

Table 12. Baseline fisheries monitoring schedule 2022 through 2026.

Year	A	B	C
2022	X	X	X
2023			X
2024	X	X	X
2025			X
2026	X	X	X

A = Thompson Falls Reservoir electrofishing, Spring (upper and lower sections)
B = Clark Fork River electrofishing, Fall (Paradise-to-Plains and Above Islands)
C = Gillnetting Thompson Falls Reservoir, Fall

Between 2011 and 2025, a total of 42 ladder fish (1 fish in 2025) have been recorded during the baseline surveys, including 30 Rainbow Trout, nine Brown Trout, and two Westslope Cutthroat Trout, and one Northern Pikeminnow. The 41 fish represent 16 fish captured in the Clark Fork River above the islands complex reach, 14 fish captured in the upper section and five fish captured in the lower section of the Reservoir, three fish captured in the Paradise to Plains reach, and four fish captured gillnetting in the Reservoir. The baseline surveys have captured approximately one percent of salmonids PIT-tagged at the ladder (and released upstream) between 2011 and 2025.

Section 3.3 – Thompson Falls Reservoir Gillnetting

NorthWestern deploys nylon multifilament experimental sinking gillnets, 125 feet long and 6 feet deep, with five separate 25-foot panels consisting of 0.75-inch, 1-inch, 1.25-inch, 1.5-inch, and 2-inch bar-measure square mesh. Most years 10 nets are deployed annually in October with results varying between 33 to 231 fish representing six to nine species. In 2025, nine nets were deployed (net sites 1-6, 8-10). The site for net #7 was not used in 2024 and 2025 (and will be removed from future sample events). The location for net #7 has been unproductive in catching fish and has proven to be a less-than-optimal location for fishing and often difficult to recover. The 2025 gillnet sampling sites in the Thompson Falls Reservoir are shown in Figure 6.

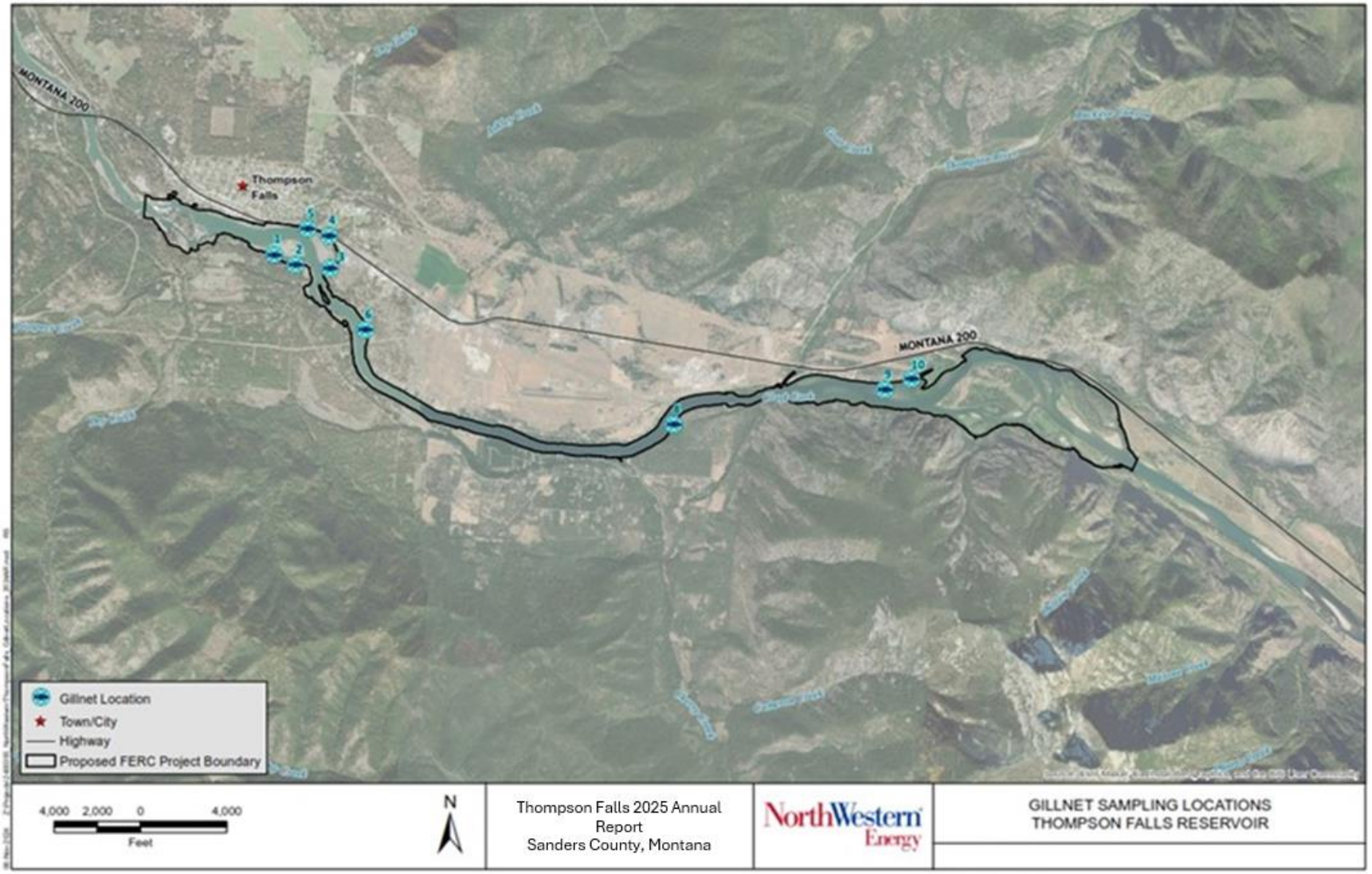


Figure 6. 2025 Gillnetting sampling locations near Thompson Falls, Montana.

The catch per net, by species from 2025 compared to the average, minimum and maximum catch per net between 2004 and 2024 is shown in Table 13.

Table 13. Catch per net, by species, during annual October gillnetting series on Thompson Falls Reservoir in 2025 and the 2004-2024 average, minimum, and maximum catch per net. A dash indicates no (zero) fish of that species was captured.

Species	2025 Catch per Net	2004-2024 Catch Per Net		
		Avg	Min	Max
BL BH	0.2	2.6	-	14.1
BL CR	-	-	-	0.1
LL	-	-	-	0.2
LMB	0.4	0.1	-	0.4
LN SU	-	-	-	0.5
LS SU	-	0.6	-	1.3
LWF	-	-	-	0.1
MWF	-	-	-	0.1
NP	11.6	3.3	1.0	11.6
NPMN	0.8	0.5	-	1.0
PEA	-	-	-	0.1
PUMP	0.7	0.4	-	2.5
RB	-	0.1	-	0.4
SMB	0.7	0.2	-	0.7
WCT	-	-	-	0.2
YL BH	-	-	-	0.1
YP	8.1	1.4	0.1	8.1
Total	**22.5**	**8.5**	**3.3**	**23.1**

In 2025, nets were set October 6 and pulled approximately 23.1 hours later October 7. There were 202 fish captured representing seven species (BL BH, LMB, NP, N PMN, PUMP, SMB, YP). The total catch per net (22.5 fish/net) was above average for the period of record (Figure 7).

In 2025, the most common species recorded in the reservoir were Northern Pike and Yellow Perch (Table 13). During the 2025 gillnet surveys, one PIT-tagged Northern Pikeminnow was collected. Since ladder operations commenced in 2011, four tagged ladder fish have been collected (1 N PMN in 2025; 1 RB in 2021; 1 RB in 2012; 1 LL in 2012).

In general, salmonids are rarely observed in Thompson Falls Reservoir gillnet catches. The most common species consistently observed in Thompson Falls Reservoir is Northern Pike with 11.6 fish caught per net in 2025 and an average of 3.3 fish per net between 2004 and 2024 (Table 13). Black Bullhead presence was greater during surveys completed between 2004 and 2007 and between 2015 and 2017, with catch per net ranging from 2.8 to 14.1 fish per net. In 2025 (as in 2024 and 2023), Black Bullhead numbers were low, with catch values below 0.3 fish per net.

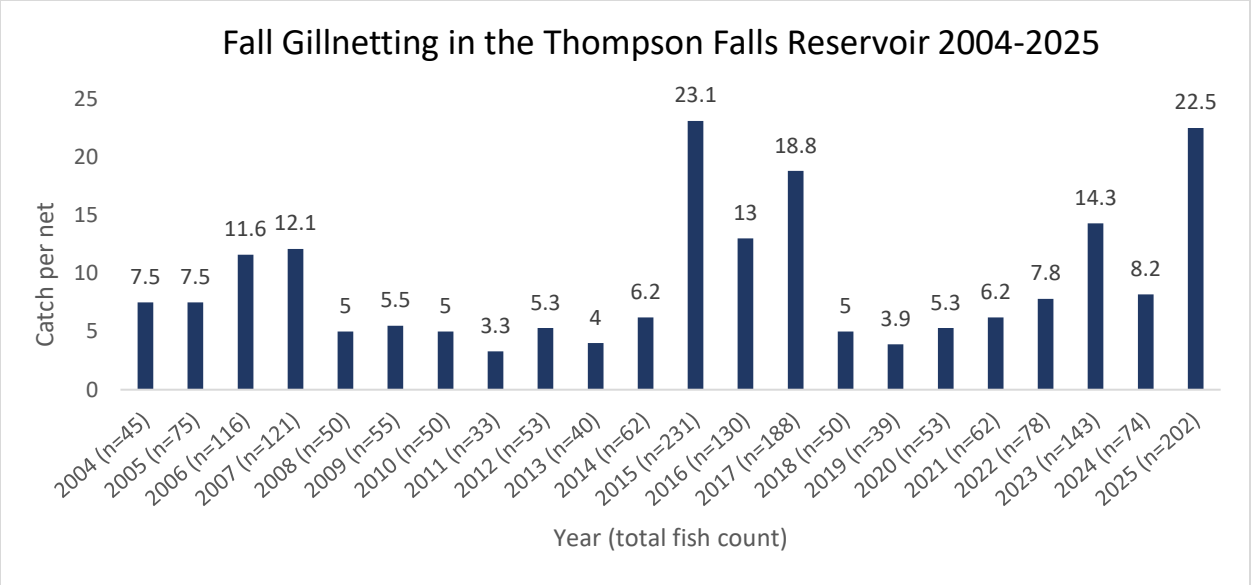


Figure 7. **Summary of catch per net during annual gillnetting efforts in Thompson Falls Reservoir, 2004-2025. The values overhead the bars indicate the catch per net value.**

Section 4.0 – Total Dissolved Gas (TDG) Monitoring

In 2010, the Total Dissolved Gas Control Plan (TDG Control Plan) (PPL Montana, 2010a) for the Project was submitted to and approved by the Montana Department of Environmental Quality (MDEQ). NorthWestern continues 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 per the TDG Control Plan. The Thompson Falls TDG Control Plan was updated in 2024 to encompass changes to project infrastructure (NorthWestern, 2024)

TDG monitoring at the Project is normally conducted in years where the most probable (50 percent) April 1 Natural Resources Conservation Service (NRCS) runoff forecast for the U.S. Geological Survey (USGS) Clark Fork River near Plains, Montana stream gage (12389000) is at or above 125 percent. This trigger value was agreed upon in 2013 by NorthWestern, DEQ, the US Fish and Wildlife Service (USFWS), and the Thompson Falls Fisheries Technical Advisory Committee (TAC).

In years where the April 1 trigger value has been met, NorthWestern monitors TDG throughout the spring runoff season (April-July) at the three established monitoring sites: 1) Above Dam, 2) High Bridge, and 3) Birdland Bay Bridge (Figure 8). The High Bridge monitoring site captures information on TDG at a location that is downstream of the Main Dam spillway and the falls but is upstream where the Dry Channel Dam spill enters the river channel. The Birdland Bay Bridge monitoring site captures information on the level of TDG entering Noxon Rapids Reservoir.

In 2025, the April 1 runoff forecast for the USGS Clark Fork River near Plains stream gage (12389000) was 86% of average (Figure 9), and the peak discharge in the Clark Fork River at Plains was recorded at 35,900 cfs on May 13th. Since the trigger value for TDG monitoring was not met, there was no TDG data collection in 2025. Due to the reduced streamflow conditions in 2025, the risk of elevated TDG in the Clark Fork River was very low.

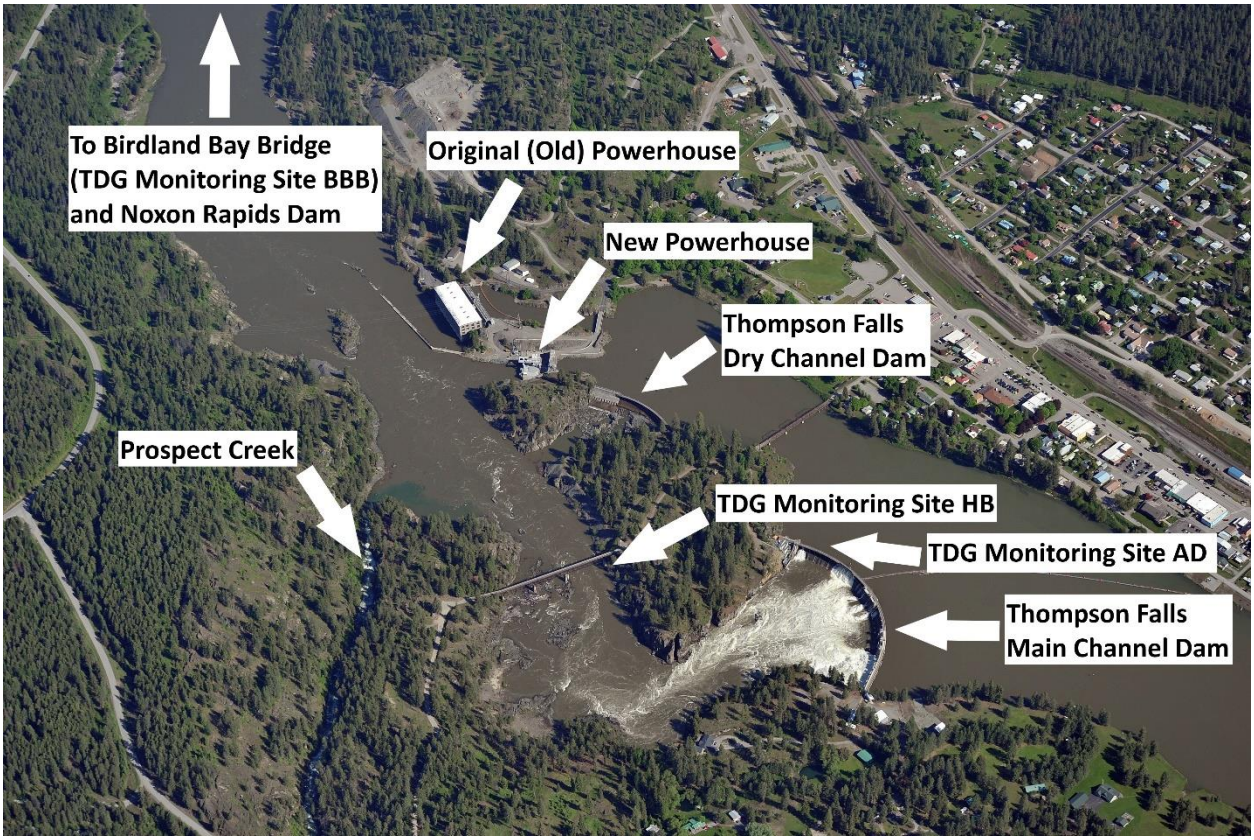


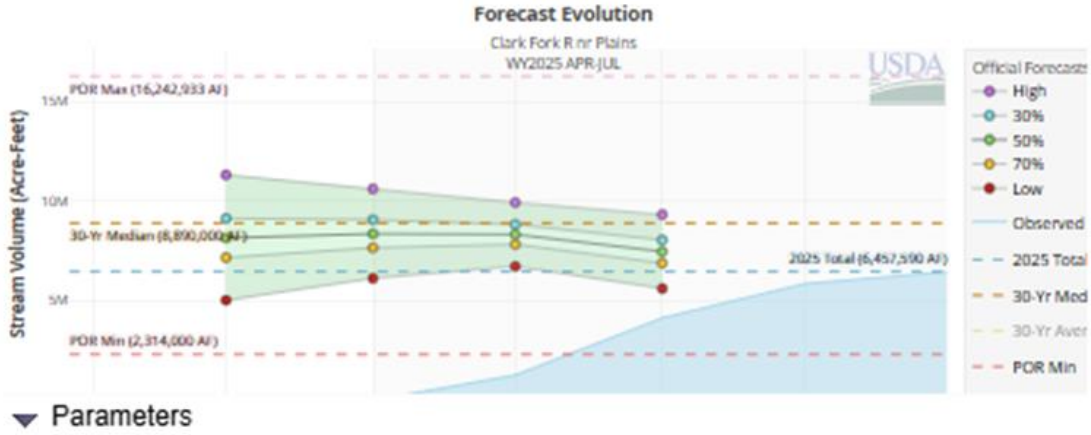
Figure 8. Monitoring locations for total dissolved gas at the Thompson Falls Hydroelectric Project site.

Clark Fork R nr Plains Streamflow 2,460 ft.

Streamflow Forecast Volume, 50% Exceedance Probability

30 Percentile (POR)

Primary Period, April 1, 2025



Parameters

Streamflow Forecast Volume (50% Exceedance Probability, kac-ft.), April - July, April 1, 2025			
Value:	8,350	**Anomaly (POR):**	-1,668.909
POR Median:	10,018.909	**NRCS 1991-2020 Median:**	8,890
% of POR Median:	83%	**% of NRCS 1991-2020 Median:**	94%
POR Average:	9,912.515	**NRCS 1991-2020 Average:**	9,760
% of POR Average:	84%	**% of NRCS 1991-2020 Average:**	86%

Figure 9. 2025 April 1 runoff forecast for the Clark Fork River near Plains USGS gage (12389000).

Section 5.0 – Adaptive Management Funding Account Funded Projects

In 2008, a Memorandum of Understanding (MOU) was established between NorthWestern, the FWS, FWP, and CSKT (voting TAC members), which established the terms and conditions for collaboration between the Licensee and the TAC agencies for the implementation of Bull Trout conservation measures at the Project. The MOU also specifies how funding by NorthWestern is allocated annually to the TAC for the purpose of downstream Bull Trout mitigation measures. The MOU, which was initially signed by each party and implemented in 2008, was renewed in 2013 and 2020, and expired on December 31, 2025. NorthWestern is working with TAC members to renew the MOU in 2026, and continues to work under the direction of the expired MOU for 2026.

Section 5.1 – 2025 Project Updates

Projects approved for funding by the TAC in 2025 are identified in Table 14. Refer to the December 2024 meeting summary available on the Project website for additional details and status of each proposed project.

Table 14. Project proposals approved by the TAC for 2025 implementation.

Agency/Entity	Project Proposal for 2025	TAC Funding Requested
MFWP	Baseline Bull Trout Genetics Update	$10,600
NWE	Submersible PIT Array Data Management	$15,400
MFWP/TPL	Prospect/Dry Creek Conservation Easement	$150,000
TOTAL		**$176,000**

Section 5.2 – 2026 TAC Funded Projects

During the 2026 Annual Thompson Falls TAC Meeting, there were three project proposals presented. The three project proposals were unanimously approved by the voting TAC members. The following table (Table 15) provides a summary of the project proposals and approved funding for the 2026 calendar year. Refer to the 2026 meeting summary available on the Project website for additional project details.

Table 15. Summary of projects proposed and approved for funding in 2026.

Agency/Entity	Project Proposal for 2026	TAC Vote	TAC Funding Requested
TU	Upper Prospect Creek Fish Passage	Yes	$12,500
Northwestern	Spare Tributary PIT Antenna	Yes	$6,700
NorthWestern	Emergency/contingency fund	Yes	$10,000
TOTAL Approved			**$29,200**

Section 6.0 – Compliance with Terms and Conditions of the Biological Opinion

A summary of the FWS's BiOp Terms and Conditions (TCs) 1 through 7 is provided in Table 16. The table includes the BiOp's TC followed by a statement describing the Licensee's actions of compliance. The language in the BiOp (FWS, 2008) refers to PPL Montana, the Licensee at the time the BiOp was prepared. All references to PPL Montana and compliance requirements in the BiOp 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 BiOp.

Table 16. Summary of FWS's Biological Opinion (2008) Terms and Conditions 1 through 7 and compliance status by the Licensee.

Terms and Conditions Requirements from Biological Opinion (FWS 2008)	Compliance Status by Licensee
TC 1 - Upstream Passage	
	On April 1, 2019, NorthWestern submitted a request to FERC to modify reporting requirements associated with the Thompson Falls Upstream Fish Passage Facility. In consultation with and approved by the FWS, NorthWestern proposed the following reporting schedule modifications: a) filing the comprehensive report required under Terms and Conditions (TC) 1h by December 31, 2019b; b) filing the structured scientific review of the project under TC 1h by April 1, 2020; c) filing the revised fishway operations plan under TC 1h by December 31, 2023; and d) eliminating the 2019 annual fish passage reporting requirement under TC 7a. The Commission approved the request in an Order dated October 7, 2019 (FERC, 2019).
TC 1(a)	**Activity is Complete** - Construction Fishway
TC 1(b)	**Activity is Complete** - Comply with Construction Permits
TC 1(c)	**Activity is Complete** -The FERC approved the Licensee's Thompson Falls Fish Ladder – Fishway Operations Manual 1.0 (SOP) in an Order issued on June 17, 2011.
TC 1(d)	Ongoing - NorthWestern will continue funding for the ladder and operate the facility in conformance with the approved SOP.
TC 1(e)	Ongoing - The Licensee provides annual funding in support of genetic testing for Bull Trout in the vicinity of the Project.
TC 1(f)	To date, fish transport via vehicle has not been requested or identified as a need. The Licensee will continue to evaluate this need and provide support as appropriate annually.
TC 1(g)	The Licensee developed and submitted the FWS-approved *Fish Passage Evaluation Plan*, *Phase 2 Action Plan, 2011-2020* (PPL Montana, 2010b) to FERC on October 14, 2010. FERC issued an Order approving the Evaluation Plan on June 9, 2011. Ongoing - Data collected annually at the ladder is summarized and reporting in the Annual Report that is approved by FWS prior to filing with the Commission each year (through the term of the license).

Terms and Conditions Requirements from Biological Opinion (FWS 2008)	Compliance Status by Licensee
TC 1(h)	**Activity is Complete** -Last activity of filing the Operations Assessment Plan in compliance with TC 1h was electronically submitted to the Commission on December 17, 2024. On April 1, 2019, NorthWestern submitted a request to FERC to modify reporting requirements associated with the Thompson Falls Upstream Fish Passage Facility. In consultation with and approved by the FWS, NorthWestern proposed the following reporting schedule modifications: a) filing the comprehensive report required under TC 1h by December 31, 2019 (instead of 12/31/2020); b); filing the structured scientific review of the project under TC 1h by April 1, 2020 (instead of 2021); c) filing the revised fishway operations plan under TC 1h by December 31, 2023 (instead of 12/31/2021) and request to the Commission with FWS concurrence in letter dated December 22, 2023 to extend the filing deadline until December 31, 2024; and d) eliminating the 2019 annual fish passage reporting requirement under TC 7a. The Commission approved the request in an Order dated October 7, 2019. Recommendations from the Scientific Review Panel were electronically filed with the Commission on April 1, 2020.
TC 2 - Downstream Passage	
TC 2	The MOU was extended through 2025 through Amendment No. 1 to the MOU Thompson Falls Hydroelectric Project. The Amendment was signed by NorthWestern, FWP, FWS, and CKST. NorthWestern renewed the MOU for the term of the license (effective 1/1/2021 – 12/31/2025). The Licensee will provide $100,000 annually through 2025 and allow a maximum of $250,000 to accrue in the Reserve account from unspent or transferred annual TAC funds.
TC 3 - Gas Supersaturation	
TC 3 (a)	Ongoing - The Licensee prepared a *Total Dissolved Gas Control Plan* (PPL Montana, 2010a) (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.
TC 3 (b)	Ongoing - 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.

Terms and Conditions Requirements from Biological Opinion (FWS 2008)	Compliance Status by Licensee
TC 3 (c)	Ongoing - Past GBT monitoring (2008-2014) below Thompson Falls Dam 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 2017, 2019-2024 have not shown any external symptoms of GBT.
TC 4 – MOU and TAC	
TC 4	**Activity is Complete.** The MOU expired on December 31, 2020. NorthWestern coordinated with the FWP, CSKT, and FWS to revisit the terms of the MOU in 2020, prior to the expiration of the agreement. NorthWestern renewed the MOU for the term of the license (effective 1/1/2021 – 12/31/2025).
TC 5 - Thompson Falls Reservoir	
TC 5 (a)	**Activity is complete.** 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' BiOp. Summary of 2014 and 2015 study has been posted on the Project website (Glaid, 2017). FERC authorized request to postpone recommendations until 2020 (FERC, 2015). Recommendations from the Scientific Review Panel were electronically filed with the Commission on April 1, 2020.

Terms and Conditions Requirements from Biological Opinion (FWS 2008)	Compliance Status by Licensee
TC 5 (b)	**Activity is Complete.** In 2014, the Licensee consulted with FWS and proposed to modify filing requirements specified in the FWS' BiOp 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* and combining the final report (due in 2020) required by TC 5a with reporting requirements in TCs 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 TCs 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. NorthWestern proposed to expedite the schedule to December 13, 2019, which was approved by the Commission on October 7, 2019). A 9-year comprehensive report (2011-July 1, 2019) was filed with the Commission on December 23, 2019.
TC 6 - System-wide Monitoring	
TC 6(a)	Ongoing. The Licensee collaborates with TAC members to proactively address the adaptive needs of the operations of the ladder each season, as well as holding annual TAC meetings 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.
TC 6(b)	Ongoing. The Licensee continues to provide annual funding available for Bull Trout genetic analysis.
TC 6(c)	Ongoing. With the construction of the fish ladder, three remote antennas were installed on the weirs (pools) that detect HDX and FDX PIT-tagged fish. Additionally, a remote antenna was installed in the lower and upper entrances of the fish ladder prior to the 2021 operational season. 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. A remote PIT-tag array was installed (in collaboration with Avista) in Prospect Creek in August 2018 and continues to be utilized to track PIT-tagged fish entering/existing the drainage. 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.

Terms and Conditions Requirements from Biological Opinion (FWS 2008)	Compliance Status by Licensee
TC 7 - Reporting	
TC 7(a)	Ongoing. The Licensee has filed annually (since 2011) by April 1, a report summarizing previous year's activities, fish passage totals, and proposed activities for the following year. Following the December 23, 2019, submittal of the Comprehensive Report, NorthWestern is not required to file the 2019 annual report with the Commission. NorthWestern will prepare a summary report for FWS and TAC members of 2019 upstream fish passage results. Annual filing will commence again for the 2020 season with a report due April 1, 2021 (through the term of the existing license). A summary of cumulative incidental take of Bull Trout since 2009 by the Licensee is provided in Table 22 in this report.
TC 7(b)	**Activity is complete**. NorthWestern filed a letter, with FWS's support, to FERC on December 17, 2014, proposing TC 7b no longer be required because comprehensive reporting has been continually provided in the annual reports. FERC approved this proposal on February 25, 2015 (FERC, 2015). No major modifications to the facility were identified or proposed.
TC 7(c)	The Licensee has archived report (dating back to 2005) annually on the Project website: http://www.northwesternenergy.com/environment/thompson-falls-project
TC 7(d)	No incidents to report in 2023
TC 7(e)	No incidents to report in 2023

Section 6.1 – Bull Trout Incidental Take Summary 2009-2025

In compliance with FWS's BiOp TC 7a, this section provides a summary of the documented cumulative incidental take from previous years' activities (2009-2025) in support of the upstream fish passage at the Project. Between 2009 and 2025, the Licensee sampled 46 Bull Trout representing 43 individuals (Table 17).

Since 2009, 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, 23 Bull Trout, representing 21 individual fish were recorded at the Thompson Falls fish ladder workstation. 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 documented occurrence of direct take 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; it 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.

Table 17. Cumulative incidental "take" of Bull Trout for the Project area located in the Lower Clark Fork River drainage, since January 1, 2009. Note: No Bull Trout sampled in 2018; EF = electrofishing; L = length; Wt = weight

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	Genetic Assignment	Condition at time of release
4/15/24	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	178	42	WF Thompson River (R4)	Alive (no additional detections)
6/29/23	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	285	180	North Fork Fish Creek (R4)	Alive (detected in Thompson River 6/29, 7/21)
5/1/23	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	582	1660	West Fork Thompson River (R4)	Alive (detected in Thompson River 5/14, 9/17-24 WF Thompson River 6/8, 9/16)
3/27/23	EFISH	Clark Fork River near confluence with Thompson River	2023 Fish Behavior Study	Licensee FWP	501	1556	NA	Alive (released on site CFR and detected in Thompson River 5/3, WF Thompson River 7/17, 8/20)
6/4/22	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	528	1262	WF Thompson River (R4)	Alive (detected in Thompson River and WF Thompson River 2021 and 2022)
4/26/22 5/26/21	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	530 519	1062	Fishtrap Creek (R4)	Alive (detecting in Thompson River and Fishtrap in 2021 and 2022)
10/21/20	EFISH	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee FWP	~480	-	No sample collected	Alive (released prior to collecting L, Wt, and genetic sample)
7/17/20	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	320	262	WF Thompson River (R4)	Alive
6/26/19	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	620	1608	WF Fish Creek (R4)	Alive
No Bull Trout Samples in 2018								
9/18/17	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	408	522	WF Thompson River (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	Genetic Assignment	Condition at time of release
6/6/16	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	618	1950	NF Fish Creek (R4)	Alive
5/18/16	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	615	1934	NF Fish Creek (R4)	Alive
4/18/16	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	413	602	Fishtrap (R4)	Alive
4/11/16	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	247	124	Prospect Ck (R3)	Alive
10/20/15	EFISH	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee FWP	651	1966	Fishtrap Creek (R4)	Alive
6/3/15	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	520	1112	Fishtrap Creek (R4)	Alive
5/17/15	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	519	1334	Fishtrap Creek (R4)	Alive
4/13/15	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	219	88	Fishtrap Creek (R4)	Alive
10/28/14	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	315	260	NF Jocko (R4)	Alive
6/3/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	509	1224	Fishtrap Creek (R4)	Alive
5/28/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	567	1640	Fishtrap Creek (R4)	Alive
5/16/14	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	523	1264	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	Fishtrap Creek (R4)	Alive
4/7/14	EFISH	Below TFalls Dam	Fish Passage Studies	Licensee FWP	520	1500	NA	Alive
8/9/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	482	1058	Fishtrap Creek (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	Genetic Assignment	Condition at time of release
6/7/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	596	1926	Fishtrap Creek (R4)	Alive
5/7/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	478	978	Fishtrap Creek (R4)	Alive
5/6/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	576	1694	Fishtrap Creek (R4)	Alive
4/30/13	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	598	2306	Fish Creek (R4)	Alive
4/10/13	EFISH	Upper TFalls Reservoir (CFR)	Long-term Population Monitoring	Licensee FWP	260	108	Fishtrap Creek (R4)	Alive
10/30/12	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	472	800	Monture Creek (R4)	Alive
10/30/12	EFISH	Paradise-Plains	Long-term Population Monitoring	Licensee FWP	444	678	Fish Creek (R4)	Alive
5/21/12 4/26/11	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	563 547	1404 1438	Fishtrap Creek (R4)	Mortality (2012) Alive (2011)
5/15/12 5/31/11	Ladder EFISH	TFalls Dam Below TFalls	Fish Passage Studies	Licensee FWP	510 482	1172 966	Meadow Creek (R4)	Alive 2012 Alive 2011
4/17/12	EFISH	TFalls Reservoir (Upper Section)	Long-term Population Monitoring	Licensee FWP	260	140	Fishtrap Creek (R4)	Alive
4/16/12	EFISH	TFalls Reservoir (Lower Section)	Long-term Population Monitoring	Licensee FWP	222	76	Fishtrap Creek (R4)	Alive
4/10/12	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	272	150	Graves Creek (R3)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	482	966	Meadow Creek (R4)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	180	50	Fishtrap Creek (R4)	Alive
5/31/11	EFISH	Below TFalls	Fish Passage Studies	Licensee FWP	247	130	Fishtrap Creek (R4)	Alive
4/13/11	Ladder	TFalls Dam	Fish Passage Studies	Licensee FWP	365	364	Thompson River (R4)	Alive

Date	Method of Capture	Location	Action	Personnel	L (mm)	Wt (g)	Genetic Assignment	Condition at time of release
10/12/10	EFISH	Clark Fork River, upstream of Island Complex	Long-term Population Monitoring	Licensee	325	240	SF Jocko River (R4)	Alive
5/1/09	Gillnet	TFalls Reservoir	Long-term Population Monitoring	Licensee	271	174	Fishtrap Creek (R4)	Alive

Section 7.0 – 2026 Proposed Activities and Reporting

In 2026, NorthWestern will continue to collect baseline fisheries data (gillnetting), will continue to operate the upstream fish passage facility, and collect species, length and weight data (salmonids and PIT-tagged fish only), and will continue to collaborate with TAC members to implement proposals approved for 2026.

Fish tagging protocol is summarized in Table 18. The primary changes from recent years are the addition of species to receive PIT Tags (LS SU and NPMN) and not checking the ladder on weekends when water temperatures equal or exceed 23 °C. The goal for 2026 is to PIT-tag up to 100 Largescale and 100 Northern Pikeminnow at the ladder (and release upstream).

As in recent years, ladder operations will remain in orifice mode for the duration of the season. The sampling protocol established in 2020 for when water temperatures exceed 20°C will remain unchanged. Fish will not be anesthetized or tagged (PIT or Floy) when water temperature exceeds 20°C except for Bull Trout. NorthWestern plans to tag and anesthetize Bull Trout when water temperatures exceed 20°C, but the determination can be made at the ladder by the operators depending on the condition of the fish at that time. When water temperatures are equal to or greater than 23°C, the ladder will be checked daily, excluding weekends. Genetic samples will be taken for Bull Trout.

The following species will not be released upstream: Walleye, Lake Trout, Brook Trout, Brook x Bull trout hybrid, or Smallmouth Bass. Smallmouth Bass was officially added to this list by FWP in December 2019 during the annual TAC meeting.

Table 18. Tagging protocol for fish species recorded at the ladder in 2026.

Species	PIT	Ad clip	Floy	Genetic sample	Comments
BULL	X			X	Continue tagging when temperatures > 20°C
LL	X	X	X		Discontinue anesthetizing, tagging, and measuring when temperatures > 20°C (2026: Goal for the season is to tag a maximum of 100 LSSU and 100 NPMN)
RB	X	X	X		
WCT	X	X	X	X*	
MWF	X	X			
LS SU	X				
NPMN	X				

*MFWP requested genetic sample of WCT in 2025 for their database. MFWP will fund genetic analysis

NorthWestern will prepare a summary report for 2026 activities that will be submitted to FWS and the TAC, as well as filed with the Commission by April 1, 2027.

Section 8.0 – Submersible Antenna Study

Section 8.1 – Introduction

In 2024, NorthWestern initiated a 2-year pilot study to evaluate fine-scale fish movements using submersible passive integrated transponder (PIT) arrays located in the far and near field of the Project area. The far field defined for the study extends from the confluence of Prospect Bay Creek to the natural falls area immediately below Main Channel Dam. The near field extends from the natural falls area upstream to the fish ladder.

The study's goal is to identify the optimal location for deploying submersible arrays and evaluating fish movements in the study area (as defined in NorthWestern 2024, 2025). Section 8.0 of the report provides a summary of the 2025 study season. The objectives for the 2025 submersible array study season include the following:

Objective 1 – Assess the fine-scale movement of PIT-tagged fish, by species detected at each submersible array locations and each fixed array inside ladder.

Objective 2 – Assess the fine-scale movements of PIT-tagged fish, by species detected outside the ladder via the submersible array(s) or inside the ladder via the fixed PIT-tag array network at the entrance, lower pools, or holding pool.

Kleinschmidt Associates has been contracted by NorthWestern to utilize an analysis software to evaluate far and near field fish movements and provide data analysis for the 2025 submersible data sets. This report, written by Kleinschmidt Associates, provides a summary of the 2025 PIT-tagged fish detected by submersible and/or ladder array stations for the entire study season, including the entire operational season of the ladder. The 2025 data represent data collection through October 30, 2025.

Section 8.2 – Methods

Section 8.2.1 – Movement Analysis Software

Kleinschmidt developed a statistical program, referred to as the Movement Analysis Software (MAST), for telemetry data and transferrable to PIT tag data to process and analyze data more efficiently from the submersible arrays at the Thompson Falls Project. This program is open-source software (and free) to the public: Python (Py) MAST. The software PyMAST is licensed under the permissive Massachusetts Institute of Technology license.

PyMAST is a Python-based tool built for analyzing one-dimensional (1D) movement using detections from PIT tag arrays. It simplifies the process of organizing detection data, modeling movement paths, and calculating key metrics like passage time, travel speed, and the likelihood of fish moving from one receiver site to another.

Section 8.2.2 – Data Sources

Data input for the PyMAST software includes the 2025 detection data (raw files provided by NorthWestern) from the submersible receivers, with location data associated with each submersible receiver in the system; data for both the remote PIT tag array detections from

within the ladder (two entrances, lower pools, and holding pool) and a master list of potential PIT tags were retrieved from NorthWestern's database. Potential PIT tags in the system include fish that were initially PIT-tagged and with data entered in NorthWestern's database prior to October 31, 2025. The output for the software is set up to address NorthWestern's study objectives described in Section 8.1 and outlined in the *Evaluating Fine-Scale Fish Movements Using Submersible PIT Antennas* (NorthWestern 2024).

Section 8.2.3 – Period of Analysis

The 2025 study season aligns with the Thompson Falls Upstream Fish Passage Facility operations, March 17 through October 30, 2025. The period(s) of deployment for each submersible station is provided in Table 19 along with the submersible receiver identification (ID) and station/location, which are also shown in Figure 10. The PIT tag array network in the ladder operations and data collection occurred continuously between March 17 and October 30, 2025

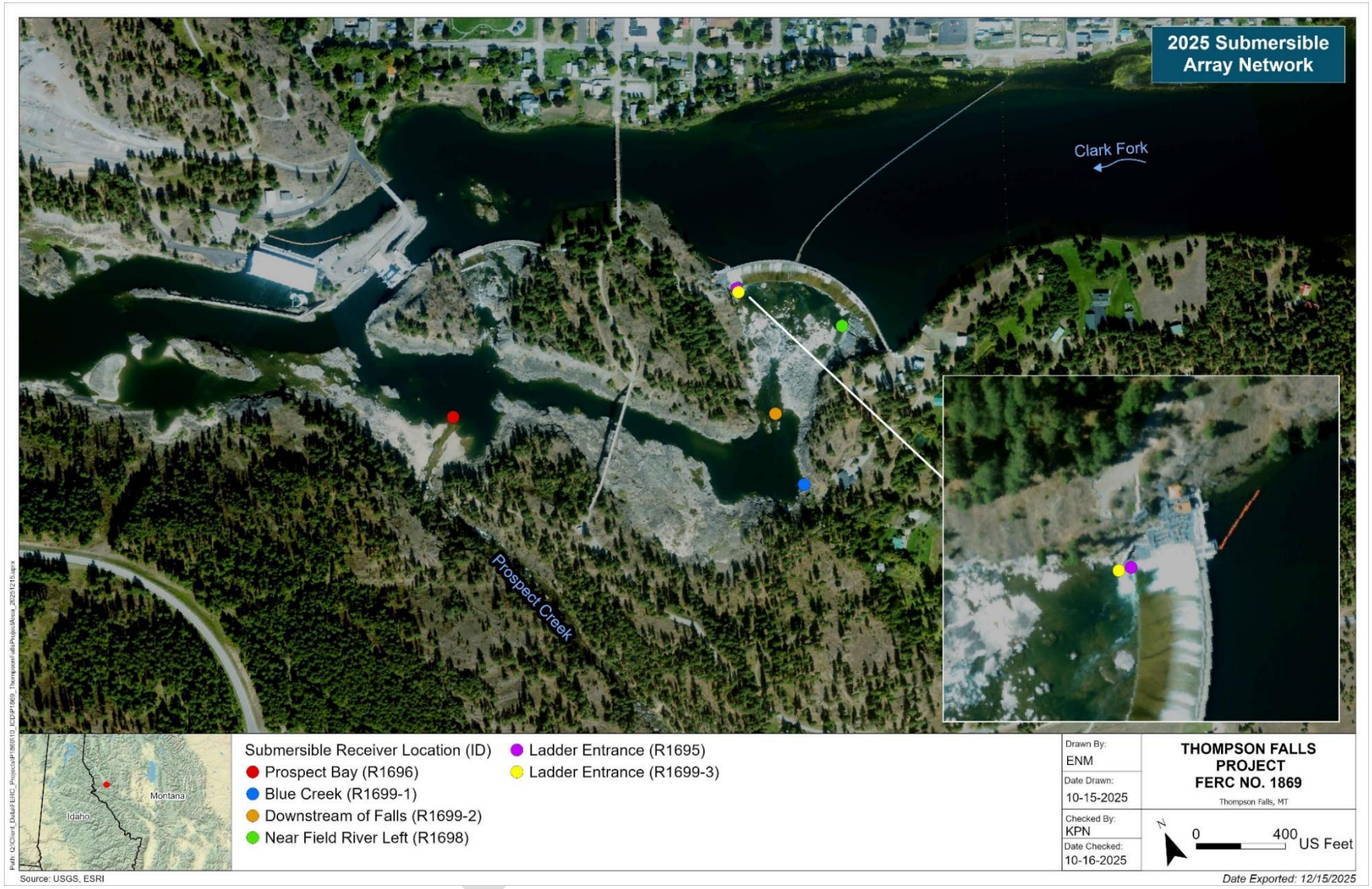


Figure 10 Submersible array network in 2025.

Table 19 Summary of the 2025 submersible receiver ID, data range, and physical location.

Submersible Receiver ID	Date Range	Station/Location
R1696	March 17 – April 29, 2025 June 10 – October 30, 2025	Prospect Bay
R1699-1	July 25 – October 30, 2025	Blue Creek
R1699-2	March 20 – April 10, 2025 June 20 – July 25, 2025	Downstream of Falls
R1698	March 19 – April 30, 2025 June 10 – October 30, 2025	Near Field River Left (River Left)
R1699-3	April 11 – April 29, 2025	Ladder Entrance (temporary) – Outside
R1695	March 18 – April 29, 2025 May 21 – October 30, 2025	Ladder Entrance (primary) – Outside

Section 8.2.4 – 2025 Study Area

The 2025 submersible study evaluated PIT-tagged fish detections below Thompson Falls Dam, from the furthest downstream station in Prospect Bay upstream to the most upstream station located immediately outside of the ladder entrance. Locations of submersible array stations are shown in Figure 10. Details about the submersible arrays are provided in Table 19.

Section 8.2.5 – Data Setup

The 2025 submersible study included 11 array stations, six submersible stations, and five ladder stations, represented by eight states (Table 20). A “state” is a unique ID for each receiver that is used in the model to assess fish movement through the system. In three instances, two receivers are combined into one state. For example, the submersible receivers located outside the ladder (R1695 and R1699-3) were treated as State 5, the two stations at the ladder entrance (Ant 4 and 5) were treated as State 6, and internal ladder stations at Pools 7 and 8 (Ant 1 and 2) were treated as State 7. Also note, Pools 7 and 8 are often referred to as lower pools.

Table 20 Summary of the 2025 array network, including the receiver ID, receiver type, physical location, and state value used in the model to address Objective 1 and Objective 2.

Receiver ID	Receiver Type	Station/Location	Obj. 1 State	Obj. 2 State
R1696	Submersible PIT	Prospect Bay	1	NA
R1699-1	Submersible PIT	Blue Creek	2	NA
R1699-2	Submersible PIT	Downstream of Falls	3	NA
R1698	Submersible PIT	Near Field River Left	4	NA
R1699-3	Submersible PIT	Ladder Entrance – Outside (temporary)	5	5
R1695	Submersible PIT	Ladder Entrance – Outside (primary)	5	5
R0004	Ladder PIT	Fish Ladder – Lower Entrance (Ant 4)	6	6
R0005	Ladder PIT	Fish Ladder – Upper Entrance (Ant 5)	6	6
R0001	Ladder PIT	Fish Ladder – Lower Pool 7 (Ant 1)	7	6
R0002	Ladder PIT	Fish Ladder – Lower Pool 8 (Ant 2)	7	6
R0003	Ladder PIT	Fish Ladder – Holding Pool (Ant 3)	8	6

NA = not applicable to analysis.

The analysis also included a *release state*, or State zero (0). State 0 allows the analysis to include all fish detected in the array network that made a movement (identified in Table 20) instead of restricting the analysis to those detected (recaptured) at the first state. Modeling from release offers an alternative method to a more traditional analysis, which requires a fish to first be detected at State 1 (Prospect Bay) before being included in the analysis. Modeling from release allows us to include information from all fish detected in the array network and does not limit analysis to those detected initially by State 1. It should be noted that, if a fish was only detected at a single receiver, it will not show up in the State Transition table, referred to as Matrix 1, or Transition Frequency table, referred to as Matrix 2, because the fish did not make a transition from one state to a new state.

The network used in the 2025 Thompson Falls analysis, where receivers were grouped into representative "states" or locations, is illustrated in Figure 11 and Figure 12. Each figure shows how the data were used to analyze Objective 1 (Figure 11) and Objective 2 (Figure 12). These states serve as checkpoints where fish can be detected as they migrate within the array network.

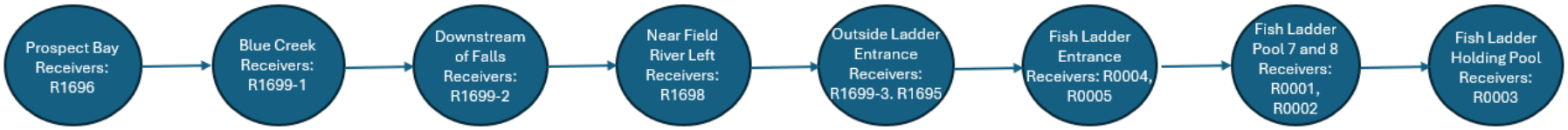


Figure 11 **The network deployment locations and receiver ID used outside the ladder and inside the ladder to address Objective 1 – fish movement throughout the system, 2025.**

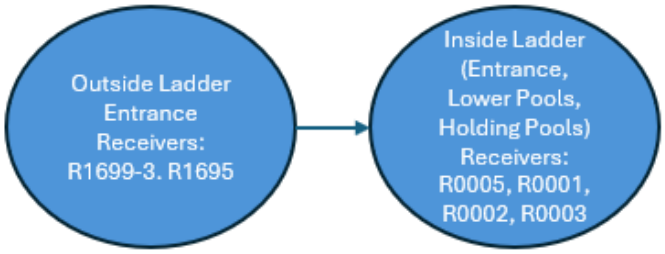


Figure 12 **The network deployment locations associated receiver ID used to address Objective 2 – fish transitions/movements outside and inside the ladder, 2025.**

To address each objective of the study, this analysis does not require fish to “pass” through State 1 before moving to State 2 and so on. The analysis includes a starting point, State 0, which is defined as any potential PIT-tagged fish in the system recorded in NorthWestern’s database prior to October 31, 2025. For example, if an individual fish was tagged below Thompson Falls Dam in 2012 and is only detected outside the ladder in 2025, State 0 is the 2012 tagging date and State 5 is the detection outside the ladder. This individual fish has not illustrated a transition between states because its starting point was State 0 and there was no movement detected by the submersible or ladder arrays between States 1 and 8 during the study period.

To address Objective 1, the analysis of fish movement in the system includes all detections of PIT-tagged fish at all States 1 through 8, which is done by providing a State 0 as the “starting” point. The objective is to evaluate all detections of fish at all submersible array stations. To accomplish this, the starting point, State 0, includes all the potential PIT tags in the system. This allows the program to evaluate all potential PIT tags from State 0 and any subsequent detection at any location, and any order of movement, between States 1 and 8.

To address Objective 2, the analysis of fish movements outside or inside the ladder, regardless of detection order, includes all detections of fish movements at States 5 through 8. State 0 is used as a starting point, so the analysis provides a summary of all detections that occurred outside or inside the ladder. Total fish transitions/movements are summarized by evaluating detections at States 5, 6, 7, and 8. The number of individual fish transitions and duration of transitions between outside and inside the ladder combines fixed ladder arrays (Ant 1 through 5) into one state, State 6.

It is also important to note, the outside submersible array was not continuously operating throughout the ladder season (see outage between April 29 and May 21,Table 19).

For future studies or analysis, the software parameters can be modified to specify a fish being detected in a specific state before proceeding to the next state and so on, depending on the study objective.

Section 8.2.6 – PyMast Output

PyMAST used the network in Figure 11 to track tagged fish as they moved through a 1D network of detection station(s), or state(s). Each state included one or more PIT tag receivers that recorded when a fish passed by. By laying out these states in sequence and analyzing every movement from one to the next for each individual detection/fish, we created a detailed view of how fish progressed through the system. The modeling results provide matrices that outline movement routes and travel time between states.

For each model, PyMAST generates several key outputs, including a state transition matrix (Matrix 1), transition frequency summaries (Matrix 2), and transition duration analysis (Matrix 3), as provided in Section 8.3. The following text provides guidance in the interpretation of the PyMAST outputs.

Section 8.2.6.1 – Matrix Interpretations

Matrix 1 and Matrix 2 are used to visualize and measure how PIT-tagged fish moved through the 1D array network, establishing the groundwork for additional analysis (e.g., movement efficiency and route-specific behavior).

An Example Matrix (**Error! Reference source not found.**) is provided to help interpret Matrix 1 – state (S) transition and Matrix 2 – transition frequency summaries.

Table 21 Example Matrix for interpreting Matrix 1 and Matrix 2 analysis – not representing real data.

Starting State	Destination State						
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**
S1	14	4	2	5	0	0	0
S2	3	17	0	25	0	0	0
S3	0	0	4	7	0	0	0
S4	8	0	7	28	24	1	0
S5	0	0	0	7	0	22	0
S6	0	0	0	2	11	0	18
S7	0	0	0	1	0	0	17

In the Example Matrix, the **rows** identify the **starting state** with the state identified in the left-most column in bold. The **columns** represent the **next detection** or endpoint and are defined by state shown in the top row in bold.

The diagonal values (highlighted in blue) in the Example Matrix represent detections within the **same detection state** rather than movements to a new location. High diagonal values typically reflect fish holding behavior or repeated back-and-forth movements within the detection range, not the number of fish concluding their migration at those points.

Upstream movements are shown in the cells highlighted in grey and above the diagonal values, while downstream movements are shown in the cells below the diagonal values (and not highlighted).

It is also important to note that the matrix values showing a zero (0) indicate no fish was detected making this transition. For instance, in the Example Matrix, there were no fish detected from State 4 moving to State 2. This result may reflect low submersible detection efficiency, or the timing of fish movement occurred when the submersible arrays were not in place/operating.

Section 8.2.6.1.1 – State Transition Analysis – Matrix 1

The state transition analysis, Matrix 1, evaluates how many total fish detections (or movements) are observed between each state. That is, Matrix 1 shows how many movements occurred between each pair of detection states. In this matrix, rows represent the starting states, columns represent the destination states, and each value shows the total number of transitions recorded between them across all fish.

Assume **Error! Reference source not found.**represents an example Matrix 1 output for the state transition analysis. Matrix 1 illustrates **every observed movement** of PIT-tagged fish between detection states (receiver locations). Values inside the table are the total number of fish movements recorded, meaning they include repeat movements by the same fish. This provides a complete view of movement intensity and highlights frequently traveled routes, as well as movements where fish might repeatedly linger between two states.

As stated in the previous section, high diagonal values (detections within the **same detection state**) typically reflect fish holding behavior or repeated back-and-forth movements within the detection range, not the number of fish concluding their migration at those points. Thus, these numbers can (and often do) exceed the total number of individual fish in the study.

For example, looking at the row for State 3 and the column of State 4 in Table 21, the value is the number 7 (highlighted in yellow). This means that there were 7 total movements of all tagged fish from State 3 and ending at State 4.

Section 8.2.6.1.2 – Transition Frequency Analysis – Matrix 2

The transition frequency analysis, Matrix 2, counts the number of unique fish making each transition between each state, rather than the total number of detections. This helps separate repeated detections from true movement and provides a clearer picture of how many individuals used each route. It also forms the basis for calculating movement probabilities and identifying areas where movement may slow down or stop.

Assuming Table 21 represents an example Matrix 2 output for the transition frequency, the table illustrates the number of **individual tagged fish movements** detected between detection states (receiver locations). Values inside the table are the total number of individual (unique) fish recorded, meaning the value does not include repeat movements.

For example, when we look at the row for State 3 and the column for State 4, we will see the number 7 (highlighted in yellow). This means there were seven individual fish that moved from State 3 to State 4. For this demonstration, the Example Matrix represents both the state transition and transition frequency. Therefore, the cell highlighted in yellow (State 3, State 4) represents seven individual fish made a total of seven movements starting at State 3 and ending at State 4.

Section 8.2.6.1.3 – Transition Duration Analysis – Matrix 3

The transition duration analysis, Matrix 3, assessed the state-to-state movement of the fish. PyMAST calculates how long it took fish to move between each pair of detection states by measuring the time between consecutive detections. For each transition, we summarized duration (in hours) using minimum, median, and maximum values across all individuals. This helps capture the variation in how often fish used different routes.

Matrix 3 provides insight into the variability and patterns of fish movement speeds, helping pinpoint transitions where fish consistently moved quickly, where substantial delays or holding behavior occurred, and where individual behavior varied widely.

For example, the row (3,4) highlighted in yellow in Table 22 provides a summary of duration (minimum, median, and maximum) from State 3 to State 4 for the seven total fish movements (**Error! Reference source not found.**, Example Matrix 1) represented by seven unique fish (Example Matrix 2). The rows highlighted in blue in Table 22 represent the diagonal values in Example Matrix 1 and Matrix 2 (**Error! Reference source not found.**).

Table 22 Example Matrix for interpreting Matrix 3 analysis – not representing real data.

State Transition (Starting State, Destination State)	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(1, 1)	0.0	0.0	4,077.3
(1, 2)	12.0	35.9	971.4
(1, 3)	141.5	149.5	157.6
(1, 4)	766.9	1,425.0	2,474.7
(2, 1)	29.2	630.7	1,703.5
(2, 2)	0.0	0.0	14.9
(2, 4)	2.6	28.5	2845.5
(3, 3)	0.0	0.0	7.4
(3, 4)	0.0	0.3	1,217.7
(4, 1)	457.9	1,192.2	3,322.6
(4, 3)	0.0	0.8	1,955.6
(4, 4)	0.0	0.0	1.0
(4, 5)	0.1	0.5	1.5
(4, 6)	0.8	0.8	0.8
(5, 4)	0.1	0.1	2.1
(5, 6)	0.0	0.0	0.4
(6, 4)	0.2	0.3	0.4
(6, 5)	0.0	0.1	36.4
(6, 7)	2.1	3.9	11.8
(7, 4)	333.4	333.4	333.4
(7, 7)	0.0	0.0	5.9

Section 8.3 – 2025 Results

The 2025 results (through October 30) include fish detections by the submersible array stations and ladder array stations during pre-spill and post-spill (at the Main Channel Dam) at Thompson Falls Dam. Kleinschmidt analyzed the movement of fish, including the summary of the state transitions (Matrix 1), the transition frequencies of individual fish (Matrix 2), and the duration between transition states (Matrix 3).

In total, the analysis identified and evaluated the movements of 203 unique fish, representing eight species (**Error! Reference source not found.**). Species identified include Bull Trout (BULL) (*Salvelinus confluentus*), Brown Trout (LL) (*Salmo trutta*), Longnose Sucker (LN SU) (*Catostomus Catostomus)*, Largescale Sucker (LS SU) (*C. macrocheilus*), Mountain Whitefish (MWF) (*Prosopium williamsoni*), Northern Pikeminnow (N PMN) (*Ptychocheilus oregonensis*), Rainbow Trout (RB) (*Oncorhynchus. mykiss*), and Westslope Cutthroat Trout (WCT) (*O. lewisi*).

Table 23 Total number of unique fish, by species detected by submersible or ladder arrays in 2025, through October 30.

Species	Count
BULL	3
LL	44
LN SU	6
LS SU	102
MWF	1
N PMN	10
RB	35
WCT	2
Total	**203**

Section 8.3.1 – Objective 1 – Fish Movements within the Entire Array Network

The network of states and associated receivers for the analysis of fish movement in the system is shown in Table 24**Error! Reference source not found.**and Table 25. In total, the analysis detected 169 unique fish by the submersible array network (States 1 through 5) and 161 unique fish by the array system inside the ladder, States 6 through 8. Fish detected outside the ladder represent eight species (BULL, LL, LN SU, LS SU, MWF, N PMN, RB, WCT). Fish detected inside the ladder represent seven species, including all species detected by submersible arrays except the Mountain Whitefish. Note that the submersible array stations did not operate continuously throughout the ladder season (refer to Table 19).

Table 24 Summary of unique fish detections at any one submersible array location, States 1 through 5, and at any one array location in the ladder, States 6 through 8.

Species	Submersible Detections States 1 through 5	Ladder Detections States 6 through 8
BULL	3	1
LL	43	36
LN SU	4	2
LS SU	76	86
MWF	1	-
N PMN	10	6
RB	30	28
WCT	2	2
Total	**169**	**161**

Table 25 Summary of individual fish detections, by species at the submersible receiver stations, through October 30, 2025.

2025	Submersible Arrays States 1 through 5				
Species	**State 1 Prospect Bay**	**State 2 Blue Creek**	**State 3 Downstream of Falls**	**State 4 Near Field River Left**	**State 5 Outside Fish Ladder (Temporary + Primary)**
BULL	2	1	-	-	1
LL	9	7	2	25	32
LN SU	4	-	-	-	-
LS SU	41	19	6	9	47
MWF	1	-	-	-	-
N PMN	1	4	1	7	6
RB	9	6	1	11	22
WCT	-	-	1	1	2
Total	**67**	**37**	**11**	**53**	**110**

Section 8.3.1.1 – Bull Trout

Three Bull Trout were detected in 2025 with a limited number of detections at the various arrays. The total number of fish movement detections are provided in Matrix 1 (Table 26). Matrix 2 (Table 27) confirms the movement detections represent three individual fish. One Bull Trout was initially tagged in 2021 in Lake Pend Oreille and later transported upstream to Thompson River (genetically assigned to Fishtrap Creek) in 2022. During the 2025 study season, this Bull

Trout made three movements from inside the ladder (State 6) to outside the ladder (State 5). The furthest upstream point of detection was in the lower pools in the ladder (State 7). The furthest downstream point of detection was Prospect Bay (State 1). The duration (in hours) between states for this Bull Trout is summarized in Matrix 3 (Table 28).

The other two Bull Trout are Region 3 fish; one tagged as a juvenile in Graves Creek in 2019 and the other tagged as a juvenile in Vermilion River in 2020. Both fish were only detected in Prospect Bay. These fish did not make any movements to other States, thus are not represented in Matrix 3.

Table 26 Bull Trout Matrix 1 – state transition.

	S1 – Prospect Bay	S2 – Blue Creek	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools
S1 – Prospect Bay	2	0	0	0	0
S2 – Blue Creek	0	1	0	0	0
S5 – Outside Entrance	1	0	0	1	1
S6 – Ladder Entrance	0	0	3	0	0
S7 – Lower Pools	0	0	0	1	0

Table 27 Bull Trout Matrix 2 – transition frequency.

	S1 – Prospect Bay	S2 – Blue Creek	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools
S1 – Prospect Bay	2	0	0	0	0
S2 – Blue Creek	0	1	0	0	0
S5 – Outside Entrance	1	0	0	1	1
S6 – Ladder Entrance	0	0	1	0	0
S7 – Lower Pools	0	0	0	1	0

Table 28 Bull Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 1)	351.54	351.54	351.54
(5, 6)	0	0	0
(5, 7)	0.11	0.11	0.11
(6, 5)	0.04	0.07	0.11
(7, 6)	4.41	4.41	4.41

Section 8.3.1.2 – Brown Trout

During the 2025 study season, 44 unique Brown Trout were detected by the array network. These individuals were observed moving among eight states with clear concentrations at ladder-associated locations: notably, many transitions to and from States 5 and 6, outside to inside the ladder (Table 29).

Matrix 1 (Table 29) summarizes all Brown Trout detections by multiple receiver locations and repeated movements between submersible and ladder receivers, consistent with active ladder-seeking and ladder-use behavior among Brown Trout.

Matrix 2 (Table 30) highlights substantial ladder-related movement by 25 individual Brown Trout from State 5 to State 6 represented by 220 movements (Matrix 1, **Error! Reference source not found.**) and 27 individuals from State 6 to State 5 represented by 225 movements. These data show greatest concentration of transition at the entrance of the ladder (States 5 and 6). The 25 Brown Trout spent a median duration of 23 minutes (0.39 hour) moving from State 5 to State 6, while the 27 individual Brown Trout spent a median duration of 6.6 minutes (0.11 hour) moving from State 6 to State 5. The minimum, median, and maximum duration between all transition states for Brown Trout are summarized in **Error! Reference source not found.**.

Table 29 Brown Trout Matrix 1 – state transition.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	4	1	0	1	3	1	0	0
S2 – Blue Creek	0	1	0	0	5	3	1	0
S3 – Downstream of Falls	0	1	0	0	1	0	0	0
S4 – Near Field River Left	2	2	0	8	7	20	4	0
S5 – Outside Entrance	1	3	0	6	5	220	24	3
S6 – Ladder Entrance	1	0	0	17	225	3	25	3
S7 – Lower Pools	0	0	0	4	10	21	1	21
S8 – Holding Pool	0	0	0	0	0	1	3	24

Table 30 Brown Trout Matrix 2 – transition frequency.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	3	1	0	1	3	1	0	0
S2 – Blue Creek	0	1	0	0	5	2	1	0
S3 – Downstream of Falls	0	1	0	0	1	0	0	0
S4 – Near Field River Left	2	2	0	8	5	12	4	0
S5 – Outside Entrance	1	2	0	5	5	25	15	3
S6 – Ladder Entrance	1	0	0	11	27	3	17	3
S7 – Lower Pools	0	0	0	4	5	14	1	19
S8 – Holding Pool	0	0	0	0	0	1	3	23

Table 31 Brown Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(1, 2)	2937.49	2937.49	2937.49
(1, 4)	1220.98	1220.98	1220.98
(1, 5)	108.05	247.11	835.95
(1, 6)	42.63	42.63	42.63
(2, 5)	4.41	49.78	827.95
(2, 6)	11.91	99.59	453.23
(2, 7)	11.95	11.95	11.95
(3, 2)	3516.37	3516.37	3516.37
(3, 5)	39.72	39.72	39.72
(4, 1)	406.72	441.16	475.59
(4, 2)	22.12	159.77	297.42
(4, 5)	5.33	17.78	256.64
(4, 6)	0.32	6.28	1785.92
(4, 7)	0.07	4.41	25.24
(5, 1)	367.86	367.86	367.86
(5, 2)	15.96	436.02	1257.42
(5, 4)	0.50	5.49	353.88
(5, 6)	0.00	0.39	507.20
(5, 7)	0.00	0.07	8.50
(5, 8)	0.92	0.96	1.74
(6, 1)	40.39	40.39	40.39
(6, 4)	0.71	11.16	263.08
(6, 5)	0.04	0.11	76.44
(6, 7)	0.00	0.18	14.19
(6, 8)	1.00	1.39	1.42
(7, 4)	2.99	9.90	22.15
(7, 5)	0.04	0.62	84.02
(7, 6)	0.04	0.28	2.17
(7, 8)	0.78	1.71	48.39
(8, 6)	19.48	19.48	19.48
(8, 7)	0.11	0.32	0.96

Section 8.3.1.3 – Longnose Sucker

Longnose Sucker detections in 2025 were limited to six individuals. Matrix 1 (Table 32) summarizes the total movements detected and number of individual fish detected. The number

of movements and number of individual fish are the same. A total of six fish were detected, four at State 1 and two at State 6. There was no movement detected between states.

Four fish detected at State 1 – Prospect Bay were initially captured via electrofishing and PIT-tagged below Thompson Falls Dam in 2017. The other two individuals detected at State 6 – ladder entrance were initially captured via electrofishing and PIT-tagged below Thompson Falls Dam in 2024. The six Longnose Sucker recaptured in 2025 were detected at a single state, thus no transition duration data were produced.

Table 32 Longnose Sucker Matrix 1 – state transition.

	S1 – Prospect Bay	S6 – Ladder Entrance
S1 – Prospect Bay	4	0
S6 – Ladder Entrance	0	2

Section 8.3.1.4 – Largescale Sucker

During the 2025 study season, 102 unique Largescale Sucker were detected by the array network. These individuals were observed moving among eight states with clear concentrations at ladder-associated locations: notably, many transitions to and from States 5 and 6, outside to inside the ladder (Table 33).

Matrix 1 (**Error! Reference source not found.**) summarizes all Largescale Sucker detections by multiple receiver locations and repeated movements between submersible and ladder receivers.

Matrix 2 (Table 34) highlights substantial ladder-related movement by 39 individual Largescale Sucker from State 5 to State 6 represented by 281 movements (Matrix 1, Table 33) and 43 individuals from State 6 to State 5 represented by 304 movements. The data show the greatest concentration of transition movements at the ladder entrance (States 5 and 6). The median duration between Largescale Sucker movement between States 5 and 6 (in both directions) was 6.6 minutes (0.11 hour, Table 35).

The second highest concentration of movement was detected between State 6 – ladder entrance and State 7 – lower pools in the ladder: a total of 69 movements from 41 individual Largescale Sucker. The 41 Largescale Sucker spent a median time of about 30 minutes (0.53 hour) between State 6 and State 7 was (Table 35). The minimum, median, and maximum durations between transition states for all Largescale Sucker are summarized in Table 35.

Table 33 Largescale Sucker Matrix 1 – state transition.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	29	18	0	0	1	11	0	0
S2 – Blue Creek	15	15	0	1	1	0	0	0
S3 – Downstream of Falls	1	3	0	0	0	2	0	0
S4 – Near Field River Left	3	1	1	0	5	2	0	0
S5 – Outside Entrance	5	2	1	5	16	281	26	0
S6 – Ladder Entrance	8	2	1	4	304	35	69	0
S7 – Lower Pools	0	0	0	0	4	63	2	32
S8 – Holding Pool	0	0	0	0	0	1	2	30

Table 34 Largescale Sucker Matrix 2 – transition frequency.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	23	12	0	0	1	11	0	0
S2 – Blue Creek	10	11	0	1	1	0	0	0
S3 – Downstream of Falls	1	3	0	0	0	2	0	0
S4 – Near Field River Left	3	1	1	0	5	2	0	0
S5 – Outside Entrance	5	2	1	5	14	39	19	0
S6 – Ladder Entrance	8	2	1	2	43	23	41	0
S7 – Lower Pools	0	0	0	0	3	35	2	31
S8 – Holding Pool	0	0	0	0	0	1	2	29

Table 35 Largescale Sucker Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(1, 2)	1.24	64.14	531.59
(1, 5)	284.91	284.91	284.91
(1, 6)	188.44	383.79	938.06
(2, 1)	3.73	67.59	815.08
(2, 4)	59.59	59.59	59.59
(2, 5)	295.29	295.29	295.29
(3, 1)	396.05	396.05	396.05
(3, 2)	9.14	125.94	864.68
(3, 6)	534.22	666.54	798.86
(4, 1)	6.40	1249.60	1486.58
(4, 2)	9.42	9.42	9.42
(4, 3)	1018.38	1018.38	1018.38
(4, 5)	0.28	1.39	5.37
(4, 6)	2.24	2.33	2.42
(5, 1)	349.94	1444.69	2641.21
(5, 2)	715.48	954.93	1194.38
(5, 3)	926.40	926.40	926.40
(5, 4)	0.53	1.42	369.81
(5, 6)	0.00	0.11	273.53
(5, 7)	0.07	0.53	1.42
(6, 1)	759.43	2036.16	3027.70
(6, 2)	1931.80	2550.52	3169.24
(6, 3)	1802.56	1802.56	1802.56
(6, 4)	6.58	103.77	906.49
(6, 5)	0.04	0.11	675.66
(6, 7)	0.04	0.53	2.92
(7, 5)	0.25	0.55	1.07
(7, 6)	0.04	0.32	74.88
(7, 8)	2.17	3.20	14.40
(8, 6)	0.89	0.89	0.89
(8, 7)	1.14	2.08	3.02

Section 8.3.1.5 – Mountain Whitefish

There was a single Mountain Whitefish detected by the submersible array at Prospect Bay. This individual fish was initially captured and PIT-tagged below Thompson Falls Dam on April 3, 2012. There was no movement between states, and thus no Matrices 1, 2, or 3 were produced.

Section 8.3.1.6 – Northern Pikeminnow

During the 2025 study season, 10 unique Northern Pikeminnow were detected by the array network. These individuals were observed moving among eight states with clear concentrations at ladder-associated locations: notably, many transitions to and from States 5 to 6 outside to inside the ladder (Table 36).

Matrix 1 (Table 36) summarizes all Northern Pikeminnow detections by multiple receiver locations and repeated movements between submersible and ladder receivers.

Matrix 2 (Table 37) highlights ladder-related movement by five individual Northern Pikeminnow from State 5 to State 6 represented by 53 movements (Matrix 1, Table 36) and six individuals from State 6 to State 5 represented by 61 movements. The data show the greatest concentration of transition movements at the ladder entrance (States 5 and 6). The median duration between Northern Pikeminnow movement between States 5 and 6 was 19.2 minutes (0.32 hours) and from States 6 to 5 was 6.6 minutes (0.11 hour, Table 38). The minimum, median, and maximum durations between transition states for all Northern Pikeminnow are summarized in Table 38.

Table 36 Northern Pikeminnow Matrix 1 – state transition.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	1	0	0	0	0	0	0	0
S2 – Blue Creek	0	3	0	1	1	3	0	0
S3 – Downstream of Falls	0	0	0	0	0	1	0	0
S4 – Near Field River Left	0	1	0	2	21	11	0	0
S5 – Outside Entrance	0	1	0	25	2	53	3	0
S6 – Ladder Entrance	0	3	1	6	61	1	5	0
S7 – Lower Pools	0	0	0	0	0	5	0	3
S8 – Holding Pool	0	0	0	0	0	1	0	3

Table 37 Northern Pikeminnow Matrix 2 – transition frequency.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	1	0	0	0	0	0	0	0
S2 – Blue Creek	0	2	0	1	1	2	0	0
S3 – Downstream of Falls	0	0	0	0	0	1	0	0
S4 – Near Field River Left	0	1	0	2	2	5	0	0
S5 – Outside Entrance	0	1	0	4	2	5	2	0
S6 – Ladder Entrance	0	2	1	4	6	1	3	0
S7 – Lower Pools	0	0	0	0	0	2	0	3
S8 – Holding Pool	0	0	0	0	0	1	0	2

Table 38 Northern Pikeminnow Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(2, 4)	81.10	81.10	81.10
(2, 5)	54.93	54.93	54.93
(2, 6)	34.95	90.13	244.30
(3, 6)	36.87	36.87	36.87
(4, 2)	14.54	14.54	14.54
(4, 4)	0.04	0.25	0.46
(4, 5)	0.21	3.98	74.56
(4, 6)	0.11	1.92	30.51
(5, 2)	10.56	10.56	10.56
(5, 4)	0.14	2.60	127.22
(5, 6)	0.00	0.32	99.16
(5, 7)	0.07	0.11	0.14
(6, 2)	4.80	12.30	300.76
(6, 3)	51.06	51.06	51.06
(6, 4)	0.53	21.99	891.77
(6, 5)	0.04	0.11	100.98
(6, 7)	0.28	0.32	0.50
(7, 6)	0.14	0.32	5.55
(7, 8)	1.92	3.13	3.34
(8, 6)	2.42	2.42	2.42

Section 8.3.1.7 – Rainbow Trout

During the 2025 study season, 35 unique Rainbow Trout were detected by the array network. These individuals were observed moving among eight states with clear concentrations at ladder-associated locations: notably, many transitions to and from States 5 and 6, outside to inside the ladder.

Matrix 1 (**Error! Reference source not found.**) summarizes all Rainbow Trout detections by multiple receiver locations and repeated movements between submersible and ladder receivers, consistent with active ladder-seeking and ladder-use behavior among Rainbow Trout.

Matrix 2 (Table 40) highlights substantial ladder-related movement by 19 individual Rainbow Trout from State 5 to State 6 represented by 54 movements (Matrix 1, Table 39) and 22 individuals from State 6 to State 5 represented by 63 movements. The data show the greatest concentration of transition movements at the ladder entrance (States 5 and 6). The median duration between Rainbow Trout movement from States 5 and 6 was 12.6 minutes (0.21 hour) and from State 6 to 5 was 6.6 minutes (0.11 hour, Table 41). The minimum, median, and maximum duration between transition states for Rainbow Trout is summarized in Table 41.

Table 39 Rainbow Trout Matrix 1 – state transition.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	7	2	0	0	0	1	0	0
S2 – Blue Creek	1	5	0	0	2	1	0	0
S3 – Downstream of Falls	0	1	0	0	0	0	0	0
S4 – Near Field River Left	1	0	0	0	8	10	0	0
S5 – Outside Entrance	0	2	1	7	2	54	14	0
S6 – Ladder Entrance	0	0	0	7	63	1	10	2
S7 – Lower Pools	0	0	0	0	0	2	0	22
S8 – Holding Pool	0	0	0	0	0	1	0	24

Table 40 Rainbow Trout Matrix 2 – transition frequency.

	S1 – Prospect Bay	S2 – Blue Creek	S3 – Downstream of Falls	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S1 – Prospect Bay	7	2	0	0	0	1	0	0
S2 – Blue Creek	1	3	0	0	2	1	0	0
S3 – Downstream of Falls	0	1	0	0	0	0	0	0
S4 – Near Field River Left	1	0	0	0	6	7	0	0
S5 – Outside Entrance	0	1	1	5	2	19	13	0
S6 – Ladder Entrance	0	0	0	5	22	1	9	2
S7 – Lower Pools	0	0	0	0	0	2	0	21
S8 – Holding Pool	0	0	0	0	0	1	0	23

Table 41 Rainbow Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(1, 2)	1107.02	1119.86	1132.69
(1, 6)	176.82	176.82	176.82
(2, 1)	302.01	302.01	302.01
(2, 2)	0.00	0.07	1545.35
(2, 5)	8.92	10.47	12.02
(2, 6)	2.31	2.31	2.31
(3, 2)	313.74	313.74	313.74
(4, 1)	766.44	766.44	766.44
(4, 5)	2.99	11.77	43.84
(4, 6)	0.11	4.59	84.05
(5, 2)	8.92	14.76	20.59
(5, 3)	101.65	101.65	101.65
(5, 4)	1.17	17.99	142.12
(5, 5)	0.00	0.02	0.04
(5, 6)	0.00	0.21	138.67
(5, 7)	0.00	0.25	1.17
(6, 4)	1.42	19.38	87.79
(6, 5)	0.04	0.11	459.27
(6, 7)	0.07	0.28	0.78
(6, 8)	1.67	2.79	3.91
(7, 6)	0.07	0.18	0.28
(7, 8)	1.07	2.33	22.01
(8, 6)	1.53	1.53	1.53

Section 8.3.1.8 – Westslope Cutthroat Trout

During the 2025 study season, two unique Westslope Cutthroat Trout were detected by the array network. These individuals were observed moving among State 3 – downstream of the falls upstream to State 8 – holding pool in the ladder. There were no detections at States 1 or 2. Matrix 1 (Table 42) summarizes all Westslope Cutthroat Trout detections by multiple receiver locations and repeated movements between submersible and ladder receivers.

Matrix 2 (Table 43) highlights ladder-related movement by two individual Westslope Cutthroat Trout from State 5 to State 6 represented by seven movements (Matrix 1, Table 42) and two individuals from State 6 to State 5 represented by six movements. The data show the greatest concentration of transition movements at the ladder entrance (States 5 and 6). The median duration between Westslope Cutthroat Trout movement from States 5 and 6 was 8.4 minutes (0.14 hour) and from State 6 to 5 was 6.6 minutes (0.11 hour, Table 44). The minimum, median,

and maximum durations between transition states for all Westslope Cutthroat Trout are summarized in Table 44.

Table 42 Westslope Cutthroat Trout Matrix 1 – state transition.

	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S3 – Downstream of Falls	0	1	0	0	0
S4 – Near Field River Left	0	1	0	0	0
S5 – Outside Entrance	0	0	7	2	0
S6 – Ladder Entrance	1	6	1	2	0
S7 – Lower Pools	0	0	3	0	2
S8 – Holding Pool	0	0	0	1	1

Table 43 Westslope Cutthroat Trout Matrix 2 – transition frequency.

	S4 – Near Field River Left	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S3 – Downstream of Falls	0	1	0	0	0
S4 – Near Field River Left	0	1	0	0	0
S5 – Outside Entrance	0	0	2	1	0
S6 – Ladder Entrance	1	2	1	1	0
S7 – Lower Pools	0	0	2	0	1
S8 – Holding Pool	0	0	0	1	1

Table 44 Westslope Cutthroat Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(3, 5)	538.92	538.92	538.92
(4, 5)	5.23	5.23	5.23
(5, 6)	0	0.14	14.47
(5, 7)	0	0.04	0.07
(6, 4)	30.26	30.26	30.26
(6, 5)	0.07	0.11	0.11
(6, 7)	0.71	0.92	1.14
(7, 6)	0.07	0.43	0.5
(7, 8)	1.07	1.62	2.17
(8, 7)	0.21	0.21	0.21

Section 8.3.2 – Objective 2 – Fish Movements Outside and Inside the Ladder

This section provides a summary of the analysis of fish movement, by species detected at State 5 (two submersible arrays immediately outside the ladder) or at State 6 (defined as all fixed arrays inside the ladder). State 6 represents the ladder entrances (Ant 4 and Ant 5), the lower

pools (Ant 1 and Ant 2), and the holding pool (Ant 3). Matrix 1 refers to States 6, 7, and 8 as defined for Objective 1 to provide details about fish movement within the ladder. Matrix 2 and Matrix 3 define State 6 (inside the ladder) as including all fixed array stations inside the ladder. The following text either specifies the location inside the ladder (ladder entrance, lower pools, or holding pool) or refers to "inside the ladder" to define a detection by any one fixed array inside the ladder.

In total, the analysis detected 110 unique fish outside the ladder (State 5) and 161 unique fish inside the ladder (Table 45). Fish detected outside the ladder represent six species (BULL, LL, LS SU, N PMN, RB, WCT). Fish detected inside the ladder represent seven species (BULL, LL, LN SU, LS SU, N PMN, RB, WCT). The receivers outside the ladder representing State 5 were not operating (removed between April 2 and May 21 during high flows) throughout the ladder season (March 17 – October 30), thus some individuals may have been detected inside the ladder and not outside the ladder.

Table 45 Summary of unique fish detection in State 5, outside the ladder and in State 6, inside the ladder.

Species	State 5 (Outside Ladder Entrance)	State 6 (Inside the Ladder)
BULL	1	1
LL	32	36
LN SU	-	2
LS SU	47	86
N PMN	6	6
RB	22	28
WCT	2	2
Total	**110**	**161**

A total of 99 individual fish, representing six species, were first detected at State 5 and then detected in the ladder (Table 46).

Table 46 Summary of individual fish detected at State 5, immediately outside the ladder, and then inside the ladder, 2025

Species	# of Individual Fish Detected at State 5 (Outside Ladder Entrance) and Then Detected at State 6 (Inside the Ladder)
BULL	1
LL	30
LN SU	-
LS SU	40
MWF	-
N PMN	5
RB	21
WCT	2
Total	**99**

Section 8.3.2.1 – Bull Trout

One Bull Trout was detected by the array network in 2025 and showed limited but clear ladder-associated activity (Table 47 and Table 48). The individual Bull Trout made a single approach from the outside entrance (State 5) into the ladder entrance and up to the lower pools (State 6) and three return events from the ladder entrance back to State 5 (Table 47). Its median approach time (State 5 to State 6) was about 3 minutes (0.05 hour), and the median return time (State 6 to State 5) was about 4 minutes (0.07 hour, Table 49). Although the sample size is small and limited to one individual, these detections demonstrate that the Bull Trout did pass between outside and inside ladder states in 2025.

Table 47 Bull Trout Matrix 1 – state transition.

	S5 – Outside Ladder Entrance	S6 – Ladder Entrance	S7 – Lower Pools
S5 – Outside Ladder Entrance	1	1	1
S6 – Ladder Entrance	3	0	0
S7 – Lower Pools	0	1	0

Table 48 Bull Trout Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	1	1
S6 – Inside Ladder	1	0

Table 49 Bull Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 6)	0	0.05	0.11
(6, 5)	0.04	0.07	0.11

Section 8.3.2.2 – Brown Trout

In 2025, most movements detected for Brown Trout were at the ladder entrance transitioning 445 times between State 5 and State 6 (Table 50). These movements represented 30 Brown Trout moving from State 5 to State 6 with a median duration of 21.3 minutes (0.36 hour)and 27 Brown Trout moving from State 6 to State 5 with a median time of 6.6 minutes (0.11 hour) (Table 51 and Table 52).

Table 50 Brown Trout Matrix 1 – state Transition.

	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S5 – Outside Entrance	5	220	24	3
S6 – Ladder Entrance	225	3	25	3
S7 – Lower Pools	10	21	1	21
S8 – Holding Pool	0	1	3	24

Table 51 Brown Trout Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	5	30
S6 – Inside Ladder	27	32

Table 52 Brown Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 6)	0	0.36	507.2
(6, 5)	0.04	0.11	84.02

Section 8.3.2.3 – Longnose Sucker

In 2025, two of the six individual Longnose Sucker detected by the array network were detected at the ladder entrance, State 6. These two fish were initially PIT-tagged below Thompson Falls Dam in April 2024 with no subsequent detections in the system. There are no detections of the two fish in State 5 prior to their detection at State 6, thus there are no analyses of state transitions, transition frequency, or duration frequency available.

Section 8.3.2.4 – Largescale Sucker

In 2025, most movements detected for Largescale Sucker were at the ladder entrance transitioning 585 times between State 5 and State 6 (Table 53). These movements represented 40 Largescale Sucker moving from State 5 to State 6 with a median duration of 8.4 minutes (0.14 hour) and 43 Largescale Sucker moving from State 6 to State 5 with a median duration of 6.6 minutes (0.11 hour, Table 54 and Table 55).

Table 53 Largescale Sucker Matrix 1 – state transition.

	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S5 – Outside Entrance	16	281	26	0
S6 – Ladder Entrance	304	35	69	0
S7 – Lower Pools	4	63	2	32
S8 – Holding Pool	0	1	2	30

Table 54 Largescale Sucker Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	0	40
S6 – Inside Ladder	43	71

Table 55 Largescale Sucker Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 6)	0	0.14	273.53
(6, 5)	0.04	0.11	675.66

Section 8.3.2.5 – Northern Pikeminnow

In 2025, most movements detected for Northern Pikeminnow were at the ladder entrance transitioning 114 times between State 5 and State 6 (Table 56). These movements represented five Northern Pikeminnow moving from State 5 to State 6 with a median duration of 15 minutes (0.25 hour) and six Northern Pikeminnow moving from State 6 to State 5 with a median duration of 6.6 minutes (0.11 hour, Table 57 and **Error! Reference source not found.**).

Table 56 Northern Pikeminnow Matrix 1 – state transition.

	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S5 – Outside Entrance	2	53	3	0
S6 – Ladder Entrance	61	1	5	0
S7 – Lower Pools	0	5	0	3
S8 – Holding Pool	0	1	0	3

Table 57 Northern Pikeminnow Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	0	5
S6 – Inside Ladder	6	0

Table 58 Northern Pikeminnow Matrix 3 – transition duration (hours).

Transition	Min	Median	Max
(5, 6)	0	0.25	99.16
(6, 5)	0.04	0.11	100.98

Section 8.3.2.6 – Rainbow Trout

In 2025, most movements detected for Rainbow Trout were at the ladder entrance transitioning 117 times between States 5 and State 6 (Table 59). These movements represented 21 Rainbow Trout moving from State 5 to State 6 with a median duration of 12.8 minutes (0.21 hour) and 22 Rainbow Trout moving from State 6 to State 5 with a median duration of 6.6 minutes (0.11 hour, Table 60 and Table 61).

Table 59 Rainbow Trout Matrix 1 – state transition.

	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S5 – Outside Entrance	2	54	14	0
S6 – Ladder Entrance	63	1	10	2
S7 – Lower Pools	0	2	0	22
S8 – Holding Pool	0	1	0	24

Table 60 Rainbow Trout Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	0	21
S6 – Inside Ladder	22	0

Table 61 Rainbow Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 6)	0	0.21	138.67
(6, 5)	0.04	0.11	459.27

Section 8.3.2.7 – Westslope Cutthroat Trout

In 2025, most movements detected for Westslope Cutthroat Trout were at the ladder entrance transitioning 13 times between State 5 and State 6 (Table 62). These movements represented two Westslope Cutthroat Trout detected transitioning from State 5 to State 6 seven times with a median duration of 4.2 minutes (0.07 hour) and two Westslope Cutthroat Trout detected moving six times from State 6 to State 5 with a median duration of 6.6 minutes (0.11 hour, Table 63**Error! Reference source not found.** and Table 64).

Table 62 Westslope Cutthroat Trout Matrix 1 – state transition.

	S5 – Outside Entrance	S6 – Ladder Entrance	S7 – Lower Pools	S8 – Holding Pool
S5 – Outside Entrance	0	7	2	0
S6 – Ladder Entrance	6	1	2	0
S7 – Lower Pools	0	3	0	2
S8 – Holding Pool	0	0	1	1

Table 63 Westslope Cutthroat Trout Matrix 2 – transition frequency.

	S5 – Outside Entrance	S6 – Inside Ladder
S5 – Outside Entrance	0	2
S6 – Inside Ladder	2	0

Table 64 Westslope Cutthroat Trout Matrix 3 – transition duration (hours).

State Transition	Minimum (hrs)	Median (hrs)	Maximum (hrs)
(5, 6)	0	0.07	14.47
(6, 5)	0.07	0.11	0.11

Section 8.3.3 – Summary of Fish Movements

In summary, 203 individual fish were detected by the array network in either the far field or near field (Table 65) or inside the ladders (Table 66). The far field includes States 1 through 3 (Prospect Bay, Blue Creek, Downstream of Falls), and near field includes States 4 and 5 (Near Field River Left, Outside Ladder Entrance). The ladder arrays include State 6 (Ant 4 and Ant 5), State 7 (Ant 1 and Ant 2), and State 8 (Ant 3). A summary of the percentage and number of individual detections by species in the far and near fields is provided in **Error! Reference source not found.**and in the ladder in Table 66.

Overall, approximately 42 percent of the 203 individual fish were detected by at least one of the far field receiver stations; 60 percent were detected by at least one of the near field receiver stations; 77 percent were detected at the ladder entrance; 56 percent were detected at the lower pools; and 41 percent were detected at the holding pool.

Table 65 Individual detections of fish in the far field (S1, S2, S3) and near field (S4 or S5), through October 30, 2025.

2025 Data	Individual Fish	S1, S2, or S3	S4 or S5
Species	**Total Detections at any PIT Array**	**% (#) in Far Field**	**% (#) in Near Field**
BULL	3	100 (3)	33 (1)
LL	44	34 (15)	95 (42)
LN SU	6	67 (4)	-
LS SU	102	43 (44)	46 (47)
MWF	1	100 (1)	-
N PMN	10	50 (5)	70 (7)
RB	35	37 (13)	66 (23)
WCT	2	50 (1)	100 (2)
Total	**203**	**42 (86)**	**60 (122)**

Table 66 Individual detections of fish in the ladder, 2025, through October 30, 2025.

2025 Data	Individual Fish	Internal Ladder Arrays		
Species	**Total Detections at any PIT Array**	**% (#) Ladder Entrance**	**% (#) Lower Pools**	**% (#) Ascend Ladder**
BULL	3	33 (1)	33 (1)	-
LL	44	75 (33)	66 (29)	57 (25)
LN SU	6	33 (2)	-	-
LS SU	102	83 (85)	54 (55)	30 (31)
MWF	1	-	-	-
N PMN	10	60 (6)	30 (3)	30 (3)
RB	35	80 (28)	66 (23)	66 (23)
WCT	2	100 (2)	100 (2)	50 (1)
Total	**203**	**77 (157)**	**56 (113)**	**41 (83)**

Section 8.3.4 – Conclusion

NorthWestern has completed 2 years of submersible array deployments coinciding with the ladder season and evaluation of detections recorded at each receiver site. The submersible arrays were not operating continuously throughout the ladder season and were removed during high spring flows. This report provides a summary of detections, information on total movements between the receivers, and the number of individual fish detected and duration between the movements. Each submersible receiver deployed in 2025 detected fish movement during the study season. The majority of fish detections were concentrated between the submersible array located outside the ladder entrance and the fixed arrays at the ladder entrance (Kleinschmidt Associates 2025).

Section 9.0 – References

Federal Energy Regulatory Commission (FERC). 2015. Modifications of reporting requirements of Commission's February 12, 2009 Order Approving Construction and Operation of Fish Passage Facilities. Letter to Jon Jourdonnais, dated February 25, 2015. From FERC, Joy Kurtz.

FERC. 2019. Order Amending Reporting Schedule Under Order Approving Construction and Operation of Fish Passage Facilities. October 7, 2019. 169 FERC 62, 010.

Glaid, J. 2017. Subadult Bull Trout Out-Migration in the Thompson River Drainage, Montana. MS Thesis. Montana State University, July 2017.

Kleinschmidt Associates. 2025. 2025 Updated Data Analysis of Fine-Scale Fish Movements Using Submersible PIT Antennae. Thompson Falls Dam FERC No. 1869.

NorthWestern. 2019a. 2018 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

NorthWestern. 2019b. Thompson Falls Hydroelectric Project FERC Project No. 1869, Comprehensive Phase 2 Final Fish Passage Report. Electronically filed with the Commission on December 23, 2019.

NorthWestern. 2021. 2020 Annual Report Fish Passage Project. Thompson Falls Hydroelectric Project, FERC Project Number 1869.

NorthWestern. 2022. 2021 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

NorthWestern. 2023. 2022 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

NorthWestern. 2023a. Thompson Falls Hydroelectric Project FERC Project No. 1869 - Final Study Report – Fish Behavior Study 2023.

NorthWestern. 2024. 2023 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

NorthWestern. 2025. 2024 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

New Wave Environmental Consulting and GEI Consultants (New Wave and GEI). 2020. 2019 Annual Report Fish Passage Project Thompson Falls Hydroelectric Project, FERC Project Number 1869.

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

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

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 Ecological Services Field Office, Helena.