Thompson Falls Hydroelectric Project
FERC Project No. 1869
Volume II of IV – Public
Draft License Application Exhibit E

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List of Abbreviations and Acronyms

>	greater than
<	less than
~	approximately
°F	degrees Fahrenheit
ug/L	micrograms per litre
3D	three-dimensional
*ug/*L	micrograms per litre
AA	Assessment Areas
ADA	Americans with Disabilities Act
Agreement	1988 Mitigation Agreement
AIS	aquatic invasive species
APE	Area of Potential Effect
ARM	Administrative Rules of Montana
Avista	Avista Utilities
BED	Baseline Environmental Document
BCC	Birds of Conservation Concern
BIA	U.S. Bureau of Indian Affairs
BLM	Bureau of Land Management
BL BH	Black Bullhead
BO	Biological Opinion
BULL	Bull Trout
BULL x EB	Bull x Brook Trout Hybrid
CaCO3	Calcium carbonate
CFD	computational fluid dynamics
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHRU	Columbia Headwater Recovery Unit
CHSU	Critical Habitat Subunit
CHU	Critical Habitat Units
City	city of Thompson Falls
Commission	Federal Energy Regulatory Commission
Council	Northwest Power and Conservation Council
COVID-19	respiratory illness that is caused by a coronavirus
CSKT	Confederated Salish and Kootenai Tribes
CZMA	Coastal Zone Management Act
CWA	Clean Water Act
DLA	Draft License Application
DO	dissolved oxygen
DNRC	Department of Natural Resources and Conservation
B	Brook Trout
E-coli	Escherichia coli bacteria
ECOS	Environmental Conservation Online System
EFH	Essential Fish Habitat
EIM	Energy Imbalance Market
EJ Study	Environmental Justice Study
EJC	environmental justice communities

El.	elevation
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FLA	Final License Application
fps	feet per second
FWP	Montana Fish, Wildlife and Parks
FWS	United States Fish and Wildlife Service
GBT	Gas Bubble Trauma
H-A&E	Historic Architectural-Engineering
HDR	HDR Engineering, Inc.
HPMP	Historic Properties Management Plan
HVJ	high velocity jet
HxCDD	Hexachlorodibenzo-p-dioxin
ILP	Integrated Licensing Process
IPaC	Information for Planning and Consultation
ISB	Intermountain Seismic Belt
ISR	Initial Study Report
ITRR	Institute for Tourism and Recreation Research
km	kilometer
km2	square meter
KNF	Kootenai National Forest
KOK	Kokanee
kV	kilovolts
L WF	Lake Whitefish
Licensee	NorthWestern Energy
LL	Brown Trout
LMB	Largemouth Bass
LNF	Lolo National Forest
LN DC	Longnose Dace
LN SU	Longnose Sucker
LS SU	Largescale Sucker
LT	Lake Trout
m	meter
MBTA	Migratory Bird Treaty Act
MBTRT	Montana Bull Trout Restoration Team
MDL	Main Dam left
MDR	Main Dam right
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m2	milligrams per meter squared
MNHP	Montana Natural Heritage Program
Montana DEQ	Montana Department of Environmental Quality
MOU	memorandum of understanding
MPC	Montana Power Company
MSDI	Montana Spatial Data Infrastructure
MT	Montana

MW	megawatt
MWAM	Montana Wetland Assessment Method
MWh	megawatt-hours
MWF	Mountain Whitefish
N PMN	Northern Pikeminnow
NEPA	National Environmental Policy Act
new powerhouse	Unit No. 7 powerhouse
NHPA	National Historic Preservation Act of 1966
NISB	Northern Intermountain Seismic Belt
NMFS	National Oceanic and Atmospheric Administration Fisheries
NO3+NO2	Nitrate+Nitrite
NOI	Notice of Intent
NorthWestern	NorthWestern Energy
NP	Northern Pike
NPL	EPA Superfund National Priorities List
NPMN x PEA	Northern Pikeminnow x Peamouth
NRHP	National Register of Historic Properties
NTU	nephelometric turbidity units
OBL	obligate wetland
OHWM	Ordinary High-Water Mark
P&C	proposed and candidate
PAD	Pre-Application Document
PCBs	polychlorinated biphenyl
PEA	Peamouth
pH	hydrogen ion concentration
PIT	passive integrated transponder
PM&E	Protection, Mitigation, and Enhancement
Program	Northwest Power Planning Council's Fish and Wildlife Program
Project	Thompson Falls Hydroelectric Project
PSP	Proposed Study Plan
PUMP	Pumpkinseed
RB	Rainbow Trout
RBxWCT	Rainbow x Westslope Cutthroat Trout hybrid
Relicensing Participants	Local, state, and federal governmental agencies, Native American Indian Tribes, local landowners and residents, non-governmental organizations, and other interested parties.
RMU	Responsible Management Unit
RS SH	Redside Shiner
RSP	Revised Study Plan
Scientific Panel	Thompson Falls Scientific Review Panel
SCORP	Montana Statewide Comprehensive Outdoor Recreation Plan
SD	Scoping Document
SHPO	State Historic Preservation Officer
SKQ	Seli'š Ksanka Qlispe'
SMB	Smallmouth Bass
SOC	Species of Concern
SSS	special status species
TAC	Thompson Falls Technical Advisory Committee
T&E	threatened and endangered
TCDD	Tetrachlorodibenzo-p-dioxin

TCLP	Toxicity Characteristic Leaching Procedure
TCs	Terms and Conditions
TDG	total dissolved gas
TEQ	total equivalence
Thompson Falls Project	Thompson Falls Hydroelectric Project
TN	total nitrogen
TP	total phosphorous
Trails Group	Thompson Falls Community Trails Group
U.S.	United States of America
U.S.C.	United State Code
USFS	United States Forest Service
USGS	United States Geological Survey
USR	Updated Study Report
VQO	Visual Quality Objectives
WCT	Westslope Cutthroat Trout
WE	Walleye
WMA	Wildlife Management Area
YP	Yellow Perch
YL BL	Yellow Bullhead
ZOP	Zone of Passage

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1. Introduction

1.1 Application

NorthWestern Corporation, a Delaware corporation, d/b/a NorthWestern Energy (NorthWestern or Licensee) is filing this Exhibit E with the Federal Energy Regulatory Commission (Commission or FERC) as part of the Draft License Application (DLA) for the Thompson Falls Hydroelectric Project (Thompson Falls Project or Project). The current license for the Project expires December 31, 2025. NorthWestern is using FERC's default relicensing process, the Integrated Licensing Process (ILP), to prepare its relicensing application.

The Thompson Falls Project is located on the Clark Fork River in Sanders County, Montana. (**Figure 1-1**). Preliminary development of the Thompson Falls 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 Project has been operating continuously since 1915.

Non-federal hydropower projects in the United States (U.S.) are regulated by FERC under the authority of the Federal Power Act (FPA). Montana Power Company (MPC) acquired the Thompson Falls Project in 1929. The original license for the Thompson Falls Project was issued effective January 1, 1938 and expired on December 31, 1975. The current FERC license was issued to the MPC in 1979. The Project was purchased by (and FERC license transferred to) PPL Montana in 1999 and then purchased by (and FERC license transferred to) NorthWestern in 2014. An order amending the license was issued in 1990 allowing for construction of an additional powerhouse (new powerhouse), and generating unit, Unit No. 7, which was subsequently completed in 1995. With the addition of this new (second) powerhouse, the Project has a total authorized installed capacity of 92.6 megawatts (MW). NorthWestern is not proposing in this relicensing to increase capacity or construct any new facilities for the Project.

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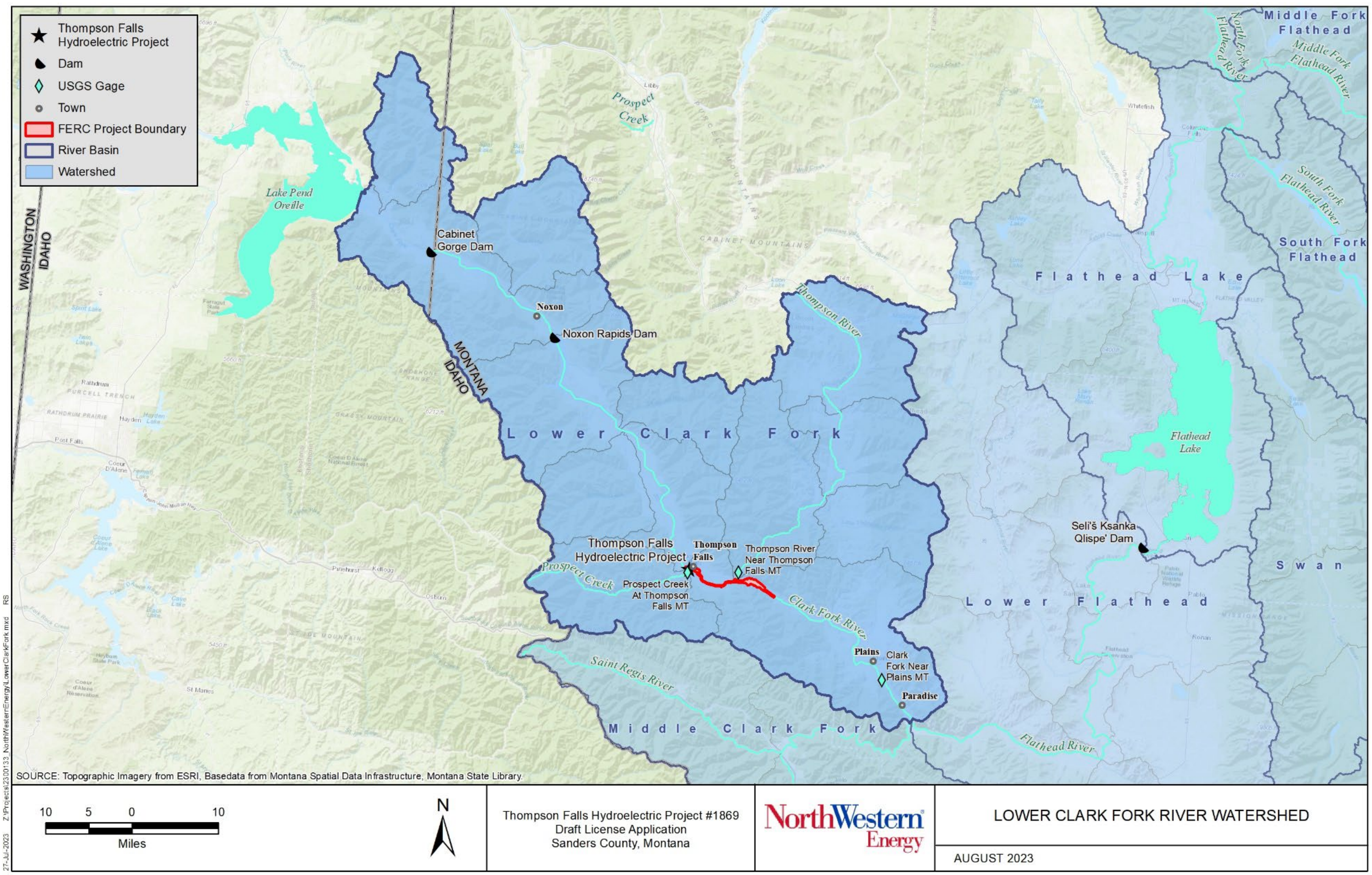
Figure 1-1. Project location and surrounding watersheds.



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1.2 Purpose of Action and Need for Power

1.2.1 Purpose of Action

In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the Project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (e.g., hydropower generation, flood control, irrigation and water supply), the Commission must give equal consideration to the purposes of energy conservation, the protection, mitigation of damage to, and enhancement of fish and wildlife (including related spawning grounds and habitat), the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

Issuing a new license for the Thompson Falls Project would allow NorthWestern to continue to generate electricity at the Project for the term of the new license, making electric power from a renewable resource available to its customers.

1.2.2 Need for Power

The Thompson Falls Project would provide hydroelectric generation to meet part of NorthWestern's obligations to serve the State of Montana's power requirements, resource diversity, and capacity needs. The Project would have an authorized installed capacity of 92.6 MW and generate approximately 475,379 megawatt-hours (MWh) per year.

Alternative sources of energy and capacity could in theory be obtained from short-term market purchases and long-term contracts with other entities in the region. However, the availability of the regional market to supply capacity and energy has been changing in recent years.

Resource adequacy is a top priority of NorthWestern. Currently, NorthWestern does not have adequate supply resources to fully serve load throughout the year. Due to inadequate supply, NorthWestern relies frequently on imported energy purchases to meet peak demand. Regionally, the Pacific Northwest is facing tight supply conditions which will likely persist into the future with projected coal retirements and the lack of adequate replacement capacity. NorthWestern cannot count on continued imports given the risk of declining generation regionally. An adequate portfolio would ensure that NorthWestern customers are less reliant on volatile and uncertain energy purchases and provide protection against transmission congestion which limits import availability (NorthWestern 2023).

The Project provides real power delivery to the local area, voltage support for the interconnecting transmission system, cost effective imbalance energy, and Frequency Reserve Response for the Western Interconnection. NorthWestern operates and maintains the Project in accordance with both the Western Electric Coordinating Council and the North American Reliability Council. NorthWestern is a registered transmission owner and operator and Balancing Authority through these entities and is responsible for grid stability and reliability. The Thompson Falls Project is interconnected into the NorthWestern system and located in its Balancing Authority Area.

NorthWestern currently participates in the Energy Imbalance Market (EIM) hosted by the California Independent System Operator. The EIM is a voluntary inter-hour market established to share energy through load balancing for the purpose of grid stability and reliability. The Project is a participating resource in the EIM.

The power from the Project would help NorthWestern meet the need for power to serve their customers in both the short and long-term.

1.3 Statutory and Regulatory Requirements

FERC's issuance of a new license for the Thompson Falls Project is subject to numerous requirements under the FPA and other applicable statutes. The major requirements are described below. The actions NorthWestern has taken to address these requirements are also described below.

1.3.1 Federal Power Act

The FPA is the primary federal statute governing the regulation of nonfederal hydroelectric power. FERC has the responsibility and authority to license operation and construction of nonfederal hydropower projects under the FPA. FERC is the lead federal agency for regulating the relicensing of the Thompson Falls Project. The following sections of the FPA will apply to the relicensing.

1.3.1.1 Section 4(e) Conditions

The first proviso of FPA section 4(e), 16 U.S. Code (U.S.C.) § 797(e), provides that any license issued by the Commission for a project within a federal reservation shall be subject to and contain such conditions as the Secretary of the responsible federal land management agency deems necessary for the adequate protection and use of the The Project occupies federal lands within Lolo National Forest (LNF) that are administered by the U.S. Forest Service (USFS). FERC will solicit FPA section 4(e) conditions from LNF after the Final License Application (FLA) is filed.

1.3.1.2 Section 10(j) Recommendations

Under Section 10(j) of the FPA, 16 U.S.C. § 803(j), each license issued by FERC must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the Protection, Mitigation, and Enhancement (PM&E) of fish and wildlife resources affected by the Project. FERC is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable laws. Before rejecting or modifying an agency recommendation, FERC is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. FERC will solicit FPA section 10(j) recommendations from the U.S. Fish and Wildlife Service (FWS) and Montana Fish, Wildlife and Parks (FWP) after the FLA is filed.

1.3.1.3 Section 18 Fishway Prescriptions

FPA section 18, 16 U.S.C. § 811, states that FERC is to require construction, operation, and maintenance by a licensee of such fishways as may be presercibed by the Secretaries of Commernce or the Interior. FERC will solicit FPA section 18 fishway precriptions from FWS after the FLA is filed.

1.3.2 Clean Water Act Section 401

Under section 401 of the Clean Water Act (CWA), a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the applicable provisions of the CWA, unless the certification is waived. Therefore, a CWA section 401 water quality certification or waiver is required from the Montana Department of Environmental Quality (Montana DEQ) as a prerequisite to FERC's issuance of a new license for the Project. Pursuant to 18 C.F.R. § 5.23(b), NorthWestern will request water quality certification from Montana DEQ within 60 days of FERC's public notice that the FLA is ready for environmental analysis.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

On August 28, 2020, FERC designated NorthWestern as its non-federal representative for the purpose of initiating consultation with the FWS under ESA section 7. NorthWestern has engaged with FWS and determined that three federally listed, proposed, or candidate species may occur within the vicinity of the Project. These species include the threatened Bull Trout (*Salvelinus confluentus*); threatened Grizzly Bear (*Ursus arctos horribilis*); and candidate Wolverine (*Gulo* gulo luscus).

Discussion of the Thompson Falls Project's effects on threatened and endangered species are provided in **Exhibit E - Section 10 – Threatened and Endangered Species** of this Exhibit E.

1.3.4 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) requires federal agencies to consult with the National Marine Fisheries Service (NMFS)on all actions that may adversely affect Essential Fish Habitat (EFH). EFH is only applicable to federally managed commercial fish species which live at least one component of their lifecycle in marine waters.

The Project does not include marine fisheries, and no EFH has been designated in the Project area, thus the Magnuson-Stevens Fishery Conservation and Management Act is not applicable to this Project.

1.3.5 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(3)(A), FERC cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

Montana does not have a coastal zone or a coastal zone program; thus, the CZMA is not applicable.

1.3.6 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA), 54 U.S.C. § 306108, requires federal agencies to "take into account" how each of its undertakings could affect historic properties. "Historic properties" are defined as any district, site, building, structure, traditional cultural property, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (NRHP).

On August 28, 2020, FERC designated NorthWestern as its non-federal representative for the purpose of initiating consultation with the Montana State Historic Preservation Officer (SHPO) under Section 106 of the NHPA. As part of its role as FERC's non-federal representative, NorthWestern developed and conducted cultural resources studies in consultation with the SHPO and provided an opportunity for potentially affected Native American Tribes to participate in the development of these studies. The results of these studies and NorthWestern's analysis of historic and cultural resources are described in detail in **Exhibit E - Section 12 – Cultural Resources** of this Exhibit E.

NorthWestern anticipates that FERC will meet its obligations under NHPA section 106 through the execution of a programmatic agreement with SHPO that will require the implementation of an Historic Properties Management Plan (HPMP) that addresses the management and treatment of historic properties identified within the Project's Area of Potential Effects. A draft HPMP appears in Volume IV of this DLA.

1.3.7 Pacific Northwest Power Planning and Conservation Act

Under section 4 (h) of the Pacific Northwest Power Planning and Conservation Act, the Northwest Power and Conservation Council (Council) developed the Columbia River Basin Fish and Wildlife Program (Program) to protect, mitigate, and enhance the operation of the hydroelectric projects within the Columbia River Basin. Section 4(h) states that responsible federal and state agencies should provide equitable treatment for fish and wildlife resources, in addition to other purposes for which hydropower is developed, and that these agencies shall take into account, to the fullest extent practicable, the program adopted under the Pacific Northwest Power Planning and Conservation Act.

To mitigate harm to fish and wildlife resources, the Council has adopted specific provisions to be considered in the licensing or relicensing of non-federal hydropower projects (which are described in Appendix B of the Program).

As part of the Program, the Council has designated over 40,000 miles of river in the Pacific Northwest region as not being suitable for hydroelectric development (protected area). The Project is not located within a protected area. The Council has standards for new hydropower developments and licenses. Relicensing of the Thompson Falls Project is consistent with the Council’s program and hydropower standards.

1.3.8 Wild and Scenic Rivers and Wilderness Acts

Section 7(a) of the Wild and Scenic Rivers Act requires federal agencies to determine if the operation of the Project under the new license would invade the area or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the designated river corridor. The Project is not located within or adjacent to a river segment that is designated as part of, or under study for inclusion in, the National Wild and Scenic River System or Wilderness Area.

1.4 Public Review and Consultation

The Commission's regulations (18 CFR, § 5.1–5.16) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the ESA, the NHPA, and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

NorthWestern is using the ILP for relicensing of the Thompson Falls Project. The ILP is FERC’s default licensing process which evaluates effects of a project based on a nexus to continuing Project operations. In general, the purpose of the pre-filing stage of the ILP is to inform Relicensing Participants about relicensing, to identify issues and study needs (based on a project nexus and established FERC criteria), to conduct those studies per specific FERC requirements, defined in the FERC Study Plan Determination, and to prepare the FLA.

FERC staff are active ILP participants during the pre-filing stage, providing oversight to the applicant and Relicensing Participants. National Environmental Policy Act (NEPA) scoping is conducted during the pre-filing phase of the ILP, allowing identification of issues and studies (per FERC criteria) that may be required.

Before filing a FLA with FERC, applicants are required to conduct a pre-license application filing process that consists of 1) presenting the Project to Relicensing Participants[1]; 2) consulting with those Relicensing Participants; 3) identifying issues; and 4) gathering available information.

NorthWestern maintains a website[2] with information about the Thompson Falls Project. Relicensing information, including meeting notices and presentations, reports, and other documents are available on this website.

1.4.1 Voluntary Early Outreach

NorthWestern proactively initiated relicensing outreach discussions with Relicensing Participants in 2018 (**Table 1-1**). The first activity was a training program, "FERC 101," which was held in Missoula, Montana on September 12, 2018. This program included FERC staff who presented information on the procedures used to relicense hydropower projects under the Commission's jurisdiction. NorthWestern also presented information on the Thompson Falls Project. The goal of the meeting was to inform Relicensing Participants of the relicensing process and schedule for the Thompson Falls Project. Presentations from this meeting, and all other Thompson Falls relicensing meetings, are posted on NorthWestern's website.

Next, NorthWestern voluntarily prepared a Baseline Environmental Document (BED) which was a compilation of existing resource information. This document was released for public comment on November 1, 2018 and is available on the Thompson Falls Project website. A workshop was held in Missoula to discuss the BED and identify any data gaps and resource issues on December 4, 2018 (Table 1-1). The presentations from that meeting are available on the website. NorthWestern received written comments on the BED from FWP and Montana DEQ.

In October 2019, NorthWestern hosted a public meeting in Thompson Falls to further inform Relicensing Participants about the relicensing process and provide an update on an operational test and resource studies NorthWestern was conducting at the Project.

In March 2020, NorthWestern hosted a second public meeting in Thompson Falls to inform the Relicensing Participants of observations made during the October 2019 operational test, describe NorthWestern's Project operations, and provide an update on studies andthe relicensing process.

All of these activities, summarized in **Table 1-1** below, were done voluntarily by NorthWestern to engage the Relicensing Participants in advance of initiating the ILP. The goals of these extra efforts were to learn about potential concerns or gaps in data and to establish a common understanding among all the interested parties as to what is involved with relicensing the Project.

[1] Local, state, and federal governmental agencies, Native American Indian Tribes, local landowners, non-governmental organizations, and other interested parties.

[2] https://northwesternenergy.com/TFallsRelicensing

Table 1-1: Thompson Falls relicensing outreach and other activities conducted prior to filing the Pre-Application Document.

Thompson Falls Relicensing Outreach and Other Activities	Comment	Date
FERC 101 Relicensing Outreach Training, Missoula. Public invited.	FERC training on the procedures used to relicense hydropower projects.	Sept 12, 2018
Notified Relicensing Participants of availability of BED.	The BED described the hydroelectric Project and available fish, wildlife, water quality, cultural and recreation, operational and other Project specific information.	Nov 1, 2018
Workshop to discuss the relicensing (ILP) process and BED and identify data gaps and resource issues.	Workshop included small group breakout sessions to discuss fisheries, water resources and recreation/cultural issues.	Dec 4, 2018
Pre-relicensing data collection.	Included operations, water quality, fisheries, and recreation use data.	2018-2020
Public meeting in Thompson Falls for Relicensing Participants.	Included updates on studies and the relicensing process.	Oct 15, 2019
Public meeting in Thompson Falls for Relicensing Participants.	Included observations made during the operational test and updates on studies and the relicensing process.	March 11, 2020

In addition to the stakeholder consultation efforts, NorthWestern accelerated the schedule to conduct certain resource assessments and relicensing studies to better inform relicensing. Specifically, NorthWestern prepared a water quality monitoring plan which was implemented in 2019 to address data gaps that were noted during the preparation of the BED. The results of that study were submitted in the Pre-Application Document (PAD), filed with FERC on July 1, 2020, and are available on the Project website.

A Recreation Visitor Survey was conducted during the 2018 peak recreation season (Memorial Day weekend – Labor Day). In addition, the volume of use at five of the 10 Project-related recreation sites was monitored during the 2019 peak recreation season using automatic traffic and trail counters. The results of that study were submitted in the PAD, filed with FERC on July 1, 2020, and available on the Project website.

The 2008 Biological Opinion (BO) issued by the FWS for the Project included a requirement for the Licensee to conduct Phase 2 fish passage evaluation studies from 2010 to 2020. At the end of the Phase 2 evaluation period, the Licensee was required to prepare a comprehensive 10-year report to file with the Commission.

The BO specified that the comprehensive report be completed by December 31, 2020. NorthWestern reviewed the relicensing schedule and found that some adjustments in the compliance reporting schedule could better align the compliance schedule with the relicensing schedule. Specifically, NorthWestern requested, and FWS concurred, that the comprehensive report described in the BO would be submitted a year early. The Comprehensive Phase 2 Fish Passage Report was prepared with guidance from the Thompson Falls Technical Advisory

Committee (TAC) and filed with FERC on December 20, 2019. The Comprehensive Phase 2 Fish Passage Report summarizes the results of fish passage studies at the Project, conducted in compliance with the BO.

The BO also required that the Licensee conduct a scientific review to determine if the Thompson Falls Project upstream fish passage facility is functioning as intended, and whether operational or structural modifications are needed. The review was to also include a set of recommendations to be submitted to the FWS. The scientific review convened in January 2020, with the formation of the Thompson Falls Scientific Review Panel (Scientific Panel). The Scientific Panel included representatives from the FWS, FWP, and Water & Environmental Technologies, an environmental and engineering consulting firm. On March 27, 2020, the Scientific Panel issued a memo summarizing its evaluation of the upstream fish passage facility and providing recommendations on how to better evaluate the facility in the future. On April 16, 2020, NorthWestern received written confirmation from the FWS that the requirement for a scientific review, as expressed in Term and Condition (TC) TC1-h in the BO, had been met with the submittal of the memo summarizing the Scientific Panel's findings. The recommendations from the scientific review were adopted in NorthWestern's list of preliminary issues and studies, found in Section 14 of the PAD.

The Project is operated to provide baseload and flexible generation within the reservoir elevation and minimum flow requirements of the license. During flexible generation operations[3], the Licensee may use the top 4 feet of the reservoir from full pond while maintaining minimum flows. For several reasons, the full 4 feet has not been frequently used. In order to assess the effects using the Project's operational flexibility, an operational test was conducted in October 2019. Details of the operational test and observations made during the test are described in Section 14 of the PAD.

1.4.2 Preapplication Document and Scoping

1.4.2.1 Preparation of the PAD

The ILP has mandatory timelines and filing requirements to which NorthWestern, as the applicant, and all Relicensing Participants must adhere. The basic steps of the ILP pre-filing process appear in **Table 1-1**. Under section 15 of the FPA, 16 U.S.C. § 808, , NorthWestern must file its FLA with FERC by no later than December 31, 2023, 2 years prior to the expiration of the current license (December 31, 2025) (**Table 1-2**).

[3] Flexible generation supports grid reliability by providing spinning reserve and load balancing as river and reservoir conditions allow, by lowering the reservoir to increase generation and raising the reservoir to reduce generation.

Table 1-2: Thompson Falls Project pre-filing ILP activities (FERC activities in green, Relicensing Participant comment opportunities in orange).

Activity	Comment	Code of Federal Regulations (CFR Title 18)	Date
File PAD and Notice of Intent (NOI) to Relicense with FERC. (Formal FERC process began with this filing)		§5.5 and 5.6	July 1, 2020
Tribal consultation meetings	With FERC staff	§5.7	Aug 1, 2020
Notice of Commencement, Scoping Document 1 (SD1)	Within 60 days of PAD/NOI	§5.8	Aug 28, 2020
Scoping Meetings and On-Site Project Site Visit were waived due to restrictions associated with the COVID-19 pandemic	Written comments solicited	§5.8	Waived
PAD/SD1 Comments and Study Requests Due	60 days after Notice of Commencement	§5.9	Oct 27, 2020
SD 2	45 days after comment deadline on SD1	§5.10	Dec 9, 2020
File Proposed Study Plan (PSP) based on Relicensing Participants input on PAD	45 days after comment deadline on SD1	§5.11	Dec 11, 2020
Study Plan Meetings	30 days after PSP filed	§5.11	Jan 6, 2021
Relicensing Participants Comments on PSP Due	90 days after PSP filed	§5.12	Mar 11, 2021
File Revised PSP based on Relicensing Participants input on the PSP	30 days after comment deadline on PSP	§5.13	Apr 12, 2021
Relicensing Participants Comments on Revised Study Plan (RSP) Due	15 days after RSP filed	§5.13	Apr 27, 2021
FERC Study Plan Determination[4]		§5.13	May 10, 2021
Initial Study Season		§5.15	Spring/Summer 2021
Initial Study Season Report	1 year after study plan determination	§5.15	April 28, 2022
Initial Study Report Meeting with Relicensing Participants	Within 15 days of study report	§5.15	May 5, 2022
Initial Study Meeting Summary	Within 15 days of study report meeting	§5.15	June 9, 2022
File Disagreements/Requests to Amend Study Plan	Relicensing Participants may file a disagreement concerning the applicant's meeting summary. This filing must also include any modifications to ongoing studies	§5.15(c)(4)	July 9, 2022

[4] Agencies and Tribes with mandatory conditioning authority may request the use of a formal dispute resolution process regarding FERC's Study Plan Determination. No requests for formal dispute resolution were filed.

Activity	Comment	Code of Federal Regulations (CFR Title 18)	Date
	or new studies proposed by the FERC staff or other participant.		
File Responses to Disagreements/Amendment Requests	Responses to any filings requesting modifications to ongoing studies or new studies.	§5.15(c)(5)	Aug 8, 2022
File Responses to Disagreements/Amendment Requests[5]	Responses to any filings requesting modifications to ongoing studies or new studies. None were filed.	§5.15(c)(6)	Aug 8, 2022
FERC Determination on Disagreements/Amendment Requests	FERC Director resolves the disagreement and amends the approved study plan as appropriate	§5.15(c)(7)	Sept 1, 2022
Second Study Season		§5.15	Spring/Summer 2022
Updated Study Report	2 years after study plan determination	§5.15	May 10, 2023
Updated Study Report Meetings with Relicensing Participants	Within 15 days of study report	§5.15	May 24 and 25, 2023
Updated Study Report Meeting Summary	Within 15 days of Study Report meeting	§5.15 (c) (3)	June 9, 2023
File Disagreements/Requests to Amend Study Plan	Relicensing Participants may file a disagreement concerning the applicant's meeting summary. This filing must also include any modifications to ongoing studies or new studies proposed by the FERC staff or other participant.	§5.15(c)(4)	July 10, 2023
File Responses to Disagreements/Amendment Requests	Responses to any filings requesting modifications to ongoing studies or new studies.	§5.15(c)(4)	Aug 8, 2023
FERC Determination on Disagreements/Amendment Requests	Determination on Disagreements/Amendments	§5.15(c)(6)	Sept 7, 2023
Draft License Application (DLA)	No later than 150 days before filing of Final Application	§5.16	August 3, 2023
Comment period on DLA	90 days after DLA	§5.16	Nov 1, 2023
Filing of Final License Application	No later than 2 years prior to license expiration	§5.17	Dec 31, 2023

Under FERC regulations, NorthWestern was required to submit a PAD 5 to 5.5 years prior to the expiration of the current license (December 31, 2025). NorthWestern filed the PAD July 1, 2020. The PAD is a document that describes the Project proposal and existing, relevant information that

[5] Relicensing Participants may also file reply comments

can be used to assess potential Project effects on natural, cultural, recreational, and Tribal resources. The PAD was prepared by NorthWestern, taking into consideration information in the BED, additional information collected through post-BED Relicensing Participant outreach (*refer to* **Table 1-1**), review of federal and state comprehensive plans filed with FERC and listed on FERC's website (Appendix A of the PAD), and additional data gathering.

An applicant is not required to conduct studies to generate information for the PAD but is expected to exercise due diligence to gather existing information. This includes contacting Relicensing Participants for information relevant to the Project, the local area environment, and potential Project effects. NorthWestern exceeded these requirements with its voluntary development and distribution of the BED and subsequent Relicensing Participant outreach, as described above.

1.4.2.2 Scoping

FERC conducted scoping to determine what issues and alternatives should be addressed. It issued Scoping Document (SD1) on August 28, 2020. It was noticed in the Federal Register on September 4, 2020. Due to the proclamation declaring a National Emergency concerning the Novel Coronavirus Disease (COVID-19), issued by the President on March 13, 2020, FERC waived section 5.8(b)(viii) of the Commission's regulations and did not conduct a public scoping meeting or site visit. Instead, FERC solicited written comments, recommendations, and information, on SD1. The following entities (**Table 1-3**) provided written comments:

Table 1-3: Comments submitted on Scoping Document 1

Commenting Entity	Filing Date
U.S. Forest Service	October 26, 2020
NorthWestern Energy	October 27, 2020
U.S. Environmental Protection Agency	October 27, 2020
U.S. Fish and Wildlife Service	October 27, 2020
Montana Fish, Wildlife, and Parks	October 28, 2020
U.S. Bureau of Reclamation	October 28, 2020

1.4.3 Integrated Licensing Process Environmental Studies

1.4.3.1 Preparation of Study Plan and Study Plan Determination

In the PAD, NorthWestern identified preliminary issues and studies based on existing and relevant information, baseline conditions, and current and proposed future operations. NorthWestern identified eight potential studies in the PAD.

In response to requests for studies submitted by the USFS and FWP, NorthWestern's Proposed Study Plan (PSP) (filed with FERC December 11, 2020) proposed one additional study to the eight proposed in the PAD, a study of Westslope Cutthroat Trout Genetics.

In accordance with 18 Code of Federal Regulations (CFR) § 5.11, NorthWestern held a study plan meeting on January 6, 2021, which was open to any interested party. At the meeting, NorthWestern presented its proposed studies and provided opportunities for participants to provide input and ask questions. Subsequent to the Study Plan Meeting, during the public comment period, NorthWestern met, sometimes multiple times, with representatives of FWP, the FWS, USFS, and Montana DEQ, to discuss the PSP, attempt to resolve any differences over study requests, and inform NorthWestern's development of the Revised Study Plan (RSP).

The public comment period on the PSP closed on March 11, 2021. The comments, and NorthWestern's responses, were included in the RSP, filed with FERC April 12, 2021. In response to requests for studies submitted by FWP, NorthWestern added one additional study to the nine proposed in the PSP, Study #10 – Updated Literature Review of Downstream Fish Passage. In addition, in response to various comments by Relicensing Participants, NorthWestern modified several of the study plans in the PSP.

On May 10, 2021, FERC issued a Study Plan Determination on studies to be conducted. The FERC Study Plan Determination requiredNorthWestern to conduct seven of the studies proposed in the RSP. The Study Plan Determination did not require NorthWestern to conduct the Water Quality Study, Downstream Transport of Bull Trout Study, Westslope Cutthroat Genetics Study, study of Distribution and Status of Westslope Cutthroat Trout, or the study of Heavy Metals and Organic Compounds in Thompson Falls Reservoir.

1.4.3.2 Conduct of Studies

The seven studies approved by FERC staff in its May 2021 FERC Study Plan Determination were:

1. Operations Study: A study of operational scenarios to provide flexible capacity and the potential impact of those operational scenarios on Project resources in the Project reservoir and below the powerhouses
2. Total Dissolved Gas (TDG): A study of TDG in the Project reservoir, below the Main Channel Dam, and at the Birdland Bay Bridge
3. Hydraulic Conditions: A hydraulics study to characterize a depth-averaged velocity field and water depths between the Main Channel Dam and the High Bridge (below the Main Channel Dam)
4. Fish Behavior: Radio telemetry study of salmonids to evaluate movement paths/rates and behavior in response to hydraulic conditions, from downstream of the powerhouses to the Main Channel Dam
5. Visitor Use Survey: A study surveying recreationists at the 10 recreation sites related to the Project on or near the reservoir and the Clark Fork River below the dams
6. Cultural Resources: A study to update the inventory of the Historic Architectural and Engineering Properties (H-A&E) and to identify areas where there is a high probability for

the occurrence of prehistoric or historic archaeological properties within the proposed Area of Potential Effect[6] (APE)

7. Updated Literature Review of Downstream Fish Passage: A literature review of information in the scientific literature published since 2007, regarding downstream passage survival of various size classes of fish, with respect to current Project configuration and operations

Study reports on each of the seven studies were filed with FERC in an Initial Study Report (ISR) on April 28, 2022. The reports are also available on the Project website[7] and through the FERC eLibrary. The Visitor Use Survey and the Updated Literature Review of Downstream Fish Passage studies were 1-year studies, and thus the ISR contained the final reports for those two studies. The remainder of the studies were multi-year studies, so the ISR contained the results of the data collected in the first year.

NorthWestern held its ISR Meeting on May 5, 2022; and filed its ISR Meeting Summary on June 9, 2022. Section 5.15(c)(4) of the Commission's regulations, 18 CFR § 5.15(c)(4), provides that any participant or Commission staff may file disagreements concerning the applicant's study report meeting summary, modifications to ongoing studies, or propose new studies within 30 days of the study report meeting summary being filed (i.e., by July 9, 2022). NorthWestern received comments from FERC staff, USFS, FWS, FWP, and the Confederated Salish and Kootenai Tribes (CSKT), including proposed modifications to ongoing studies and proposed new studies.

On August 8, 2022, NorthWestern filed a response to the comments received on the ISR, proposing to conduct one additional study and modify one study. NorthWestern proposed to conduct an Environmental Justice Study to provide information that FERC staff stated they needed to assess Project effects. In addition, NorthWestern proposed to modify the Fish Behavior Study to extend the study into a third study season.

On September 1, 2022, FERC issued its determination on requests for study modifications. Modifications to Study 4 (Hydraulic Conditions), which were requested by USFS, FWS, and FWP, were not approved. FERC notified NorthWestern that they approved the proposed Environmental Justice study and the proposed modifications to the Fish Behavior Study.

On May 5, 2023, pursuant to 18 CFR § 5.15(f), NorthWestern filed the Updated Study Report (USR) for the relicensing of the Project. In accordance with Commission staff's September 1, 2022 Determination on Requests for Study Modifications, to the USR reported on the following:

[6] The Interim Study Report to identify areas where there is a high probability for the occurrence of prehistoric or historic archaeological properties within the proposed APE was filed with FERC on January 26, 2022. The updated inventory of the H-A&E was included in the ISR.

[7] https://northwesternenergy.com/TFallsRelicensing

1. Operations Study: A study of operational scenarios to provide flexible capacity and the potential impact of those operational scenarios on Project resources in the Project reservoir and below the powerhouses.
2. TDG: A study of TDG in the Project reservoir, below the Main Channel Dam, and at the Birdland Bay Bridge.
3. Hydraulic Conditions: A three-dimensional (3D) hydraulics study to characterize water velocities and water depths between the Main Channel Dam and the High Bridge (below the Main Channel Dam).
4. Fish Behavior: Radio telemetry study of salmonids to evaluate movement paths/rates and behavior in response to hydraulic conditions, from downstream of the powerhouses to the Main Channel Dam.
5. Cultural Resources: Results of a field inventory of cultural resources in the Project's APE.
6. Environmental Justice: An evaluation to determine the presence of impacts of environmental justice communities in the surrounding community, and an assessment of whether those impacts would be disproportionately high and adverse for minority and low-income populations.

The USR included an Executive Summary, described the six studies approved in the Commission staff's September 1, 2022 Determination on Requests for Study Modifications, identified minor variances from the approved Study Plan Determination, and presented results of the second season of studies (2022). With the filing of the USR, the studies required by the Commission-approved study plan for the relicensing of the Project are complete—except for the Fish Behavior Study, which is continuing in 2023. Except for the remaining work on the Fish Behavior Study, the USR contains a complete reporting of all studies and study plan modifications required by the Commission, including in its original May 10, 2021 Study Plan Determination, as well as its September 1, 2022 Determination on Requests for Study Modifications.

Relicensing Participants were notified of the filing and provided a link and the address for the NorthWestern's Project relicensing website where the USR is posted as well as instructions for accessing the reports through FERC's eLibrary. In addition, the notification invited Relicensing Participants to a USR meeting, as required under FERC's ILP regulations (18 C.F.R. §§ 5.15(f), (c)(2)). NorthWestern hosted two USR meetings, on Wednesday, May 24, 2023 at NorthWestern's Missoula, MT office, 1801 South Russell Street, from 9:00 AM until 2:00 PM Mountain Time and on May 25, 2023, from 6:00 PM to 8:00 PM (Mountain Time), at the Sanders County Courthouse, 1111 W Main St, Thompson Falls, MT 59873. Both meetings were accessible remotely via Zoom.

NorthWestern also sent separate notifications to Relicensing Participants inviting them to participate in a voluntarily-provided Project tour on the afternoon of May 25, 2023. Although attendance was not recorded, approximately 20 people attended the tour including resource agencies representatives, Commission staff, and local residents.

As required under FERC's ILP regulations (18 C.F.R. §§ 5.15(f), (c)(3)) and the Commission's Process Plan and Schedule, NorthWestern filed a summary of the USR meeting on June 8, 2023. The meeting summary included the meeting agendas, attendee lists, and copies of the presentations given at the USR meeting. Comments on the USR were due by July 10, 2023 (18 C.F.R. § 5.15(c)(4)). NorthWestern received comments from U.S. Bureau of Indian Affairs (BIA), CSKT, FWP, FWS, Green Mountain Conservation District, Sanders County Park Board, SHPO and 25 local landowners or residents.

Following an opportunity for NorthWestern to respond to any comments by August 8, 2023, Commission staff is expected to issue a determination on on any disagreements or amendments by September 7, 2023 (18 C.F.R. § 5.15(c)(6)).

1.4.4 Comments on the Draft Application

[This section is a placeholder for comments filed after DLA filing and will be populated for the FLA. Consultation that has occurred prior to the filing of this DLA is presented in **Exhibit E - Section 1.4 – Public Review and Consultation and Exhibit E – Section 19 – Consultation Documentation**.]

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2. Proposed Action and Action Alternatives

2.1 No Action Alternative

Under the no-action alternative, the Project would continue to operate under the terms and conditions of the current license. Thus, this description of the no-action alternative includes a description of the existing facilities and current authorized Project operation.

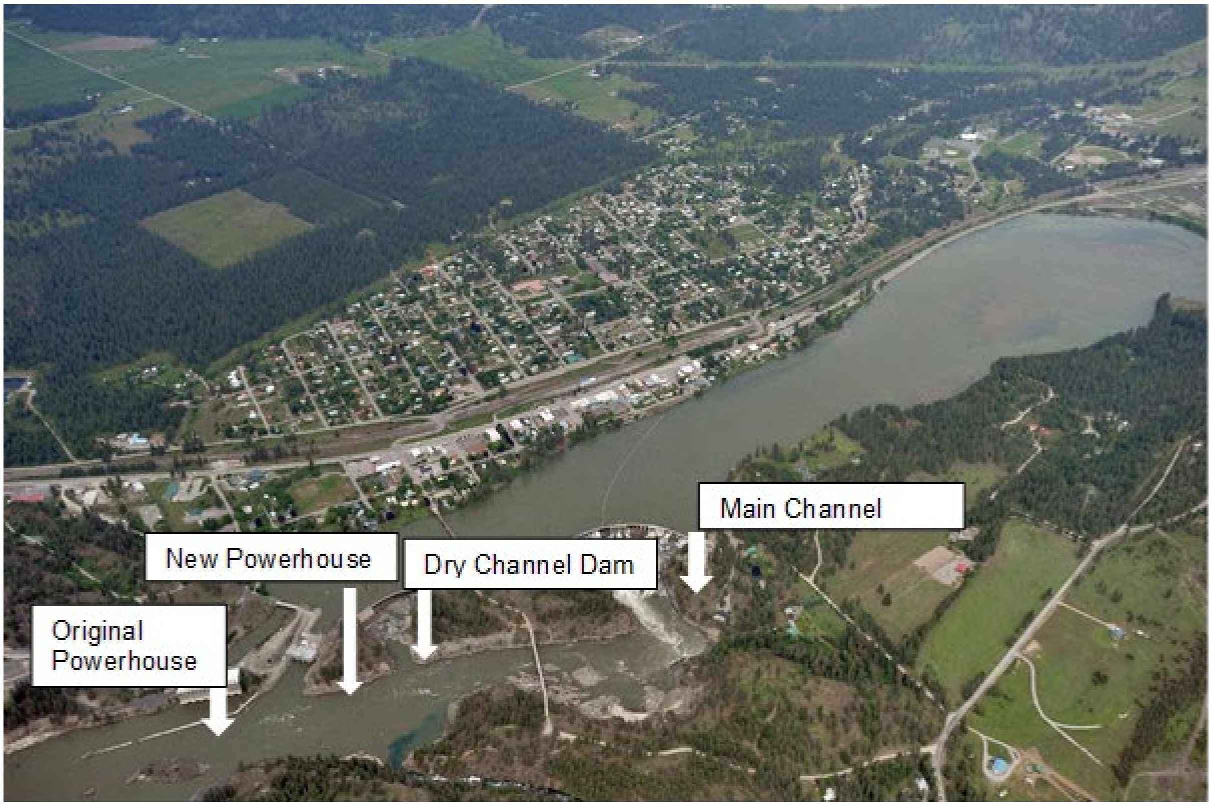
The Thompson Falls Project is located on the Clark Fork River in Sanders County, Montana. Preliminary development of the Project began in June 1912, by the Thompson Falls Power Company. Construction commenced in May 1913, and the first generating unit was placed in service on July 1, 1915. By May 1917, an additional generation unit was placed in service bringing the total to six generating units. MPC acquired the Project in 1929. An order amending the license was issued to MPC by FERC in 1990 allowing for construction of an additional powerhouse and generating unit, subsequently completed in 1995, giving the Project a total generating capacity of 92.6 MW. A February 12, 2009 Project license amendment approved construction and operation of upstream fish passage facilities. The current license expires on December 31, 2025.

Non-federal hydropower projects in the U.S. are regulated by FERC under the authority of the FPA. The original license for the Project was issued effective January 1, 1938 and expired on December 31, 1975. The current FERC license was issued December 28, 1979. A major license amendment was issued April 30, 1990, approving the construction of a new powerhouse and extending the license term to 50 years. The Project was purchased by PPL Montana in 1999 and later purchased by NorthWestern in 2014. With each purchase, the Project's FERC license was transferred to the new owner.

2.1.1 Existing Project Facilities and Works

The Project consists of two curved concrete gravity dams (Dry Channel Dam and Main Channel Dam) with overflow spillways and two powerhouses, and a fish passage facility (**Photograph 2-1**). In this license application, all references to river right or left are based on the viewpoint of facing downstream. The original powerhouse contains six generating units and the new powerhouse contains one generating unit. Existing Project facilities are described in further detail in **Exhibit A – Project Description**.

The current Project boundary encompasses about 12 miles of river and reservoir, with a maximum width of about 1,800 feet. Active storage capacity of the Thompson Falls Reservoir is approximately 15,000 acre-feet between crest elevation (El.). 2380.0 feet and normal full operating level El. 2396.5 feet. The reservoir surface area is approximately 1,226 acres, not including the islands.



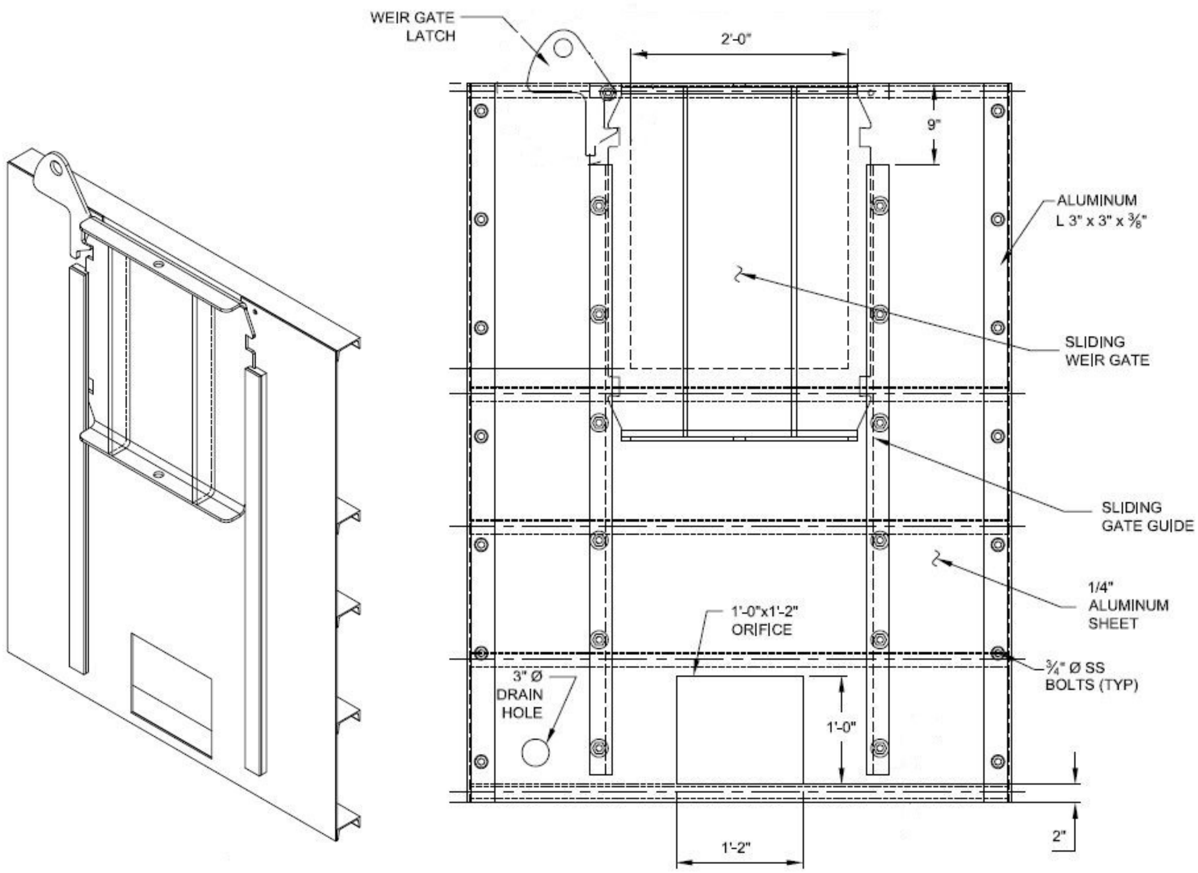
Photograph 2-1: **Aerial photo of the Thompson Falls Project looking upstream.**

2.1.1.1 Project Upstream Fish Passage Facility

The Thompson Falls upstream fish passage facility (fish passage facility) was designed in general accordance with the NMFS Criteria (2008), which was used by the FWS to provide input to the design of the upstream passage facility. The upstream fish passage facility design incorporates a fish ladder (ladder) with a series of 48 pools, each 6-foot-long by 5-foot-wide by 4-foot-deep.

Hydraulically, the ladder was designed to allow passage of a diverse population of fish over the Main Channel Dam. The ladder was designed with flexibility to allow operations of the ladder in one of two modes, “orifice” or “notch.” The ladder was not designed for operating with a combination of the two modes. Raising the central sliding weir gate allows pool-to-pool flow through the bottom orifice (orifice mode). Lowering the weir gate allows pool-to-pool flow through the top weir (notch mode) (**Figure 2-1**). The upper Pools, 46, 47, and 48 operate solely in orifice mode to reduce the effects of the forebay water level on the ladder hydraulics.

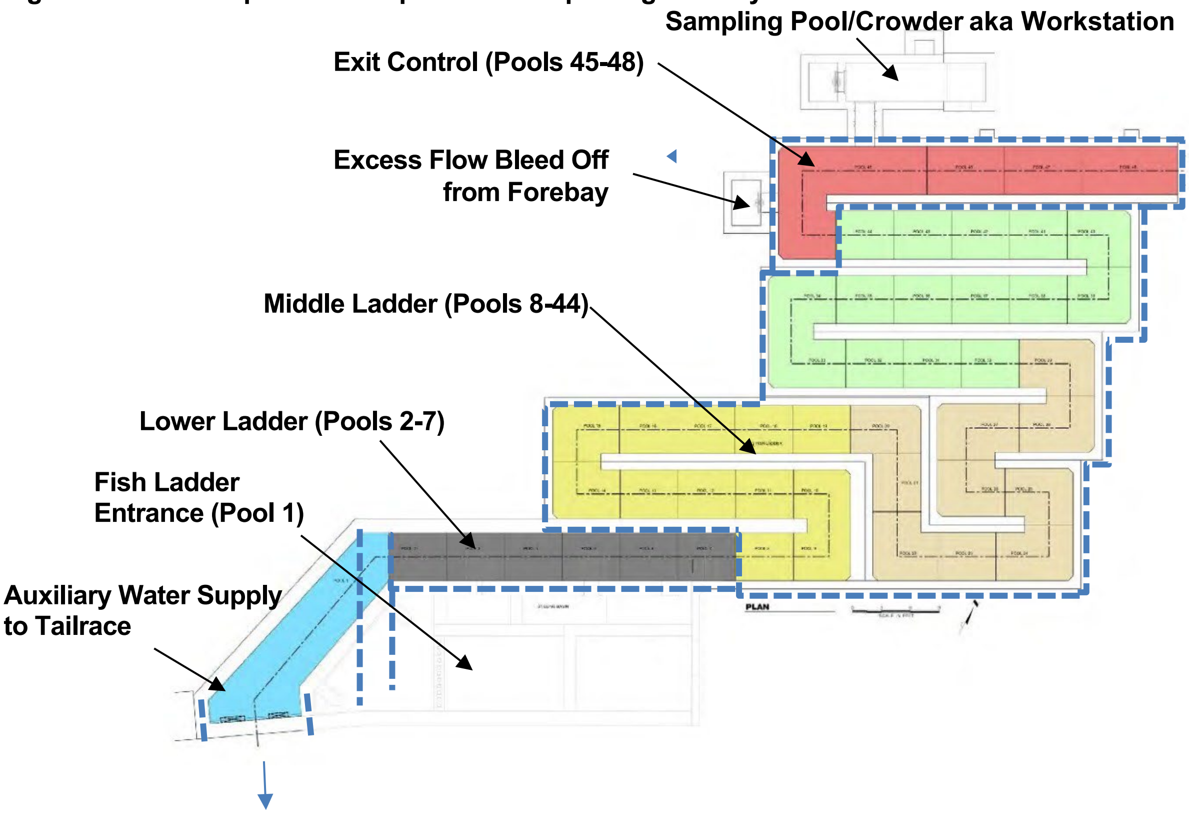
Figure 2-1: Isometric and front view of aluminum weir plates. By lowering the sliding weir gate down to cover the bottom orifice, the ladder is operated in notch mode.



By design, the upstream fish passage facility has four distinct areas, as follows (**Figure 2-2**):

- Fish Ladder Entrance – Pool 1
- Lower Ladder Pools – Pools 2-7
- Middle Ladder Pools – Pools 8-44
- Exit Control Section – Pools 45-48

Figure 2-2: Thompson Falls upstream fish passage facility



The upstream fish passage facility is operated from mid-March to mid-October. The ladder season ends (and the ladder is dewatered and shut down) when a fall weather freeze is imminent. Temporary closures during the season may occur due to high flows in the spring. The sampling/pool crowder (also referred to as the work station) has 3 cubic feet per second (cfs) flowing and the ladder has 6 cfs flowing pool-to-pool (*refer to* **Figure 2-2**). Attractant flows include options of 20 cfs from the high velocity jet (HVJ) and maximum of 54 cfs from the auxiliary water system. Thus, the passage facility may utilize between 9 and 83 cfs. In addition to these operating and attractant flows at the ladder, part of one Main Channel Dam spill panels near the upstream fish passage facility may be opened to provide an additional fish attractant flow of approximately 100 to 125 cfs.

Additional details of the upstream fish passage facility design and operations are provided in the Comprehensive Phase 2 Fish Passage Report[8] (NorthWestern 2019) and Standard Operations Manual[9] (PPL Montana 2010).

[8] http://www.northwesternenergy.com/docs/default-source/thompson-falls/thompson-falls- other-reference-material/2020comprehensivefishladderreport.pdf

[9] http://www.northwesternenergy.com/docs/default-source/thompson-falls/thompson- falls-public-reference-file/thompson-falls-annual-reports-and-ferc- orders/thompson_falls_ferc_fish_ladder_approval-fishway_operations_manual_2011.pdf

2.1.1.2 Recreation Facilities

Table 2-1 includes a description of recreation sites that are in the Project vicinity.

Table 2-1: Recreation areas in Project vicinity.

Recreation Area	Site Amenities
Island Park	Day use site between Main Dam and Dry Channel Dam. Non-motorized access with adjacent parking areas, interpretation, picnic tables, benches, trails, fish passage viewing, garbage facilities, and vault toilets.
Cherry Creek Boat Launch	Day use boat launch site with picnic facilities and vault toilet.
South Shore Dispersed Recreation Area	Day use shoreline access area with dispersed parking and informational signs. Vault toilet and garbage facilities are nearby at the Historic High Bridge.
Wild Goose Landing Park	Community park with boat launch and dock, swimming dock, toilets, informational signs, parking, garbage facilities, and picnic facilities.
Power Park	Community park with benches, tables, group use pavilion with running water, toilets, informational and interpretive signage, and parking.
Powerhouse Loop Trail	Non-motorized trail with benches, vault toilet, and adjacent parking.
Sandy Beach (dispersed)	Undeveloped beach area along the Powerhouse Loop Trail below the tailrace.
North Shore Boat Restraint	Undeveloped shoreline above the Main Dam with benches, picnic tables, a small dock, and parking.
North Shore Dispersed Use Area (including former sawmill site)	Undeveloped shoreline area along the northeast shoreline of the main reservoir, popular for dispersed shoreline fishing.

2.1.1.3 Project Boundary

The Thompson Falls Project boundary as defined in the FERC license extends approximately 0.3 mile downstream and 12 miles upstream of the Project's dams (**Figure 2-3**). The current Project boundary was established in the December 28, 1979 license (as amended). The current Project boundary encompasses a total of 2,001 acres, consisting of 1,226 acres of reservoir, not including islands, and 775 acres of non- reservoir. Federal land managed by the USFS (National Forest System Lands) includes 103.8 acres, which are largely open space forest lands (**Table 2-2**). The Thompson River, a major tributary to the Clark Fork River, enters the reservoir about 6.2 miles upstream of the dam. Its lower 0.3 mile is included within the Project boundary. The current Project boundary is a metes and bounds survey that incorporates some uplands in the area around the dams and powerhouse, and upstream from that point it approximates the reservoir's normal full operating level elevation.

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Figure 2-3: Current Project boundary.

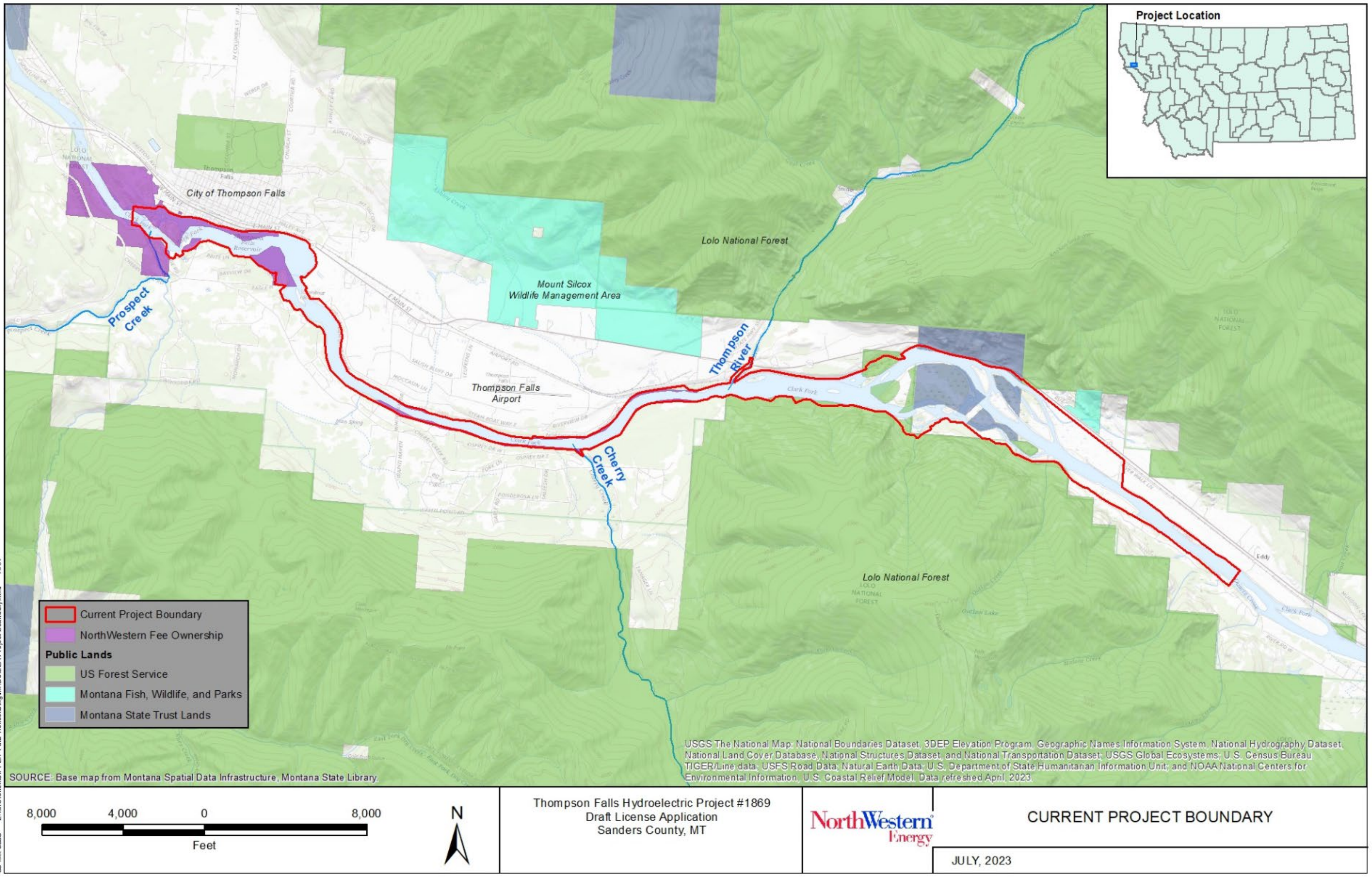

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Table 2-2: Thompson Falls Project – federal lands within Project boundary.

Township	Range	Section	Subdivision	Acres	Agency
21N	28W	15	Government Lot 1	1.4	USFS
21N	28W	17	Government Lots 5-11	78.7	USFS
21N	28W	18	Government Lots 8-10	1.8	USFS
21N	28W	20	NENE	0.3	USFS
21N	28W	21	Government Lots 1-3, NWNW	3.3	USFS
21N	28W	22	Government Lots 3-5	18.3	USFS
		Total		**103.8**	

2.1.2 Project Safety

The Project has been operating for more than 45 years under the existing license and during this time, Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance. In addition, the Project has been inspected and evaluated every 5 years by an independent consultant and the most recent consultant's safety report was submitted to the Commission on November 1, 2021.

2.1.3 Existing Project Operation

The Project is operated to provide baseload and flexible generation within the reservoir elevation and minimum flow requirements of the license. Baseflow generation uses the river inflow by matching reservoir outflows to generate electricity while maintaining a stable reservoir elevation. Flexible capacity increases or decreases generation from the baseflow, raising or lowering the reservoir elevation as the flow through the units is changed to support flexible capacity needs. Under the current license, NorthWestern may use the top 4 feet of the reservoir from full pool while maintaining minimum flows.

Under the No action alternative, the Project would continue to operate as it has in the past under the existing license term. The Project would continue to be operated to provide baseload and flexible generation within the new license's the reservoir elevation and minimum flow requirements, and NorthWestern would continue to be authorized to use the top 4 feet of the reservoir from full pool for these purposes.

Under the no action alternative, many of the licensee's proposed measures or the resource agencies' recommendations and mandatory conditions would not be required. Several of the PM&E measures proposed by NorthWestern (including limiting flexible operations to the top 2.5 feet of the reservoir from full pond) would also not be implemented, and therefore few benefits from implementation of the new NorthWestern-proposed PM&E measures would be realized.

NorthWestern utilizes the Project to support grid reliability by providing spinning reserve and load balancing as river and reservoir conditions allow. These operational modes utilize the flexibility, as provided in the license, to vary reservoir elevations. The Project is typically operated to maximize peak generation efficiency across all units with available flows. Unit No. 7 is used as the primary unit for efficiency followed by Units 1 and 3, and finally Units No. 2, 4, 5, 6. Units are typically dispatched in this efficiency priority as flows allow.

When flow exceeds total powerhouse capacity (23,320 cfs), the spillway panels are used along with the radial gates to pass additional flow. As runoff increases, the 4- by 8-foot spillway panels on the Main Channel Dam are removed for additional spill capacity. As flows increase, more panels are removed to balance flows across the length of the Main Channel Dam Spillway. When the peak flood discharge is less than 70,000 cfs, spill is usually restricted to the Main Channel Dam section. If flows exceed 70,000 cfs, there are 72 Dry Channel Dam spill panels (each 4- x 8-foot) available to increase spill capacity. The Dry Channel Spillway has been used in 5 of the past 10 years (2010-2019).

Prior to the installation of the new radial gates (which became operational in 2019), flow exceeded the radial gate capacity for approximately 3 months in an average year, leading to a long period of manual spillway operations. The addition of two new radial gates on the Main Channel Dam Spillway reduces the the need to trip stanchions to pass high flows. The new radial gates also reduce the need to manually remove spill panels, improve safety, and provide an additional avenue to flush debris that builds up on the upstream face of the dam. Prior to the installation of the new radial gates in 2019, high flows and debris required tripping of stanchions and spill bays approximately every 7 to 10 years. With the installation of the new radial gates it is estimated that stanchion tripping will only be needed every 20 to 25 years, based on estimated river flows and debris.

The new radial gates are also used for reservoir regulation and flow restoration in case of plant trips. The typical spillway opening sequence may be modified to optimize the use of the radial gates and minimize TDG as defined in the TDG Control Plan.

2.1.4 Existing Environmental Measures

This section describes environmental measures taken pursuant to the existing Project license. Some of these measures were one time actions that have been completed while others are ongoing.

2.1.4.1 Completed Environmental Measures

In 1988, during the license amendment proceeding, the Licensee and FWP entered into the 1988 Mitigation Agreement (Agreement) for the Thompson Falls Project under which the Licensee agreed to pay $250,000 to FWP to provide full and complete mitigation as required under Section 903(e)(6) of the Northwest Power Planning Council's Fish and Wildlife Program for impacts caused by the construction and maintenance of the Project. This Agreement was signed on March 22, 1988 by FWP and the $250,000 payment was issued by the Licensee to FWP on March 31, 1988. FWP acknowledged that the $250,000 payment satisfied any responsibilities for mitigation under Section 903(e)(6) of the Program.

FWP also agreed that the $250,000 satisfied fisheries mitigation related to construction activities for expanding generation at the Project. FWP agreed to deposit the $250,000 provided by the Licensee into the Fish and Wildlife Mitigation Trust Fund and, as a Trustee, FWP was to use these funds to annually purchase 10,000 acre-feet of water from Painted Rocks Reservoir to enhance summer and fall flows for resident fish in the Bitterroot River. If requirements of the Program were amended, the funds could be used for amended purposes. The funds could also be used for other means of enhancing fish populations if, in the judgment of FWP, those means are more beneficial to enhancing the resident fisheries in the Montana portion of the Columbia River Basin; provided, however, that any use of the trust fund for purposes other than the purchase of water would not negate the full satisfaction of the Licensee's responsibilities under Section 903(e)(6) of the Program.

The 1990 license amendment states that, "…the agreement between the Licensee and FWP, is generally consistent with section 903(e)(6) of the Program. Since [the Licensee] has already completed with the agreement by depositing $250,000 in a trust fund, no license requirement, as requested by the Department of Natural Resources and Conservation (DNRC) is necessary."

In addition, in the 1990 license amendment incorporated, a wildlife management plan for the Project, prepared by FWP. The Licensee deposited $123,000 in a trust fund to finance implementation of the Plan. Additionally, the Licensee acquired the property for and developed a Canada goose brood rearing area which was successfully established.

The 1990 license amendment also included measures to mitigate for any resource impacts from the maximum daily fluctuations of up to 4 feet in the reservoir and 8.4 feet immediately downstream of the tailrace. Measures included an Erosion Control Plan (Article 401), a revegetation plan (Article 402), visual resources mitigation measures (Article 403), recreational development of Island Park (Articles 404 and 405), and provide other recreational facilities and signage (Article 407). The Licensee subsequently completed these requirements.

In 2008, a BO was prepared by FWS, which concluded that the Project may adversely affect the federally-listed threatened species, the Bull Trout. The BO included seven mandatory terms and conditions which were incorporated into the 2009 license amendment.

On February 12, 2009 FERC issued a license amendment approving construction and operation of fish passage facilities. Ordering paragraph (B) of the license amendment required the licensee comply with the TCs 1 through 7 included in the FWS's November 4, 2008 Incidental Take Statement. NorthWestern has complied with the seven TCs of the FWS's 2008 BO, including implementing a Memorandum of Understanding (MOU), Facilitation and Funding of FERC license based Consultation Process and Implementation of Minimization Measures for Bull Trout (January 15, 2008). The MOU provides terms and conditions regarding the collaboration between the licensee and the FWS, MFWP, and CSKT and the implementation of minimization measures for Bull Trout.

Under the terms of the MOU, which expires on December 31, 2025, NorthWestern provides annual funding ($100,000) to the TAC to conduct offsite habitat restoration or acquisition in important upstream bull trout spawning and rearing tributaries. The purpose is to boost recruitment of juvenile bull trout. This funding is provided to mitigate for incidental take of bull trout caused by downstream passage through the turbines and spillways.

NorthWestern completed a shoreline stabilization pilot project in 2020. The pilot project was intended to test a bioengineering approach in the Thompson Falls Project vicinity. The key component of the project involved propagating plantings of native vegetation from cuttings, bareroot, and potted plantings. The goal of the pilot project was to scale back a nearly vertical bank to a slope less than or equal to 3:1 and to utilize native willow and dogwood cuttings to develop deep-binding root mass to stabilize the newly constructed bank. Bareroot and potted shrub species (red osier dogwood, northern choke cherry, and service berry) were planted on the upper two-thirds of the bank for increased bank stability and also to provide shade and riparian habitats benefitting terrestrial bug species and songbirds. Results from the pilot project may be used to inform the approach, design, and suitability of plant species for potential projects around Thompson Falls Reservoir in the future.

The Licensee installed a new, low profile powerhouse and painted it gray to reduce visual impacts per the1990 license amendment.

2.1.4.2 Ongoing Environmental Measures

Under the existing license the following environmental measures are ongoing.

- Survey recreational use once every 6 years per license Article 406.
- Maintain the Island Park and the Wild Goose Landing recreation facilities, and the facilities at the south end of High Bridge per license Articles 404, 405 and 407 respectively.
- Address cultural resources management per license Article 408.
- Operate and maintain the upstream fish passage facility from mid-March through mid-October per FERC order issued on February 12, 2009.
- Upstream fish passage monitoring and reporting per FERC order issued on February 12, 2009.
- Fisheries population monitoring and reporting (filed with FERC) within the reservoir and portions of the river.
- Downstream fish passage mitigation per FERC order issued on February 12, 2009.
- Implement annual noxious weed control measures in high-use areas on NorthWestern's lands.
- Maintain and implement NorthWestern's *Standards for Design, Construction, Maintenance, and Operation of Shoreline Facilities* (NorthWestern 2020).

- Develop and implement operational procedures to reduce TDG production during periods of spill per FERC order issued on February 12, 2009. Procedures are described in the TDG Control Plan, 2010 (PPL Montana 2010).
- Maintain minimum instream flows downstream of the Project of 6,000 cfs or inflow, whichever is less per license Article 411.

2.2 Proposed Action

2.2.1 Proposed Project Facilities

NorthWestern is not proposing any new construction or redevelopment of the Project facilities.

2.2.2 Proposed Project Operations

NorthWestern proposes that the Project continue to provide baseflow generation and flexible capacity needs in the new license term. Baseflow generation matches reservoir inflows to generate electricity while maintaining a stable reservoir elevation. Flexible capacity increases or decreases generation from the baseflow, raising or lowering the reservoir elevation as the flow through the units is changed to support flexible capacity needs. Under normal operations, NorthWestern will maintain the reservoir between El. 2396.5 and 2394 feet (2.5 feet below normal full operating level). In the spring during periods of spill, the reservoir may be operated above El. 2396.5 but is maintained below El. 2397.0. The units may increase or decrease generation during normal operations within the above defined, reservoir elevations. Spill gates may be used to maintain reservoir elevation if needed in times of decreased generation. A minimum flow of the lesser or 6,000 cfs or inflow will be maintained downstream during normal operations.

2.2.3 Proposed Project Boundary

The current Project boundary does not accurately encompass the lands and waters that are needed for Project purposes. Thus, the **Exhibit G** maps included in this license application contain several refinements proposed to the Project boundary.

The proposed Project boundary was created using a combination of two methods. The first method was a contour elevation that encompasses the reservoir during normal full pool operations and which allows for typical elevations above normal full pool operations during spring runoff. The second method is using specified courses and distances (metes and bounds), where necessary, to encompass lands that are necessary for Project operations and maintenance and for other Project purposes such as public recreation which are outside the full pool contours.

The rational for modifying the current Project boundary is described below.

- The metes and bounds survey dates back to 1941 for the first 6 miles upstream of the dam, and to 1971 for the additional 6 miles upstream. At that time, survey standards and equipment were less advanced. This has created a situation whereby the metes and bounds survey does not always encompass Project lands and waters as intended. 18 CFR 4.41(h)(2)(i)(A)(1) reflects a FERC preference that a contour elevation be used to describe the reservoir versus a metes and bounds survey.

- Portions of Project works, including Thompson Falls Reservoir, and recreation sites which include sites required by the current license, and sites that are being proposed for the new license, are not within or fully within the current Project boundary.
- The current Project boundary encompasses lands that are not Project-related. In particular, the Project boundary includes a number of oddly-shaped, narrow (0-20 feet in width) slivers of land upstream of the dam and above full pool elevation that are not Project-related. This is due to the fact that when the surveyor(s) established the metes and bounds description to approximate the reservoir, they established a survey line set back from the reservoir's edge a short distance so they could draw long straight lines, instead of surveying every curve in the shoreline.

2.2.3.1 Differences Between Proposed and Current Project Boundary

Lands were both added and removed from the current Project boundary in creating the proposed Project boundary, but the result was a net decrease in size by 465 acres (**Table 2-3**).

Table 2-3: Net change in Acreage, Proposed Project Boundary

	Current Project Boundary (acres)	Proposed Project Boundary (acres)	Net Difference in acreage
Surface Water	1,226	1,092	-134
Recreational Lands	17	31	14
Other Land Use	758	413	-345
Total Project Boundary	**2,001**	**1,536**	**465**

2.2.3.2 Lands Proposed to be Included in Project Boundary

NorthWestern's proposed Project boundary includes the addition of land in a number of areas to encompass new recreation sites that are being proposed by NorthWestern. Additional detail on recreation sites is found in **Exhibit E - Section 11 – Recreation,** of this Exhibit E. These additions are generally described below:

2.2.3.2.1 Wild Goose Landing

Wild Goose Landing is a recreation site under the current license, but a portion of this recreation site is not within the current Project boundary. Thus, about 1 acre is being added to the Project boundary to encompass the entire site. The added land is owned by NorthWestern and the city of Thompson Falls (City). A portion of the boat ramp and boat dock are within the contour elevation discussed above, and the portion above the contour elevation is described by a separate metes and bounds description.

2.2.3.2.2 South Shore Dispersed Recreation Site

About 10 acres of land would be added to the Project boundary to encompass the South Shore Dispersed Recreation Site. The public has been making use of this site for years for activities such fishing and swimming since it provides access to the river below the dam, and for upland activities such as hiking. The South Shore Parking Area, which includes a paved parking area and latrine, is located within the South Shore Dispersed Recreation Site, and services both this site and Island Park. The land proposed to be added to the Project boundary is owned by NorthWestern. The South Shore Dispersed Area is described by a separate metes and bounds description.

2.2.3.2.3 North Shore Parking Area.

About 0.3 acre of land would be added to the Project boundary for the North Shore Parking Area and Gallatin Street Bridge gate (which includes an Americans with Disabilities Act [ADA]-parking space). These parking locations serve Island Park. The added land is owned by NorthWestern (North Shore Parking Area) and the City (Gallatin Street Bridge gate and ADA-parking space). The main Island Park is already encompassed within the contour elevation and the metes and bounds description but the North Shore Parking Area is not likewise encompassed; it is described by a separate metes and bounds description.

2.2.3.2.4 Power Park

About 0.6 acre of land would be added to the Project boundary for Power Park. While this site is generally considered a recreation site under the current license, it is not encompassed within the current Project boundary. The added land is mostly owned by NorthWestern, but part of the site is on an undeveloped City street right-of-way. Power Park is described by a separate metes and bounds description.

2.2.3.2.5 Prospect Creek Powerhouse

The historic Prospect Creek Powerhouse cultural site adds about 0.1 acre to the Project boundary. The added land is owned by NorthWestern. It is described by a separate metes and bounds description.

2.2.3.2.6 Access Roads

NorthWestern's proposed Project boundary adds about 0.9 acre to encompass two road segments that are solely used by NorthWestern for Project access. The added land is owned by NorthWestern.

2.2.3.3 Lands Proposed to be Removed From Project Boundary

Lands are being proposed for removal for the specific reasons outlined in the sections below. In general terms, none of the lands proposed for removal serve any Project purpose. They do not encompass any existing or proposed recreation sites. They were inventoried for cultural resources and none were found. No Project facilities are located on these lands.

2.2.3.3.1 Federal Lands

NorthWestern's proposed Project boundary removes approximately 37 acres of National Forest System lands from the current Project boundary reducing the acreage from the current 103.78 acres to about 66.9 acres[10]. The current Project boundary is a metes and bounds description in its entirety, even around the reservoir. When the surveyor(s) established the metes and bounds description to approximate the reservoir, they established a survey line set back from the reservoir's edge a short distance so they could draw long straight lines, instead of surveying every curve in the shoreline. This resulted in including upland acreages not needed for Project purposes within the current Project boundary, including National Forest System lands. The proposed Project boundary for the reservoir is a contour elevation that follows the water's edge, which results in removing those upland acreages from the Project boundary.

2.2.3.3.2 Non-Federal Lands Not Necessary for Project Purposes

NorthWestern's proposed Project boundary removes the approximate 3-acre Steamboat Island from the current Project boundary. Steamboat Island is privately owned and mostly bedrock so its boundary is stable and not changing due to erosion and accretion.

NorthWestern's proposed Project boundary removes an approximate 10-acre area designated as a Canada goose brood rearing area under the current Project boundary. Canada goose populations have increased significantly since the current license was issued in 1979. FWS data (FWS 2022) indicate a population of 24,200 individuals in 1979/80 for the Rocky Mountain area which encompasses the Project. That population increased about tenfold to 245,000 in 2021/22. In many areas, Canada geese are now considered a nuisance, occupying areas like golf courses and public parks, defecating and otherwise making a mess of the area. Stakeholders have not raised any issues or requested any studies related to Canada goose populations.

NorthWestern's proposed Project boundary removes approximately 336 acres which is an approximate 2-mile long section of the Clark Fork River and associated uplands from the upstream end of the current Project boundary. Data collected by NorthWestern in 2022 for the Updated Study Report indicated that the Project has minimal, if any, influence on this 2-mile-long section of river (NorthWestern 2023). Instead, this 2-mile-long section is influenced by forces upstream of the Project such as spring runoff, heavy summer rainfall events, low summer flows due to drought-like conditions, and/or releases of water from the Seli'š Ksanka Qlispe' (SKQ) project all of which can significantly change river flow volume and elevations. **Figure 2-4** is data from the 2022 study that shows water elevations at various locations within the current Project boundary. The Final Study Report – Operations Study provides the full details regarding this study (NorthWestern 2023). The bullet points below discuss the water elevation patterns at each location and whether or not the Project has an influence at that location.

[10] The source of the data used to determine federal acres was the BLM Geospatial Business Platform, data file titled "BLM MT SMA Surface Ownership 2021 Polygon". This is the same source used by FERC in their April 19, 2023 "Request for Additional Information" for the Broadwater Hydroelectric Project (Project No. 2853-073).

- The orange dashed line in **Figure 2-4** is the inflow of Clark Fork River as it entered the upstream end of the Project. This site represented the natural river flow and water surface elevation not influenced by Project operations.
- The blue line in Figure 2-4 is the water surface elevation at the Main Channel Dam. The elevation fluctuated about 2 feet during the course of the study, which reflected the flexible operations that NorthWestern employed during the study. Water surface elevations at this location were influenced by Project operations.
- Proceeding about 8.5 miles upstream from the Main Channel Dam, the next location was the Islands Complex, the gold line on **Figure 2-3.** Water surface elevation fluctuated about 6 feet during the course of the study. Most of that elevation change occurred during the tail end of the spring runoff. By mid-summer, water surface elevation fluctuations closely mirrored the fluctuations at the Main Channel Dam, indicating this location is influenced by Project operations.
    - As the water level dropped during spring runoff, the instrumentation used to measure elevation became dewatered, resulting in missing data. The instrument was relocated in mid-summer to a watered site to resume data collection.
- Proceeding 1.5 miles upstream from the Island Complex, the next location is the proposed Project boundary, the green line on Figure 2-4. Upstream (2 miles) from the proposed Project boundary is the current Project boundary, the purple line on Figure 2-3. The 2-mile stretch of river proposed for removal from the Project boundary is the area between these two locations (green and purple lines). Water surface elevation fluctuated about 6-7 feet at these 2 locations. Most of that elevation change occurred in the tail end of spring runoff. By mid-summer, the elevation fluctuated about 1 foot at these 2 locations.
    - Throughout the course of the entire study, the fluctuations at these two locations closely mirrored the fluctuations of the Clark Fork River inflows as opposed to fluctuations at the Main Channel Dam caused by Project operations. These locations, and the 2-mile stretch between the two locations, are not influenced by Project operations.
    - The instrumentation at the proposed and current Project boundary locations also became dewatered and had to be relocated.

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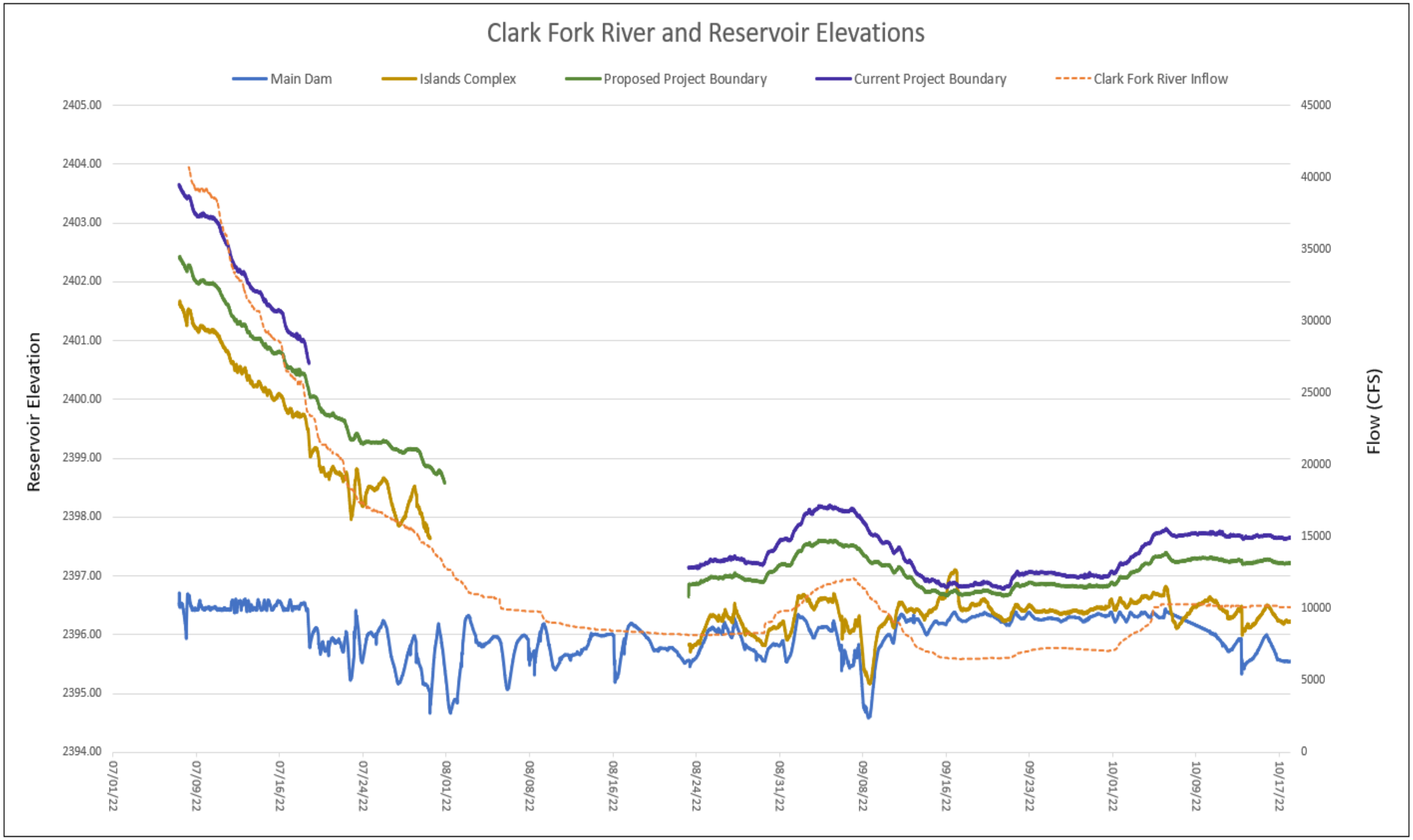
Figure 2-4: Reservoir elevation and flow data at various locations during 2022 study.



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The proposed Project boundary extends approximately 0.3 mile downstream and 10 miles upstream of the Project's dams (**Figure 2-5)**. The proposed Project boundary encompasses a total of 1,536 acres, consisting of 1,092 acres of reservoir and 444 acres of non- reservoir. Federal land managed by the USFS (National Forest System Lands) includes 66.9 acres, which are largely open space forest lands (**Table 2-4**). The Thompson River, a major tributary to the Clark Fork River, enters the reservoir about 6.2 miles upstream of the dam. Its lower 0.2 mile is included within the proposed Project boundary. The proposed Project boundary is a combination of a contour elevation of El. 2,397 feet at the dam (elevation of contour increase proceeding upstream) for most of the reservoir and a metes and bounds description that incorporates areas above the contour elevation to encompass Project facilities, recreation sites and a cultural resource site.

Table 2-4: Thompson Falls Project – federal lands within proposed Project boundary.

Township	Range	Section	Subdivision	Acres	Agency
21N	28W	15	Government Lot 1	0.3	USFS
21N	28W	17	Government Lots 5-11	49.6	USFS
21N	28W	18	Government Lots 8-10	4.3	USFS
21N	28W	21	Government Lot 1	1.45	USFS
21N	28W	22	Government Lots 3-4	11.25	USFS
		Total		**66.9**	

2.2.4 Proposed Environmental Measures

NorthWestern is proposing to implement the PM&E measures described below.

2.2.4.1 Aquatic Resources

- Continue to maintain a minimum flow of 6,000 cfs or inflows, whichever is less, in the Clark Fork River downstream of the Project. If inflow is at or less than 6,000 cfs, then NorthWestern may go below the minimum in order to maintain reservoir elevation.
- Monitor TDG levels during high flow periods in the Clark Fork River and update the TDG Control Plan as necessary.
- Operate and maintain the upstream fish passage facility from mid-March through mid-October.
- Evaluate and assess opportunities to enhance the effectiveness of the existing upstream fish passage facility.
- Continue to engage with TAC partners on PM&E.

2.2.4.2 Terrestrial Resources

- NorthWestern will implement annual noxious weed control measures in high-use areas on NorthWestern Project lands.

2.2.4.3 Recreation

- NorthWestern will maintain the Island Park, Power Park, and the Wild Goose Landing recreation facilities, and the South Shore Dispersed Recreation Area. Details about this proposal are found in **Exhibit E - Section 11-Recreation** of this Exhibit E.
- NorthWestern will develop and implement a Recreation Management Plan that includes these listed sites.

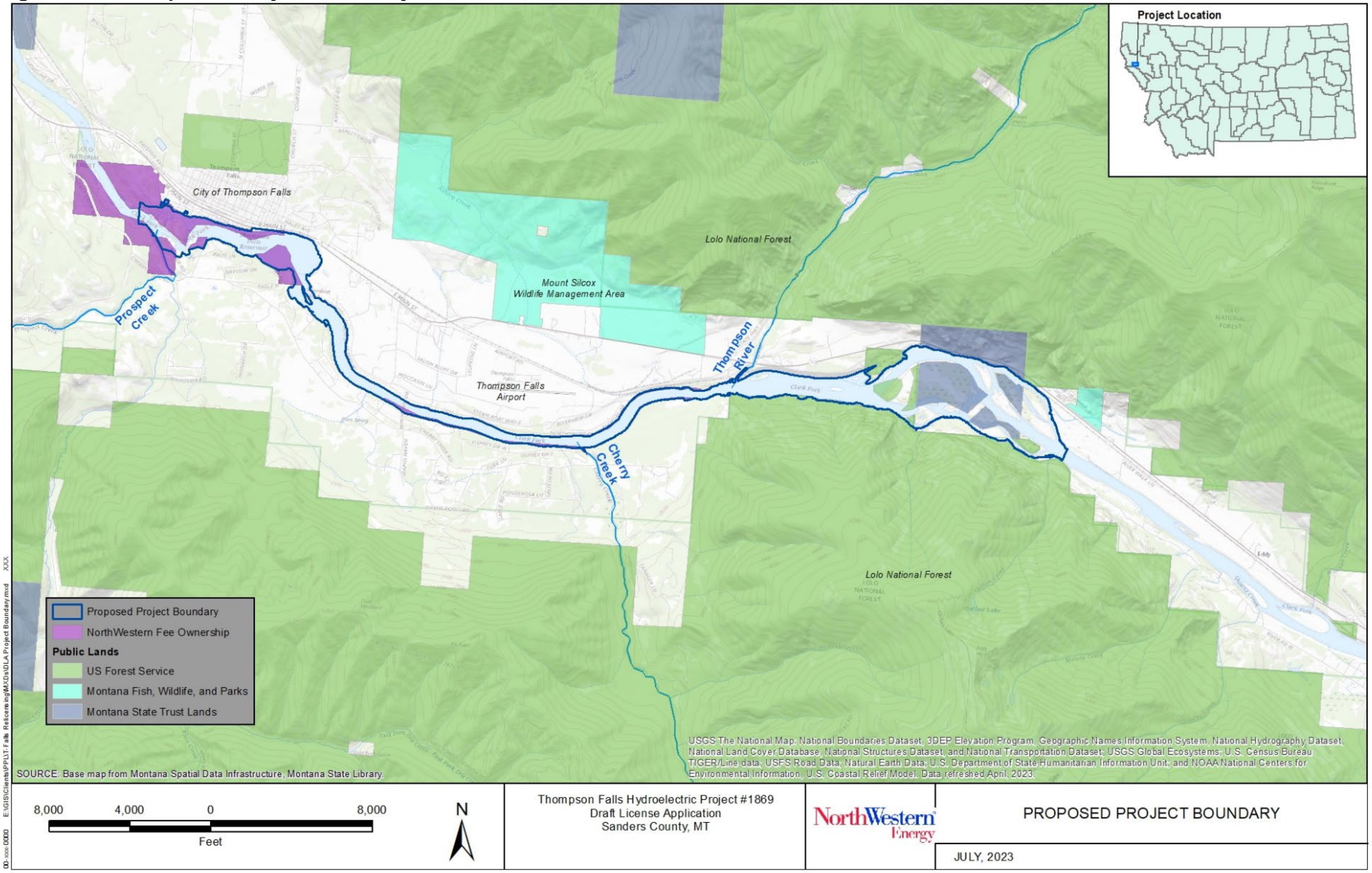
2.2.4.4 Cultural Resources

- Implement the Historic Properties Management Plan for appropriate treatment of cultural resources.

2.2.4.5 Other

- Operate to maintain reservoir elevations within the top 2.5 feet of the reservoir (between 2396.5-2394 feet), under normal operations.
- NorthWestern is in discussions with other Relicensing Participants concerning other potential environmental PM&E measures.

Figure 2-5: Proposed Project boundary



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2.3 Alternatives Considered but Dismissed from Detailed Study

2.3.1 Federal Government Takeover of the Project

Under Section 14(a) of the FPA, the federal government may take over any project licensed by the FERC upon the expiration of the original license. In accordance with 18 CFR § 16.14 of FERC regulations, during Project scoping a federal department or agency may file a recommendation that the U.S. exercise its right to take over a hydroelectric power project with a license that is subject to Sections 14 and 15 of the FPA. During the scoping period for the Project, no federal department or agency filed any such recommendation. No agency or interested party has recommended a federal takeover of the Project pursuant to Section 14 of the FPA and no federal agency has expressed an interest in operating the Project. Therefore, Federal government takeover of the Project was considered but dismissed from further consideration.

2.3.2 Issuing a Non-Project License

A non-power license is a temporary license that FERC would terminate when it determines that another governmental agency is authorized and willing to assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no governmental agency has suggested an interest, willingness, or ability to take over the Project, and NorthWestern is seeking a power license.

2.3.3 Retiring the Project

Project retirement would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions.

In SD2, FERC stated, "As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing in most cases. NorthWestern Energy is not proposing decommissioning, nor does the record to date demonstrate there are serious resource concerns that cannot be mitigated if the Project is relicensed; as such, there is no reason, at this time, to include decommissioning as a reasonable alternative to be evaluated and studied as part of staff's NEPA analysis."

NorthWestern seeks to retain and operate the Project. No participant has suggested that dam removal would be appropriate in this case, and there is no basis for recommending it.

The power generated at the Thompson Falls Project helps NorthWestern balance the production and delivery of other emission-free variable sources of power generation, such as wind and solar, to the power grid. Thus, dam removal is not a reasonable alternative to relicensing the Project as proposed.

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3. Cumulative Effects

The NEPA requires that federal agencies undertaking actions that may significantly affect the quality of the human environment consider: (i) reasonably foreseeable environmental effects of the proposed agency action; (ii) any reasonably foreseeable adverse environmental effects which cannot be avoided should the proposal be implemented; (iii) a reasonable range of alternatives to the proposed agency action, including an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative, that are technically and economically feasible, and meet the purpose and need of the proposal; (iv) the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and (v) any irreversible and irretrievable commitments of Federal resources which would be involved in the proposed agency action should it be implemented.[11]

The Council on Environmental Quality's regulations implementing NEPA define "effects" of the proposed action as including direct, indirect, and cumulative effects.[12] "Cumulative effects" are defined as "the effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions."[13] Cumulative effects can result from "individually minor but collectively significant actions taking place over a period of time."[14]

In SD1, FERC staff identified fisheries and aquatic resources as resources that could be cumulatively affected by the proposed continued operation and maintenance of the Thompson Falls Project in combination with other hydroelectric projects and other activities in the Lower Clark Fork watershed.[15]

FERC subsequently published SD2, which stated that, "While they had not yet determined just how far downstream the effects of Project operation would extend, the analysis of Project effects would not likely include the entire length of the Clark Fork River and all adjacent tributaries as suggested by the USFS, FWS, and FWP because some of these areas are either too geographically remote or any effects occurring there are the product of a lengthy causal chain making any such analysis meaningless."[16]

Cumulative analysis of fisheries and aquatic resources will be addressed in NorthWestern's FLA.

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[11] 42 U.S.C. § 4332(C)(i)-(v).
[12] 40 C.F.R. § 1508.1(g)
[13] 40 C.F.R. §1508.1(g)(3).
[14] *Id*
[15] *See* FERC's Scoping Document 1 for the Thompson Falls Project No. 1869, at 19 (issued Aug. 28, 2020).
[16] *See* FERC's Scoping Document 2 for the Thompson Falls Project No. 1869 (issued Dec 9, 2020).

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4. General Description of River Basin

The Project is located at approximately River Mile 65 on the Clark Fork River in Sanders County, Montana. The Clark Fork River is the largest river in the state of Montana based on flow. The Clark Fork River is approximately 320 miles long, with headwaters in southwest Montana, and the terminus at Lake Pend Oreille, Idaho. Outflows from the Lake Pend Oreille create the Pend Oreille River, which ultimately reaches its confluence with the Columbia River. The Columbia River Drainage Basin is estimated to have a drainage area of 258,000 square miles.

The drainage area upstream of the Project is 20,904 square miles (U.S. Geological Service [USGS] StreamStats 2018) and includes upstream flow from the Thompson, Flathead, Blackfoot, and Bitterroot rivers, among other tributaries (**Table 4-1**).

Table 4-1: Regional watershed drainage area.

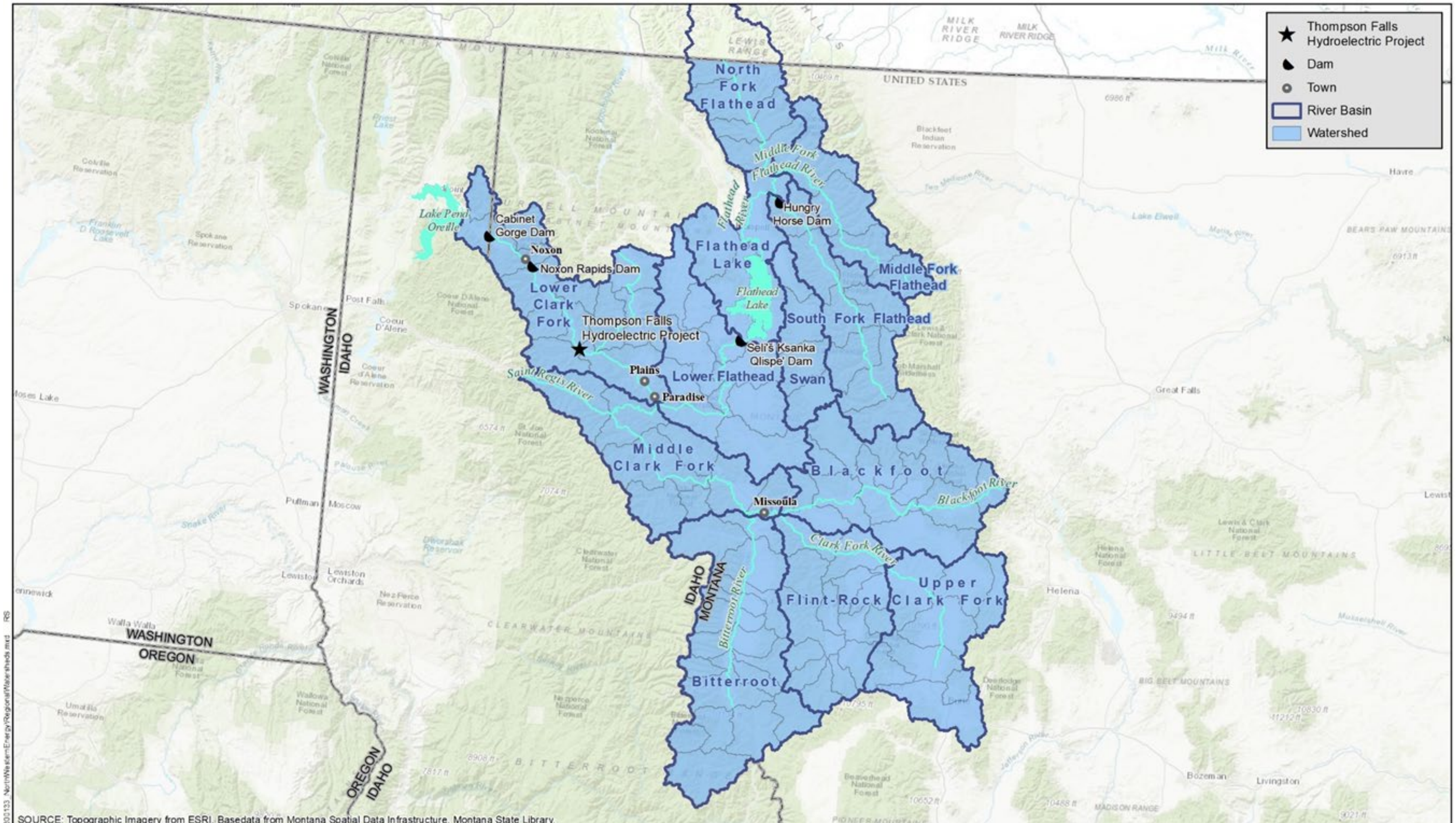
Tributary	Area (acres)	Area (miles^2)
Blackfoot	1,480,174	2,313
Middle Clark Fork	1,270,130	1,985
North Fork Flathead	1,002,762	1,567
Middle Fork Flathead	726,346	1,135
Flathead Lake	762,183	1,191
South Fork Flathead	1,072,560	1,676
Swan	466,557	729
Lower Flathead	1,285,636	2,009
Lower Clark Fork	1,495,418	2,337
Upper Clark Fork	1,199,997	1,875
Flint-Rock	1,164,568	1,820
Bitterroot	1,828,993	2,858
Regional Watershed Total	**13,755,324**	**21,493**

The Project is located in the lower Clark Fork River subbasin which contains 180 miles of perennial stream. In general, the ascending limb of the hydrograph in the lower Clark Fork River begins between mid- and late March, peaks between late May and mid-June, and descends to base flow levels around mid-August.

There are five major dams in the Clark Fork River basin (**Figure 4-1**). The furthest upstream is Hungry Horse Dam on the South Fork of the Flathead River, managed by the U.S. Bureau of Reclamation. The South Fork of the Flathead River is a tributary to the Flathead River which in turn is a tributary to the Clark Fork River. Downstream of Hungry Horse Dam on the Flathead River is the SKQ Hydroelectric Project (FERC Project P-5). The CSKT are owners and its wholly owned, federally chartered corporation, Energy Keepers, Inc. is operator of the SKQ Project. The SKQ Project is approximately 100 miles upstream of the Project. There are no other major water control facilities in the Clark Fork River basin upstream of the Project.

Downstream of the Project on the Clark Fork River is Avista Utilities' (Avista) Clark Fork River Project (FERC Project P-2058) consisting of Noxon Rapids Dam, located approximately 33 miles downstream of the Project in Montana, and Cabinet Gorge Dam, approximately 19 miles downstream of Noxon Rapids Dam in Idaho.

Figure 4-1: Regional watersheds



Thompson Falls Hydroelectric Project #1869
Draft License Application
Sanders County, Montana

NorthWestern Energy

REGIONAL WATERSHEDS

AUGUST 2023

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The Project boundary as defined in the FERC license extends approximately 0.3 mile downstream and 12 miles upstream of the Project. Thompson Falls Reservoir covers 1,226 acres at a normal pool El. 2,396.5 feet, not including the islands. The Project has a perimeter length of about 27 miles (**Figure 4-2**).

The primary tributaries of the Clark Fork River within the Project area are the Thompson River and Cherry and Prospect creeks (Figure 4-2). Prospect Creek originates in the mountain range separating Idaho and Montana and flows eastward into the Clark Fork River downstream of the Main Channel Dam. The Thompson River flows into the Clark Fork River approximately 6 miles upstream of the Main Channel Dam. Cherry Creek flows northward and enters Thompson Falls Reservoir approximately 4 miles upstream of the Main Channel Dam. Other streams in the Project area are ephemeral drainages which flow subsurface when they reach the valley alluvium.

The project boundary for the Noxon Rapids Hydroelectric Project is contiguous with the Thompson Falls Project boundary downstream of the original powerhouse. The actual backwater of Noxon Rapids Dam varies depending on flow in the Clark Fork River and the operation at Noxon powerhouse. Influence from the downstream Noxon Rapids Hydroelectric Project on the tailrace of the Thompson Falls Project is observed when Noxon Reservoir is operated near full pool and Clark Fork River Flows are near baseflow. However, the Birdland Bay Bridge is typically considered the upstream end of Noxon Reservoir (NorthWestern 2023). The gradient of the reach between the Project and Noxon Rapids Reservoir was determined through GIS analysis from downstream of the Main Channel Dam to the Birdland Bay Bridge, 3.2 miles downstream. The water surface elevation in this reach is estimated to be ~ -0.04 percent

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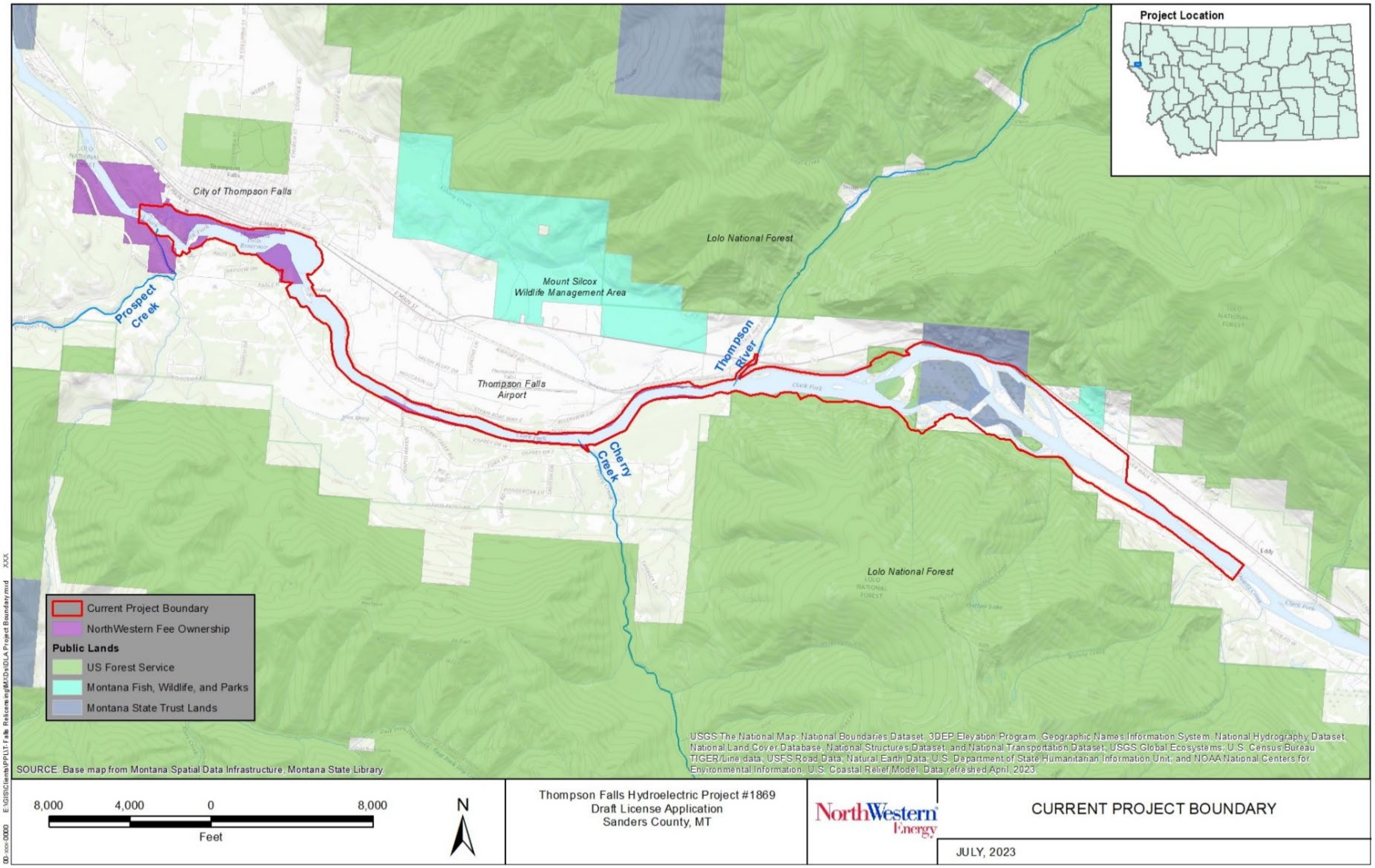
Figure 4-2: Thompson Falls Hydropower Project current FERC Project boundary.



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4.1 Topography

The topography in Project area consists of a U-shaped river valley at approximately 2,400 feet, bounded by steep mountainous terrain that exceed 6,000 feet. The Cabinet Mountains border the north and the Coeur d'Alene Mountains, part of the northernmost extent of the Bitterroot Range, along the south side of the Clark Fork River. The Clark Fork River flows northwest into Lake Pend Oreille.

4.2 Climate

The Project can be described as a cold temperate climate with freezing, snowy and mostly cloudy winters and short, clear, warm and dry summers. Average monthly temperatures vary from 23 degrees Fahrenheit (°F) during the winter to 84°F during the summer, and it is rarely below 6°F or above 92°F (Weather Spark 2022). On average, Thompson Falls receives about 23 inches of rain and 42 inches of snow per year. The warm season lasts about 2.6 months, June 22 to September 10 while the cold season extends from November 12 to March 1 (Weather Spark 2022). The region's growing season is about 130 days long (National Gardening Association 2018).

4.3 Major Land Uses

The 2,001-acre Project boundary consists of 1,226 acres of reservoir, and 775 acres of non-reservoir. Lands in the area include about 17 acres of recreation land uses and 758 acres associated with non-recreational land use.

Of the 758 non-recreational acres in the current Project boundary, NorthWestern owns about 40 acres, with the majority under and adjacent to the dams and powerhouse used for Project operations, as well as narrow slivers on the edge of the reservoir in various locations. Private lands consisting of a mix of large parcels, subdivision lots, and city lots comprise about 419 acres of non-recreational lands. Many private lands contain residential buildings. The state of Montana owns, and Montana's Department of Natural Resources and Conservation manages about 176 acres, which are largely open space. National Forest System lands include 103.8 acres which are largely open space forest lands. Railroad right-of-way and state of Montana lands managed by the Montana Department of Transportation as Montana Highway 200 right-of-way comprise the approximate remaining 17 acres and 2 acres, respectively.

4.4 Economic Activities

The local economy is based on a variety of sources including forestry, mining, agriculture, outdoor recreation, and mining.

Thompson Falls had been a logging community for many years, but reductions in timber harvest coupled with decreased lumber production have reduced logging projects (Bureau of Business and Economic Research [BBER] 2019). Transition away from the timber industry amidst the recession of 2008-2010 was slow. The economic state that resulted is reflected in Sanders County's

Distressed Communities Index[17] rating. The county ranked last in the state, accumulating 91 out of 100 possible points as averaged from 2007-2011 giving it a "distressed" ranking. However, that ranking improved for the timeframe 2012-2016, when the index fell 28.6 points to 62.4 putting it in the "at risk" ranking, reflecting improved economic conditions. As of June of 2023, there was further improvement with the index dropping to 52.5 points putting it in the "mid-tier" ranking (Economic Innovation Group 2023).

Mining in the area historically occurred in the Thompson River drainage, which flows into Thompson Falls Reservoir about 6 miles upstream of Thompson Falls Dam. There were a limited number of mines, still the district represented one of the largest mining districts in Sanders County. The district produced 943 tons of ore, including gold, silver, copper, lead, and zine from 1906 to 1958 (Crowley 1963).

According to 2017 Census of Agriculture data, Sanders County encompasses 642,640 acres of farmland, accounting for 36.4 percent of land area in the county. These lands include nearly 400,000 acres of large-tract woodlands for timber production, while the remaining 240,000 acres (approximately) can be considered true farms (USDA National Agricultural Statistics Service 2019). These smaller farm operations are typically not self-sustaining, and their owners use off-farm employment to support themselves.

The area is popular among Montana residents and nonresident visitors for outdoor recreation. Outdoor recreation, including hunting and fishing, and contribute significantly to Sanders County's economy. Big game hunters spent $12.7 million in Sanders County in 2016; $6.2 million by nonresidents and $6.5 million by Montana residents. Elk hunters accounted for 52 percent of these expenditures, while deer hunters accounted for 48 percent (FWP Responsible Management Unit [RMU] 2017). The FWP and angling pressure survey in 2020 estimated 2,607 angler use days of Montana residents on Thompson Falls Reservoir (League and Ball 2020).

Travel-related spending in Sanders County in 2018 was estimated at $54 million. Expenditures by out-of-state visitors are estimated at $17.9 million (Institute for Tourism and Recreation Research [ITRR] 2018), while Montana resident travel spending totaled $36.1 million in the county (65% on day trips, 35% on overnight trips; Grau 2018).

[17] The Distressed Communities Index (DCI) combines seven complementary economic indicators into a single measure of community well-being, ranging from 0 to 100. Scores over 80 are considered distressed.

5. Geology, Topography, and Soils

5.1 Affected Environment – Geology

5.1.1 Geologic and Physiographic Setting

The Project is located in the Rocky Mountain Physiographic Province on the west side of the Continental Divide near the Montana and Idaho border. The region is characterized by rugged mountainous terrane that is interrupted by relatively narrow valleys that interconnect intermontane basins. Many of the rivers and tributary drainages in the region follow ancient bedrock faults that tend to have a northwest trending pattern. The Project resides along the Clark Fork River. The Clark Fork River generally trends east-west through the Project area, and then flows northwesterly downstream of the Project along the Hope Fault Zone. The western part of the Project near the town of Thompson Falls, where the dams and powerhouses are located, is within a relatively flat-floored 3-mile-wide section of the river valley. The upstream portion of the Project east of the confluence with the Thompson River is markedly narrower (referred to as Eddy Narrows) and flanked on either side by precipitous valley walls. The nominal elevation of the valley floor is 2,400 feet and the neighboring peaks are in excess of 6,000 feet.

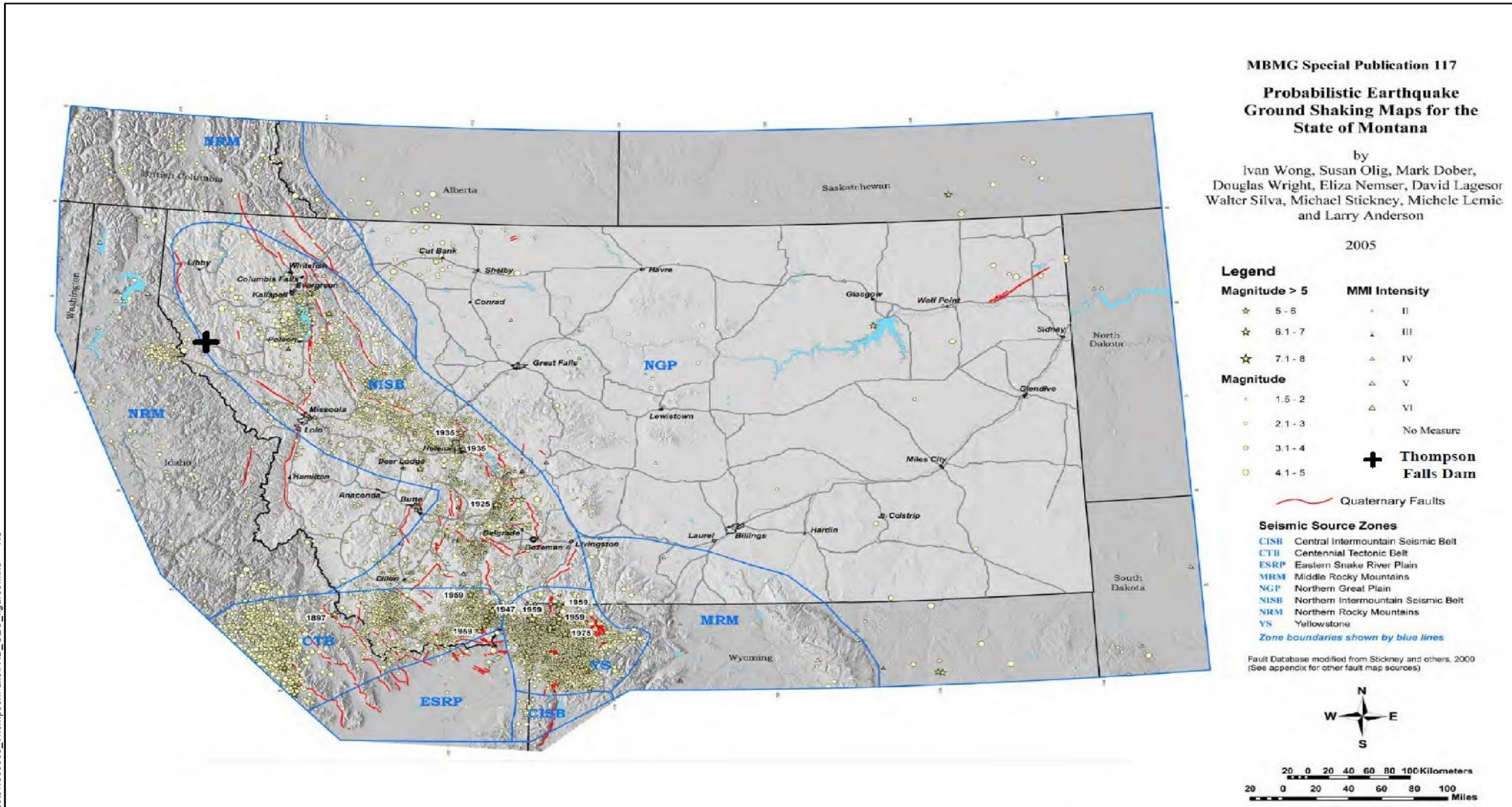
5.1.2 Tectonic Setting

The Project resides within the Northern Intermountain Seismic Belt (NISB), which is a sub-region of the more extensive Intermountain Seismic Belt (ISB). The ISB is characterized as a broad north-south trending zone of interplate seismicity that extends from northern Arizona to northwestern Montana. The ISB is principally deforming in response to ongoing tectonic extension within the North American Plate. The late-Quaternary normal faulting generally is associated with diffuse shallow (< 15 km) seismicity with surface ruptures resulting from earthquakes that range from **M** 6.5-7.5. Proximal to the Project, within the NISB in western Montana, seismicity is diffuse with generally small magnitude (**M** ≤ 4.0) events, with some larger (**M** ≥ 6.0) events (URS Corporation 2011).

Within the ISB is the Basin and Range Province, the Project is within a portion of the northern Basin and Range Province. The Yellowstone hotspot migration in the late Cenozoic that is associated with Snake River Plain, is considered the boundary between the northern and southern Basin and Range regions. The northern region has a somewhat different tectonic signature than the southern. Typically, the northern region is characterized as north-northwest trending ranges bound on one or more sides by steeply dipping normal faults. The basins formed by the down-dropping are then filled with broad alluvial sediments. The southern Basin and Range also has these similar mountain range geometries, however, listric normal faults that sole into "master" low angle detachments are more common (Arabasz 1992).

The conspicuous Quaternary age normal faulting along the north-northwest trending range-fronts and historical seismicity in the northern Basin and Range Province suggests crustal extension rates of 2 millimeters (mm) per year that are observed in the southern region may be characteristic for this northern region as well (URS 2011). There are three principal seismic regimes that contribute to the ground motions at the Project: The NISB, the Centennial Tectonic Belt, and Yellowstone (**Figure 5-1**). Other regimes that could contribute to the ground shaking hazard in western Montana are the Central ISB, and the Northern and Middle Rocky Mountains.

Figure 5-1: Historical seismicity 1809–2001.



Source: Figure extracted from URS (2011)

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	Thompson Falls Hydroelectric Project #1869 Draft License Application Sanders County, Montana	NorthWestern Energy	HISTORICAL SEISMICITY 1809-2001, QUATERNARY FAULTS, AND REGIONAL SEISMIC SOURCE ZONES APRIL 2020 FIGURE

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5.1.3 Bedrock

A detailed geologic map of the Project is the USGS Wallace Quadrangle presented at a scale of 1:250,000 by Harrison et al. (1986) (**Figure 5-2**). The Project is entirely within Middle Proterozoic (~1.5 billion years ago) bedrock. The downstream portion of the Project area, including the dam site, is underlain by the Wallace Formation, which is a thick sequence of carbonate-bearing laminated black and white argillite, green argillaceous siltite, and minor limestone and dolomite (MPC 1982). Rock of the underlying Ravalli group are exposed at the mouth of Eddy Canyon at the upstream end of the Thompson Falls Reservoir.

A geologic characterization of the dam site was completed when MPC was planning to expand the Project in the early 1980s (MPC 1982). This involved mapping and characterization of the dominant discontinuity (i.e., bedding, joints, shears, etc.) sets. The rock near the dam was described as a dark gray argillite of the Wallace Formation. The rock has been subjected to metamorphism several times during its history, resulting in tilted and folded bedding that has also been faulted. Generally, the rock is hard, massive to blocky jointed and not severely weathered (MPC 1982). Near the dam site MPC (1982) found the predominant dip of the bedding to be at a low angle dipping obliquely downstream with localized variation due to folding. A secondary joint set was observed to be near vertical in a NE-SW direction, which is cut by steeply dipping northwest-southeast primary joints and shears. A fourth set is roughly flat lying, occasionally breaking preferentially along flat lying bedding planes. This last set was interpreted to be an exfoliation joint that is the result of crustal unloading.

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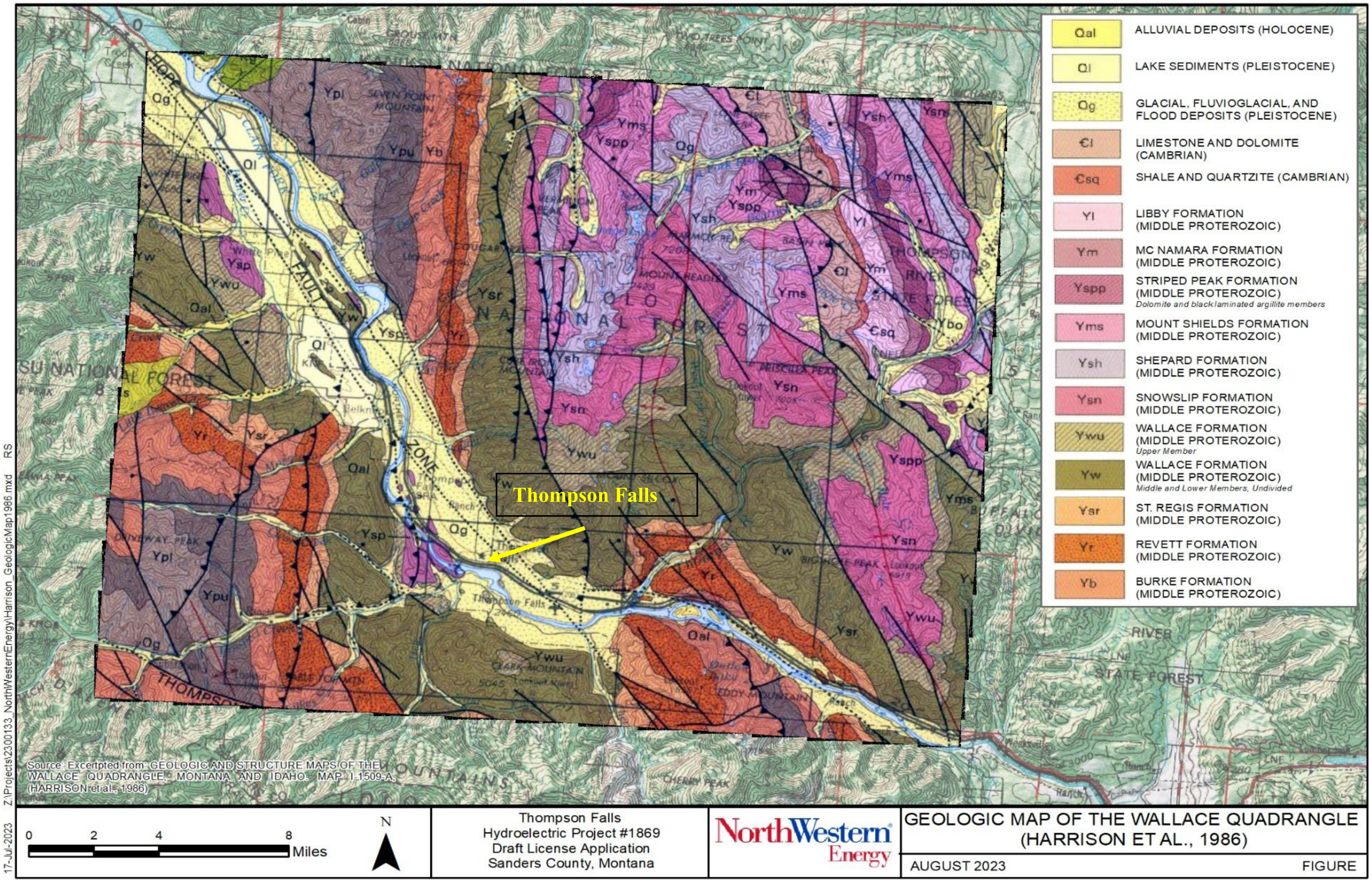
Figure 5-2: Geologic map of Project Area.



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5.1.4 Seismicity and Ground Motions

In 2011 there was a site-specific seismic hazard study performed by URS. The following is an excerpt from that study and summary included in NorthWestern's 2016 18 CFR Part 12 report.

Of the considered seismic sources the Thompson Valley Fault was considered to be the most significant. Although relatively short (~10 km) the proximity to the site (~30 km) increases the significance of the fault structure. The Thompson Valley Fault is not well characterized; however, it is possible that surface rupture has occurred as recent as 30,000 years ago (Ostenaa et al. 1990). URS (2011) considered a preferred maximum magnitude for the Thompson Valley Fault of **M** 6.2 in the PSHA, and a **M** 6.6 in the DSHA, which is typically considered the threshold for surface rupture.

The results from the 2011 Deterministic Seismic Hazard Analysis (DSHA) for the Project found the maximum seismic event to correspond to a **M** 6.6 earthquake on the Thompson Valley fault at a rupture distance of 26.6 km. The 84th percentile deterministic PGA is 0.15 g. The results of the PSHA for Thompson Falls Dam estimated peak ground accelerations at the dam site for return periods of 1,000, 3,000, and 5,000 years, and the resulting PGAs are estimated to be 0.14 g, 0.22 g, and 0.26 g, respectively. For the low hazard Thompson Falls Project, the Safety Evaluation Earthquake recommended by URS in 2011 and used as the basis for the 2014 dam analyses has a return period of 2,500 years and PGA of 0.22 g in accordance with national practice.

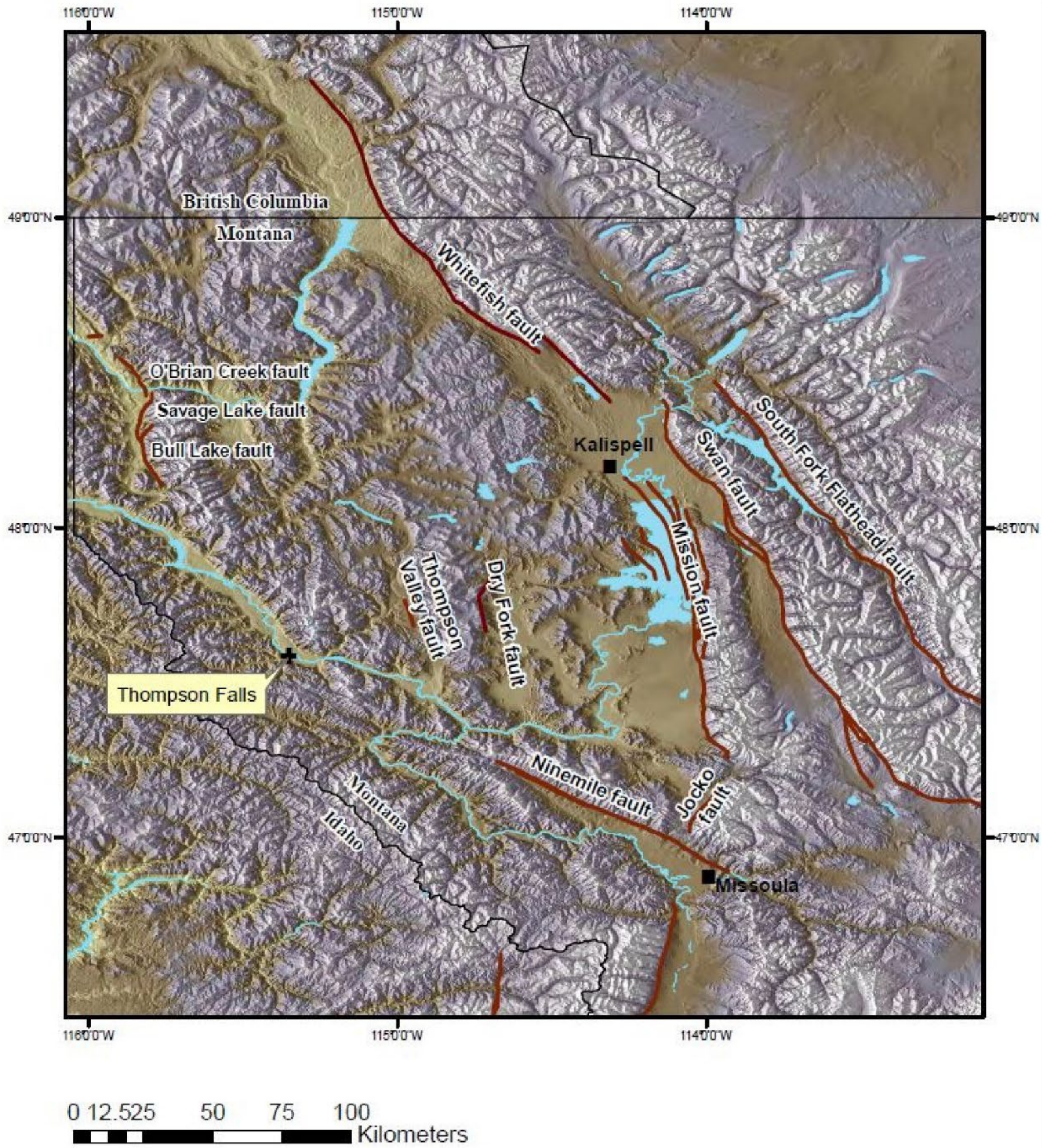
As part of the 2011 URS analysis, it considered nine Quaternary active faults and one background source as potential contributors to the seismic hazard. A summary of the seismic sources is included in **Table 5-1** and shown on **Figure 5-3.**

Table 5-1: Seismic hazards at Thompson Falls Hydroelectric Project.

Fault/Source	Maximum Rupture Length(s) (km)	Most Recent Movement
Thompson Valley Fault	9.6	< 130,000 years
Ninemile Fault	70.1	< 1,600,000 years
Bull Lake, Savage Lake and O'Brien Creek faults	46 (unsegmented), 21 (Bull Lake), 17 (Savage Lake), 15 (O'Brien Creek)	< 1,600,000 years
Dry Fork Fault	19	Middle or Late Quaternary
Jocko Fault	15.8	< 130,000 years
South Fork Flathead Fault	75 (unsegmented), 40 (Firefighter Mountain Section), 70 (Hungry Horse Reservoir Section), 50 (Big Salmon Lake Section)	< 1,600,000 years (?)
Swan Fault	75 (unsegmented), 65 (Lake Blaine Section), 90 (Condon Section)	< 1,600,000 years
Whitefish Fault	110 (unsegmented), 84 (Northern Section), 30 (Southern Section)	< 1,600,000 years (?)
Mission Fault	104 (unsegmented), 67 (Flathead Lake Section), 40 (Mission Valley)	< 15,000 years
Background Earthquakes	N/A	N/A

Note: Table adapted and modified from URS (2011), "(?)" indicated additional uncertainty in the age of the most recent movement along the fault source.

Figure 5-3: Quarternary faults in Project Area.



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SOURCE: Figure extracted from URS (2011)

Thompson Falls Hydroelectric Project #1869 Draft License Application Sanders County, Montana	NorthWestern Energy	QUATERNARY FAULTS NEAR THOMPSON FALLS DAM JULY 2023 FIGURE

5.1.5 Historical Seismicity

Minimal seismogenic instrumentation monitoring coverage existed in Montana prior to 1972, reducing the certainty in locating epicenters of older events. It is estimated that about a dozen earthquakes of **M** 6.0 or greater have occurred since 1900. Of these significant earthquakes one occurred in or near eastern Montana in 1909, and the others have occurred along the ISB and Centennial Tectonic Belt in western Montana (URS 2011). Historical earthquakes of note that are indicative of the seismogenic potential in the ISB are: 1925 **M** 6.6 Clarkston Valley Earthquake, 1935 **M** 6.3 Helena Earthquake, 1959 **M** 7.3 Hebgen Lake earthquake, and the 1983 **M** 6.8 Borah Peak earthquake. These earthquakes generated significant damages in their respective regions. Of note is the 1925 Clarkston Valley event, as it is considered the "typical background earthquake". Background earthquakes are considered "floating" earthquakes that are not attributed to a specific known mapped fault. Historical seismicity near Thompson Falls is shown in **Figure 5-4**.

5.1.6 Structural Features

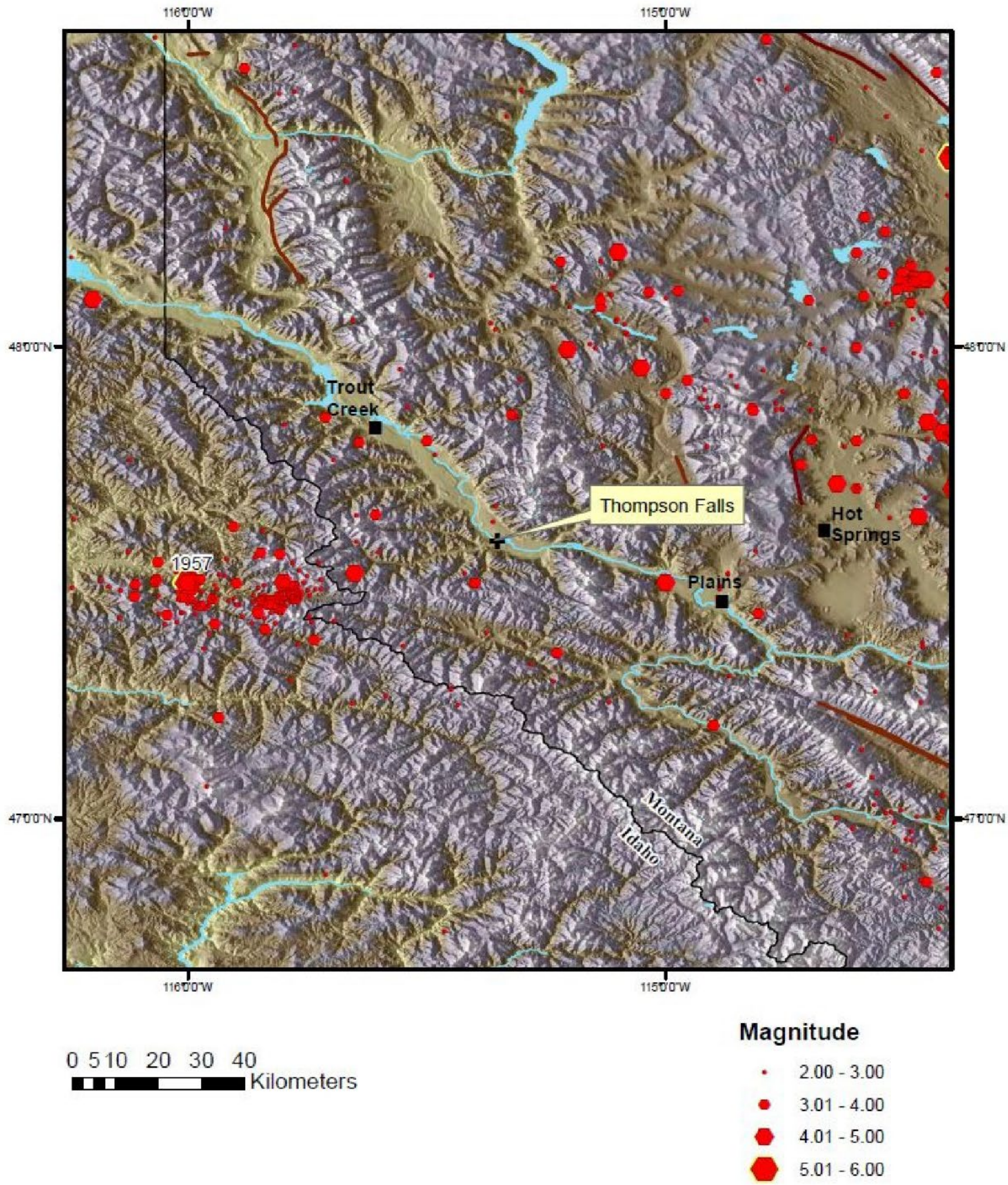
The Project lies on the southwest limb of a northwest trending anticlinorium (MPC 1982). The anticlinal axis can be traced from Eddy Canyon at the Oak Fork drainage across the Thompson River to the northwest, crossing the Thompson River 2 miles upstream from the confluence of the Thompson and Clark Fork rivers (MPC 1982). The Revett quartzite located near the mouth of Eddy Canyon and the Thompson River strikes northwest, parallel to the axis of the major anticlinal system. The Revett quartzite lies on the southwest dipping limb of the anticline (*refer to* **Figure 5-2**).

The Hope fault zone lies along the relatively straight escarpment forming the north wall of the Clark Fork Valley at Thompson Falls (MPC 1982). The trace of the fault is buried beneath the valley fill upstream from Thompson Falls. The Hope fault leaves the Clark Fork Valley at Cherry Creek and follows that drainage to the southeast. Geologic evidence indicates that right-lateral strike-slip movement occurred along the Hope fault during the Precambrian.

The widening drainage pattern of the Clark Fork River Valley below the mouth of the Thompson River suggests that the river has eroded into a basin-and-range type graben structure (MPC 1982). The north and east walls of the valley are anomalously straight, indicating fault scarps on the up thrown horst blocks. The valley thus resides within a relatively small graben block upstream of the dam site. Water well records show that the portion of the valley upstream from Thompson Falls has been eroded to El. 2,050 feet, compared to a bedrock El. of 2,350 to 2,400 feet on the upthrown block at the dam site and under the bench north of Thompson Falls. This relative upward movement on the downstream side of the graben at Thompson Falls created a bedrock step (Thompson Falls at the location of the present dam).

Evidence of ancient thrust faulting is found on the north-northwest-trending parallel faults mapped at the Thompson Falls Project (MPC 1982). Both strike and dip-slip movement are found on these structures. The orientation of drag folds and slicken-sided bedding plane features associated with these faults suggest that at least minor thrusting has occurred (MPC 1982). The relative movement on these faults indicates a slight thrusting of the horst over the western portion of the graben at the Thompson Falls dam site. Historical seismicity in the valley is generally very low (**Figure 5-4**), further indicating these are ancient structures rather than active faults.

Figure 5-4: Historical seismicity near Project Area.



SOURCE: Figure extracted from URS (2011)

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Thompson Falls Hydroelectric Project #1869 Draft License Application Sanders County, Montana	NorthWestern Energy	HISTORICAL SEISMICITY NEAR THOMPSON FALLS DAM JULY 2023 FIGURE

5.1.7 Surficial Geology

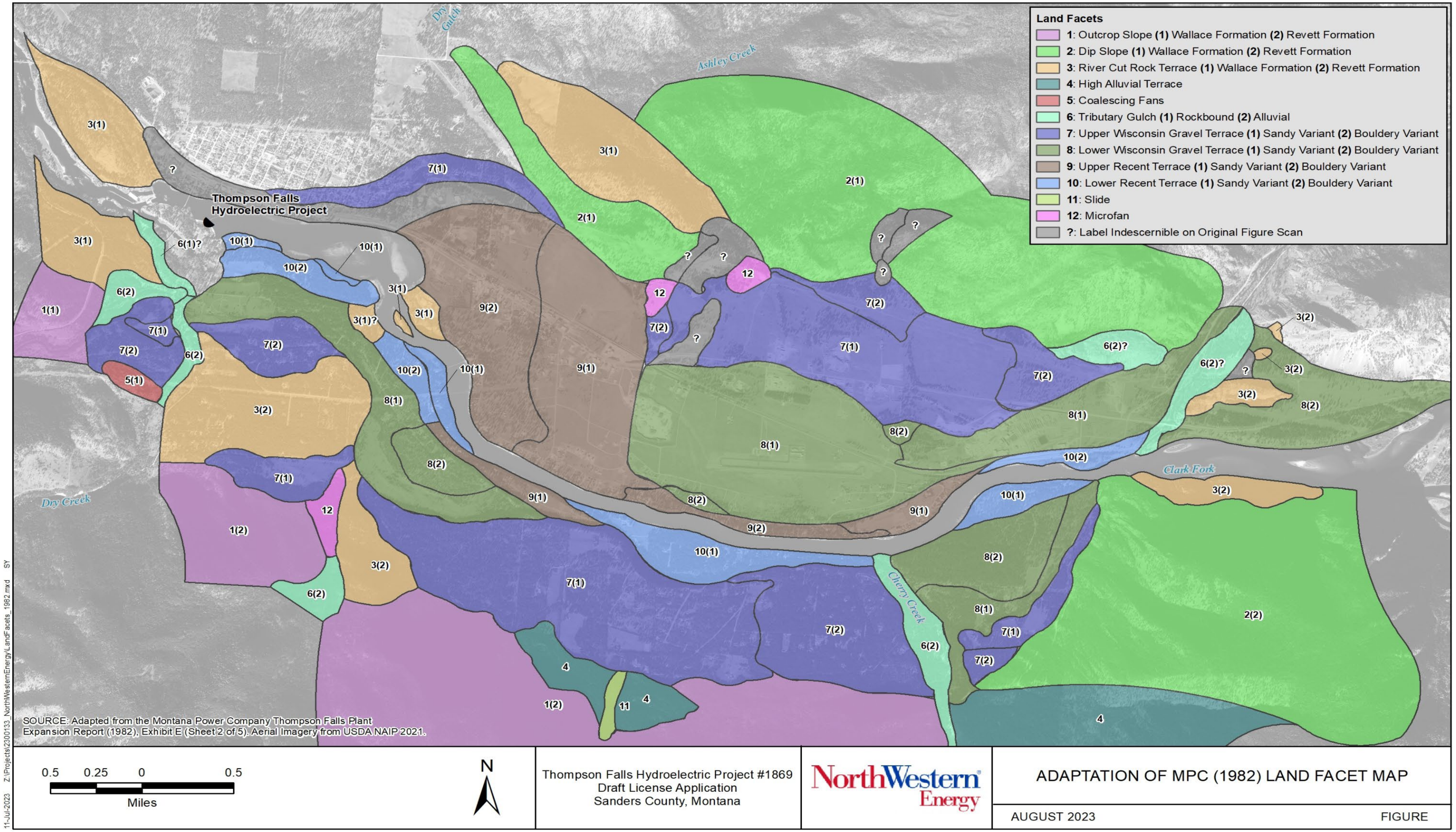
The distribution and types of Quaternary (last 2.6 million years) deposits within the Project area have a complex history. The entire Project area is within the inundation zone of the Pleistocene (0.126–2.6 million years ago) age Glacial Lake Missoula. The lake was formed when the Purcell Lobe terminated near the basin of Pend Oreille Lake, thus crowding the valley of the Clark Fork River and impounding water in the Clark Fork Valley to a maximum El. 4150 feet, which is approximately 1,750 deep at the Project (Pardee 1942). The ice dam was breached catastrophically and was reestablished tens of times in the Late Pleistocene (12.6-130 thousand years ago) (Baker 1981).

Quaternary mapping of the Project area was conducted by Pardee in 1942. His mapping suggested that following the breach of the ice dam(s) the flood waters of Glacial Lake Missoula likely took days, possibly a week to recede from the Project area. The flood waters were estimated to be as high as 1000 feet above the valley floor within Eddy Narrows at the east end of the Project and cover the entire width of the Clark Fork Valley in which Thompson Falls resides. These enormous flood events command stream powers not demonstrated in modern times. Within the east end of the Project the velocities were high enough to presumably strip any remnant Glacial Lake Missoula fine grained slack water deposits leaving a thin cover of alluvium that ranges from gravel and sand to large boulder sized clasts. Where the flood waters emptied to the Clark River Valley of Thompson Falls, the energy dissipated but was generally swift, also likely striping away any Glacial Lake Missoula slack water deposits and blanketing the floor with stratified sand, gravel, and boulder deposits (Pardee 1942).

Following these epic flooding events in the Late Pleistocene there have been a series of river terraces (straths) cut into the older Missoula Flood deposits. The stepwise downcutting during late Pleistocene and recent times has produced four major erosional terrace levels with numerous small intermediate levels (MPC 1982). Alden (1953) identified two Latest Pleistocene (12.6-16 thousand years ago) age terraces. Two additional lower level terraces mapped by GeoWest (1981) were inferred to be recent (Holocene) in age. Much of the development adjacent to the Project reservoir resides on these younger alluvial deposits that are cored at depth by the older coarse-grained flood deposits. In places such as at the dam site and near Steamboat Island 1.3 miles upstream of the dam, bedrock crops out above the alluvium. However, a water well at the Thompson River Lumber (located just west of the confluence of the Thompson River and the Clark Fork River) penetrated 432 feet of alluvium before encountering bedrock (MPC 1990). This demonstrates the considerable variability in alluvial depth throughout the Project area.

Quaternary geomorphic mapping specific to the Project was conducted by Geowest (1981). Geowest mapped a series of units along the Project defined as “land facets”. The land facets are divided based on the geomorphic characteristics (fluvial terrace, alluvial fans, etc.), topographic position, as well as the material properties of the land facet verified through test pitting (**Figure 5-5**). The younger terraces, channels, and point bars often have a veneer of sand that is typically thin (<1-foot) but reaches thicknesses of 7 to 10 feet locally (MPC 1982). These finer grained sediments indicate a relative lower energy depositional environment compared to the Pleistocene age higher energy sediments. The Agricultural cultivation activity is confined to the sandy depositional terraces. The soils are classified as sandy loams.

Figure 5-5: Land facet map, Thompson Falls, Montana.



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5.1.8 Mineral Resources

The Wallace Formation at the Project does not have significant mineralization potential (MPC 1990).

5.2 Affected Environment – Topography

The topography in Sanders County, Montana consists of rugged mountain ranges, and broad intervening drainages that provide substantial local relief. The Cabinet and Salish mountains, and Bitterroot Range occupy the northern and southern parts of the county, respectively. These two mountain regimes are separated by the northwest flowing Clark Fork River.

5.3 Affected Environment – Soils

This section characterizes soils within and near the Project. The term, "soil" when used in this section refers to the upper topsoil.

5.3.1 Soil Type and Occurrence

Soil types found within the Project are shown in **Figure 5-6**. Horseplains fine sandy loam are the most common soils found within the Project. This type of soil is found upstream of the confluence with Thompson River as islands within the Thompson Falls Reservoir. Generally, the soil types in the Project are sandy-skeletal and loamy-skeletal which are moderately to well drained. The soils, where they occur, are usually less than 0.5-foot-thick (MPC 1982).

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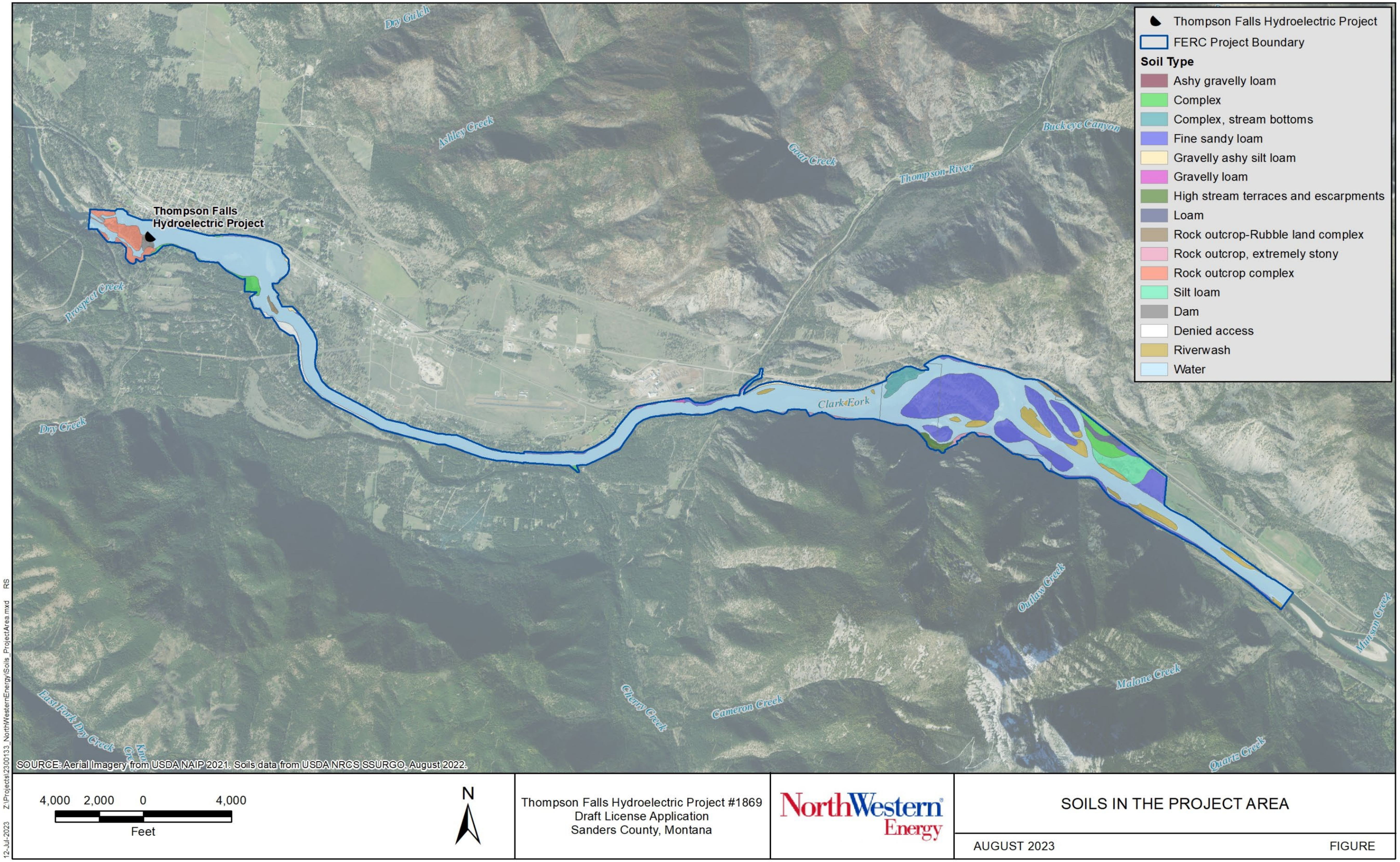
Figure 5-6: Soils in the Project Area.



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5.3.2 Physical and Chemical Characteristics

The soils near the Project are of the Mollisol order of soils (MPC 1982). As described by MPC (1982), due to the shallow soil depths found at many of the sites investigated, much of this area is not suitable for crop production. There were a few cultivated sites investigated, but most were capable of sustaining range grasses only, and several of those would require limited grazing.

Using the Natural Resources Conservation Service's system of land classification, most of the classifications were represented in this investigation (MPC 1982). The extremes vary from Class II to Class VIII, based upon a scale of I (good crop production) to VIII (limited use due to severe limitations).

5.3.3 Erodibility

Previous characterizations of the Project by Geowest (1981), MPC (1982, 1989) found that in general the soils typically are a thin veneer overlying coarse grained alluvium parent material. The thin nature of the topsoil does not present a geohazard due to its limited volume. Moreover, the coarse-grained soils that are found at depth typically resist erosion. Recent operations testing performed in October 2019 found that the historical reservoir infill sediment is susceptible to localized slumping. However, visual observation by NorthWestern staff during the 2019 drawdown observed that the slumping appears surficial and does not typically extend into native alluvium that the reservoir infill sediment is overlying. High spring flows are the largest contributing source of erosion within the Project boundary. Spring flows can be in excess of 100,000 cfs of inflow to the Project.

5.3.4 Existing Soil Instability

Shallow raveling and minor slumps typically occur in finer grained soil types (i.e., sandy deposits or 'Sandy Variant' [MPC 1982]). These finer grained deposits are less resistant to being undercut by wave action that results from dominant wind patterns and increased fetch distances, whereas the more bouldery and gravelly dominated deposits are more resistant to erosion and maintain a steeper angle of repose. In 1982, MPC reported that two terraces along the southern shoreline of the Thompson Falls Reservoir had experienced relatively more erosion than elsewhere within the reservoir. These two surfaces are referred to as, "Land Facet 10(1): Lower Recent Terrace, Sandy Variant" and "Land Facet 8(2): Lower Wisconsin Terrace, Bouldery Variant" (*refer to* **Figure 3-5**). They noted erosion to the boulder variant was anomalous and attributed it to increased fetch distances. The exact locations described by MPC (1982) are not certain. More recently, NorthWestern staff has observed minor bank erosion along the south side of the reservoir. It is not clear if these are the same locations observed by MPC. Stabilization measures that NorthWestern promotes for these relatively shallow slope failures include bioengineered stabilization measures. This approach entails strategic planting of native vegetation to stabilize slopes with deep-binding root structure to create a stable and resilient bank capable of withstanding wave action and other localized forces that may cause erosion (NorthWestern 2020).

The second type of slope instabilities observed are related to deep drawdowns that are necessary to facilitate spillway repairs after large, infrequent flooding events. Most recently, in May 2018, a drawdown occurred that lowered the reservoir 15 feet. During this drawdown, NorthWestern acquired Unmanned Aerial Vehicle imagery for the Project. The data included a high resolution georectified aerial image, and a structure-from-motion (photogrammetric) derived point cloud data set and associated digital elevation model.

The 2018 deep drawdown resulted in several smaller, shallow, slumps below the normal full pool level in what appeared to be fine-grained recent reservoir infilling. These slumps do not impact the reservoir rim stability. However, in two locations additional movements occurred that encroach outboard from the reservoir rim, notably upstream of the original powerhouse, near Power Park. NorthWestern is currently conducting further research into these sites (planned for fall 2023) and will implement control measures if needed as a matter of Project maintenance. At these two locations erosion outside of the Project boundary was not observed.

5.4 Environmental Measures

5.4.1 Existing Environmental Measures

NorthWestern maintains Shoreline Standards: *Standards for the Design, Construction, Maintenance, and Operation of Shoreline Facilities on NorthWestern Hydroelectric Projects* (Standards). The Standards serve to guide the design and construction of shoreline facilities, shoreline bank stabilization projects, as well as management of shoreline facilities. The purpose of the Standards is to provide general direction such that shoreline facilities are designed, constructed, maintained, and operated in a safe, and environmentally friendly manner to protect and/or enhance adjacent recreation and natural aesthetic resources.

Since the 2018 drawdown, two new 18 feet high radial gates have been installed on the Main Channel Dam Spillway. These gates provide a discharge capacity of 20,000 cfs (10,000 cfs each). The addition of the gates adds substantial reservoir operational control by reducing the frequency of tripping stanchions to pass high flows, resulting in less frequent deep drawdowns of the reservoir.

5.4.2 Proposed Environmental Measures

No new impacts to geology, topography or soils were identified in the results of NorthWestern's Operation Study (2023). Existing measures will continue to be implemented but no new measures are being proposed.

5.5 Environmental Effects

5.5.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

5.5.1.1 Reservoir Drawdown Induced Slope Movement

Under the current license, reservoir water level fluctuations to 4 feet below full pool could occur periodically. The Project team identified two potential adverse impacts to this fluctuation in the pool level: 1) relatively larger slope failures that extend into the older native alluvium (reservoir rim stability), and 2) localized shoreline erosion and slumping of post Project reservoir sediment infill. To evaluate the potential impacts of these slope hazards, a drawdown operations test was conducted in October 2019. The test included maximum generation and the associated drafting the reservoir level the full 4 feet as authorized by the current license, then raising the level in 1-foot increments.

5.5.1.2 Reservoir Rim Stability

To evaluate reservoir drawdown induced movement of relatively larger slope failures, detailed monitoring at specific areas that were judged to be the most susceptible to movement were monitored in detail. The monitoring included a series of transects through slide observation areas, that were monitored and measured during the drawdown cycles to detect movement. No measurable ground movement was detected along the transects during the 4-foot drawdown.

5.5.1.3 Shoreline Erosion

The most effective way to evaluate localized shoreline erosion during the drawdown test was by observation from a boat. NorthWestern staff patrolled the reservoir to observe and document the degree to which localized shoreline erosion was occurring. Generally, the visual observations made by boat noted that historical reservoir sediment infill and some limited areas of fine-grained alluvium that is less compact experienced some surficial slumping.

To the extent that larger slope movements are associated with deeper drawdowns, they will occur less frequently than in the past, as a result of the installation of new radial gates on the Main Channel Dam.

5.5.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations.

5.5.2.1 Reservoir Drawdown Induced Slope Movement

In 2021 and 2022, NorthWestern conducted a study of shoreline stability under flexible generation within a 2.5-foot range of full pool (NorthWestern 2023). Following sections describe the conclusions of the study.

5.5.2.2 Reservoir Rim Stability

Since no significant slope movement was observed during the 4-foot drawdown, there is even less of a possibility of slope movement during smaller 2.5-foot drawdowns.

5.5.2.3 Shoreline Erosion

Similar observations that were made during the 4-foot drawdown, were also observed during the 2.5-foot drawdown. The most commonly observed shoreline erosion was sloughing of the recent reservoir sediment infill. The fluctuating water levels due to Project operations did not appear to appreciably change the amount, type, or cause of erosion.

In addition to the sloughing of the recent reservoir sediment, there were some locations of shoreline erosion at areas that are use-based impacts such as human or wildlife footpaths, or natural events such as spring runoff, runoff in response to rain events, or wind-toppled trees. Much of the reservoir bed near the shoreline is armored with rock, cobble, gravel, woody material and/or aquatic vegetation. Thus, lowering the reservoir results in the water's energy being exerted on these armored areas which are generally stable and resistant to erosion.

Proposed modifications to the Project boundary incorporate the lands and water that are needed for Project purposes. The proposed modification will have no impact on geological resources.

5.6 Unavoidable Adverse Impacts

Raveling and minor localized slumps in finer grained reservoir soils are likely to occur during flexible generation. Particularly, the young reservoir infill sediment that has little compaction and intrinsic strength will be subject to localized mobilization.

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6. Water Quantity and Quality

6.1 Affected Environment – Water Resources

Section 6.1 describes and characterizes the water resources and water quality of the Project. For a description of the entire river basin, *refer to* **Exhibit E - Section 4.0 – General Description of River Basin**.

6.1.1 Major Land and Water Use in Project Area

The Project boundary (*refer to* **Figure 4-1**) encompasses about 2,001 acres, which is about 0.01 percent of the river basin. The Project is 1,226 acres of reservoir and 775 acres of non-reservoir. Of the 775 acres that are non-reservoir, about 17 acres are associated with recreational land uses, and the remaining 758 acres are associated with non-recreational land use. The acreage includes 40 acres owned in fee by NorthWestern, 103.8 acres of federal lands managed by the USFS and the rest of the acres are various public and private owners.

A more detailed description of these land uses is in **Exhibit E – Section 13 – Land Use**.

6.1.2 Dams and Diversion Structures in the Clark Fork River Basin

Upstream of the Project is the SKQ Project (formerly known as Kerr Dam, FERC Project P-5), located on the Flathead River, approximately 100 miles upstream (*refer to* Figure 4-1). The Flathead River is a tributary to the Clark Fork River. The CSKT are owners and its wholly owned, federally chartered corporation, Energy Keepers, Inc. is operator of the SKQ Project. The only other major dam in the watershed upstream of the Thompson Falls Project is Hungry Horse Dam on the South Fork of the Flathead River, managed by the U.S. Bureau of Reclamation (*refer to* Figure 4-1).

Downstream of the Project, is Avista's Clark Fork River Project (P-2058), including Noxon Rapids Dam and Cabinet Gorge Dam.

6.1.3 Potentially Affected Tributary Rivers and Streams

The primary tributaries of the Clark Fork River within the Project area are the Thompson River and Cherry and Prospect creeks. Prospect Creek originates in the mountain range separating Idaho and Montana and flows eastward into the Clark Fork River downstream of the Main Channel Dam. The Thompson River flows into the Clark Fork River approximately 6 miles upstream of the dam. Cherry Creek flows northward and enters Thompson Falls Reservoir approximately 4 miles upstream of the dam. Other streams in the Project area are ephemeral drainages which flow subsurface when they reach the valley alluvium. No artesian conditions are known to occur within the Project area.

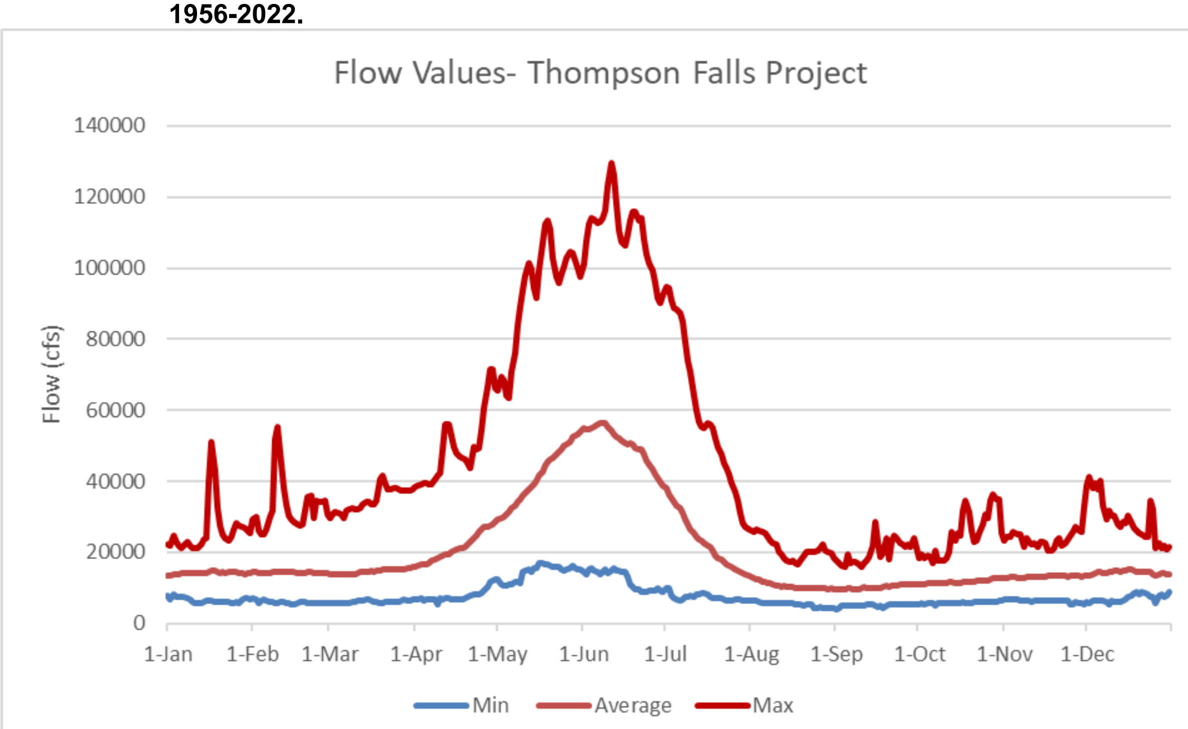
6.2 Affected Environment - Clark Fork River Flow

6.2.1 Adjusted Minimum, Mean, and Maximum Recorded Flows

The Clark Fork River is gaged near Plains, MT approximately 30 miles upstream of the Project. There is only one tributary with appreciable flow between the Plains gage station and the Project, the Thompson River. The Thompson River contributes on average 2.0 percent of the flow in the Clark Fork River with a range of 0.7 percent up to 5.4 percent. The USGS also maintains a gage on the Thompson River. Flow statistics were derived by combining USGS gages on Clark Fork River at Plains, Montana (USGS gage 12389000) with Thompson River near Thompson Falls (USGS gage 12389500), to calculate streamflow in Clark Fork River at the Project (**Figure 6-1**).

Mean daily streamflow data was recorded at the USGS gage on the Clark Fork River at Plains from October 1, 1910 to present. The Thompson River near Thompson Falls flow data was recorded from March 1 to September 29, 1911 and from April 1, 1956 to present. To ensure that the hydrograph is representative of current conditions, Figure 6-1 represents the minimum, maximum, and mean daily flows from April 1, 1956 to 2022. This period of record allows complete datasets for both USGS gages (Clark Fork River at Plains and Thompson River near Thompson Falls) to be analyzed and also provides representative data of upstream flows since the construction of upstream dams on the Flathead River.

Figure 6-1: Daily minimum, maximum, and mean streamflow at Thompson Falls Project, April 1, 1956-2022.



Source: USGS, Gage Stations 12389000 and 12389500

The ascending limb of the hydrograph begins between mid- and late March, peaks between late May and mid-June, and descends to base flow levels around mid-August (*refer to* Figure 6-1).

A summary of the minimum, maximum, and mean daily streamflow from the Clark Fork River at Plains and Thompson River near Thompson Falls gages combined for the most recent 5-year period (2018-2022) appears in **Table 6-1**. Minimum daily streamflow showed little variation, while both mean and maximum daily streamflow showed substantial variation. Mean daily flows were greater in 2018 and 2022 compared to the long-term average.

Mean daily streamflow in recent years ranged from 16,481 cfs (2021) to 25,467 cfs (2018) and maximum daily streamflow ranged from 59,229 cfs (2021) to 104,475 cfs (2018).

Table 6-1: Summary of estimated minimum, maximum, and mean daily mean streamflow at Thompson Falls Project for 2018, 2019, 2020, 2021, and 2022 and from historic 67-year data (1956-2022).

Year	Minimum Daily Streamflow (cfs)	Mean Daily Streamflow (cfs)	Maximum Daily Streamflow (cfs)
2018	7,895	25,467	104,475
2019	6,925	16,910	69,169
2020	7,577	19,712	79,778
2021	7,164	16,481	59,229
2022	6,685	20,880	84,312
1956-2022	**3,806** (1958)	**20,067**	**129,510** (1964)

Notes: cfs = cubic feet per second; Year of streamflow record in parentheses.
Source: USGS, Gage Stations (12389000 and 12389500).

Maximum daily streamflow data was recorded at 129,510 cfs on June 11, 1964, and the minimum daily streamflow for the period of record was 3,806 cfs on September 1, 1958. The average daily streamflow from 1956 to present was calculated from the combined streamflow data of the two recorded USGS gage data to be 20,067 cfs (*refer to* Table 6-1).

6.2.2 Monthly Flow Duration Curve

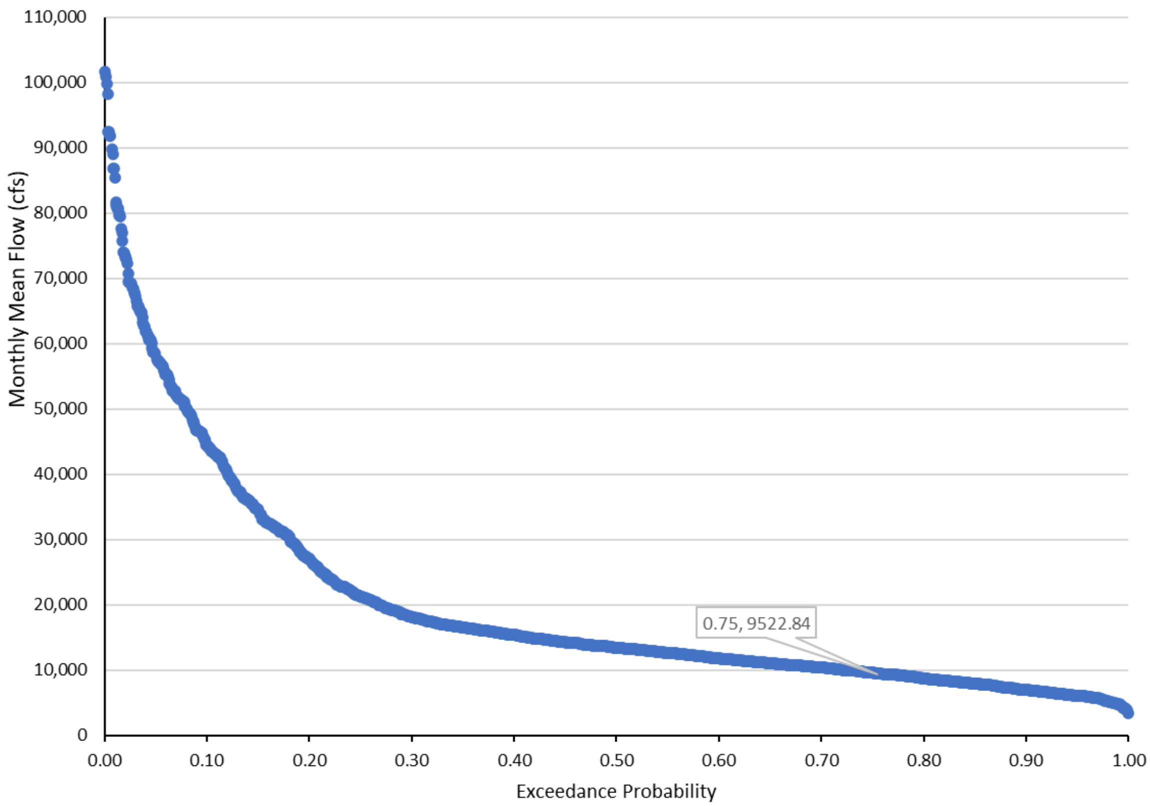
The monthly flow duration curve data[18] is from USGS gages on Clark Fork River at Plains, Montana (USGS gage 12389000) and Thompson River near Thompson Falls (USGS gage 12389500) combined (**Figure 6-2**).

The total capacity of the two powerhouses at Thompson Falls is approximately 23,320 cfs. River flow in excess of this amount is routed over the spillways. Typically, spill begins in late April,

[18] The flow-duration curve is a cumulative frequency curve that shows the percent of time specified discharges were equaled or exceeded during a given period. It combines in one curve the flow characteristics of a stream throughout the range of discharge, without regard to the sequence of occurrence. These curves are often used to predict the distribution of future flows.

peaks in early June, and ends in mid- July. Approximately 80 cfs is passed downstream of the Main Channel Dam Spillway during the fish passage season (March–October) to enhance operation of the fish passage facility and fish attraction flow. The minimum flow for the plant for power generation is 6,000 cfs or inflows to the plant, whichever is less.The typical operational range of the plant for power generation (6,000-23,320 cfs).

Figure 6-2: 3Monthly flow duration curve of the Clark Fork River at Thompson Falls Project from October 1911 – February 2023.



Source: USGS, Sum of Flow at Gage Stations 12389000 and 12389500, 2023

6.3 Affected Environment - Existing and Proposed Water Uses and Upstream and Downstream Requirements

The largest consumptive water use in the Clark Fork River basin is for irrigation, which accounts for about 93 percent of all diversions. The other 7 percent is a combination of public water supply, domestic, stock water use, and industrial. The largest consumption of water occurs in the agricultural areas of the Mission, Bitterroot, Upper Clark Fork, and Blackfoot valleys, upstream of the Project area (*refer to* **Figure 4-2**) (DNRC 2014).

Water use in the Clark Fork watershed upstream of Noxon, Montana indicates that 1,651,784 acre-feet of water is diverted to service the estimated 456,455 acres of irrigation. Only a portion of the water diverted for irrigation uses is consumed. The volume of water diverted from groundwater and surface water to meet the irrigation demands of crops is typically three times the actual volume of water consumed by the crop. This is due to conveyance losses, efficiencies of the irrigation method, and irrecoverable losses. Ultimately, a significant portion of diverted water is returned to the source via surface flows or groundwater. The timing of when the water is returned can vary greatly depending on location and local hydrogeologic conditions. On average during the irrigation season in the Clark Fork basin, 5 percent (448,685 acre-feet) of water is diverted and consumed, 13 percent (1,203,099 acre-feet) is diverted and not consumed, and 80 percent (7,079,909 acre-feet) is not diverted. Reservoir evaporation is 2 percent of water use (155,000 acre-feet) (DNRC 2014).

Hydropower generation and instream flow rights for fisheries are the primary non-consumptive water uses in the Clark Fork Basin. The largest water storage projects in the basin are for flood control and hydropower and include Hungry Horse, SKQ (upstream of the Project) and Noxon Rapids and Cabinet Gorge Dams (downstream of the Project) (DNRC 2014).

Instream flow water rights, temporary leases and storage contracts are used in the Clark Fork Basin for the purpose of fish and wildlife. FWP is the largest holder of water rights, leases and contracts for environmental uses. Conservation groups and private citizens also hold water rights, leases, and contracts for environmental uses (DNRC 2014).

Downstream of Thompson Falls, hydropower is the primary water use in the lower Clark Fork River.

6.4 Affected Environment - Existing Instream Flow Uses and Water Rights

NorthWestern holds eight water right claims from the Clark Fork River for power generation, totaling 30,967 cfs. Additionally, NorthWestern holds one water right claim for domestic use at the Project.

6.5 Affected Environment - Reservoir

The current Project boundary encompasses about 12 miles of river and reservoir which is 400 to 1,800 feet wide. Active storage capacity of the reservoir is approximately 15,000 acre-feet and the total storage is approximately 20,400 acre-feet. At the normal maximum reservoir level El. 2,396.5, the reservoir surface area is approximately 1,226 acres, not including the islands. The maximum depth of the reservoir is approximately 90 feet. Bathymetric maps of the reservoir are found in **Figures 6-4** through **6-9**.

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Figure 6-4: Bathymetric Map Thompson Falls Reservoir Sheet 1 of 6.

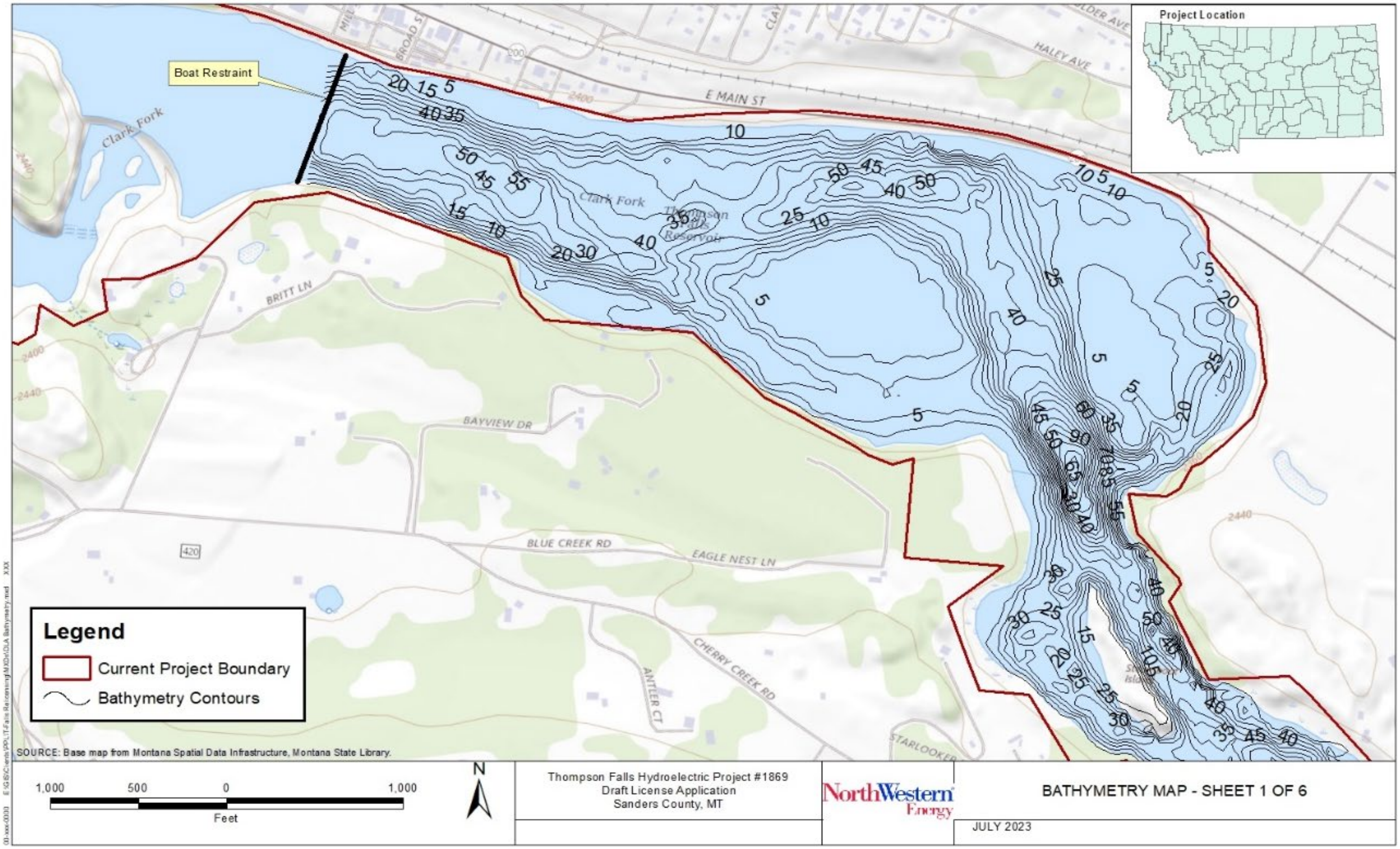


Figure 6-5: Bathymetric Map Thompson Falls Reservoir Sheet 2 of 6.

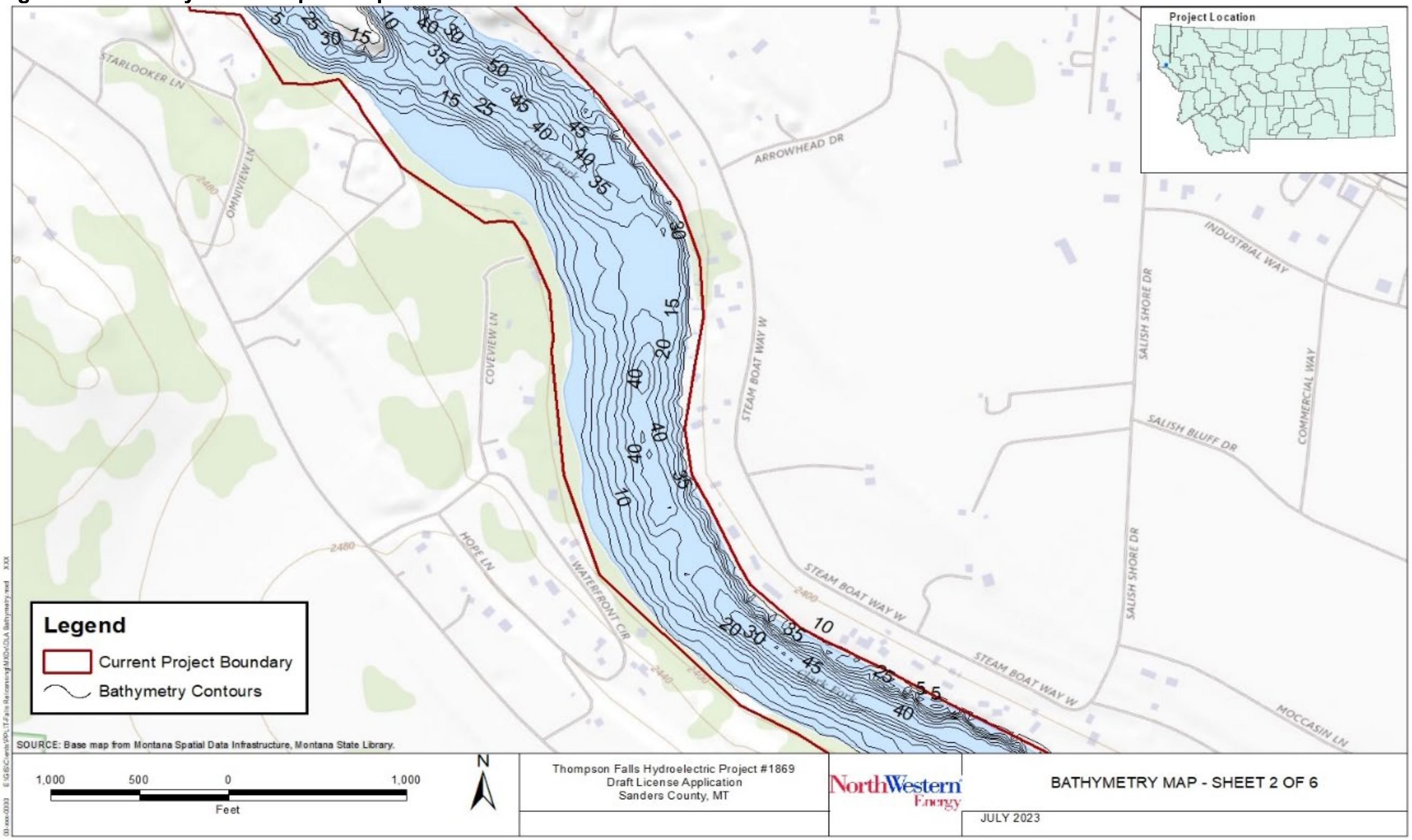


Figure 6-6: Bathymetric Map Thompson Falls Reservoir Sheet 3 of 6.

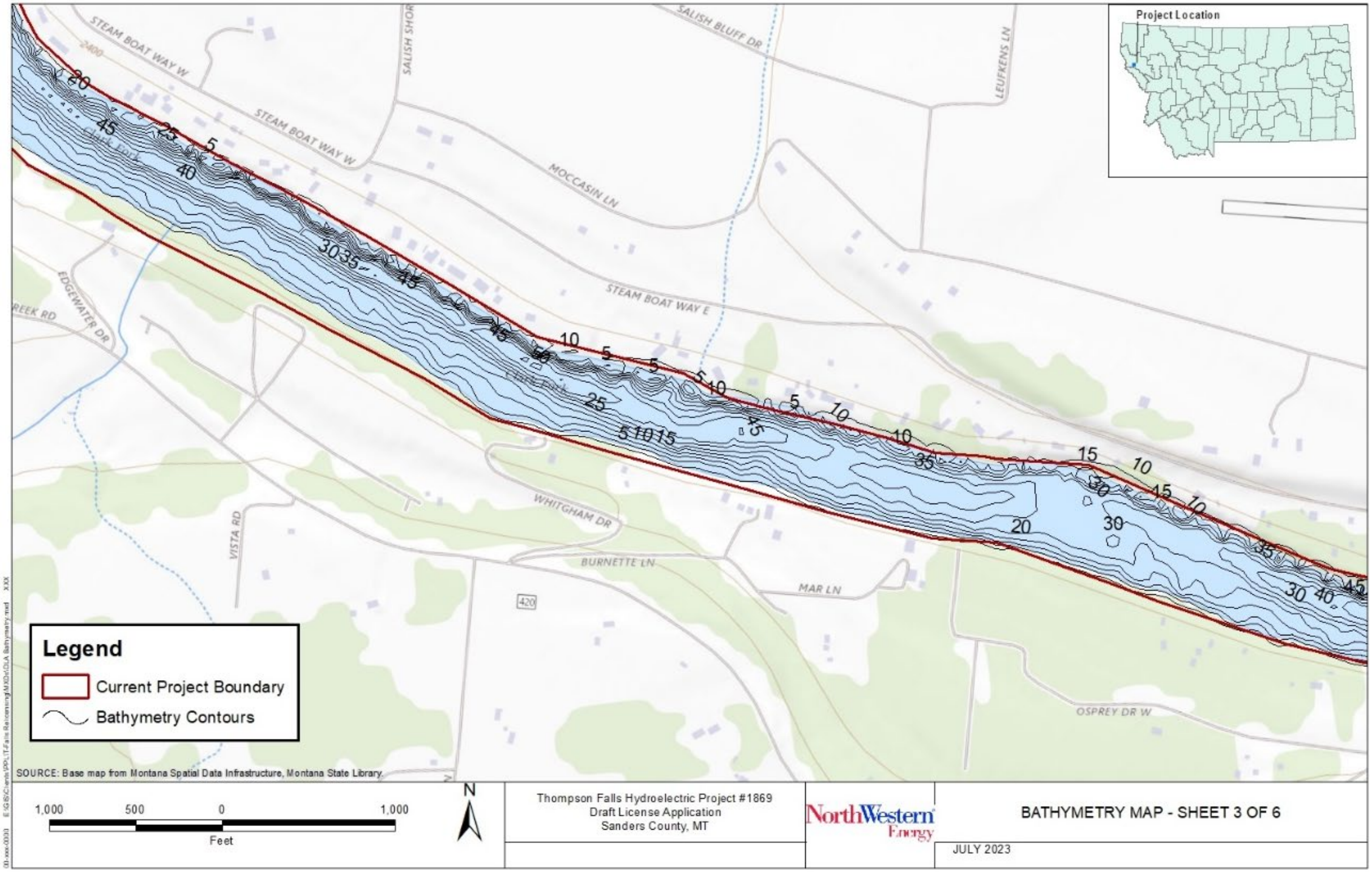


Figure 6-7: Bathymetric Map Thompson Falls Reservoir Sheet 4 of 6.

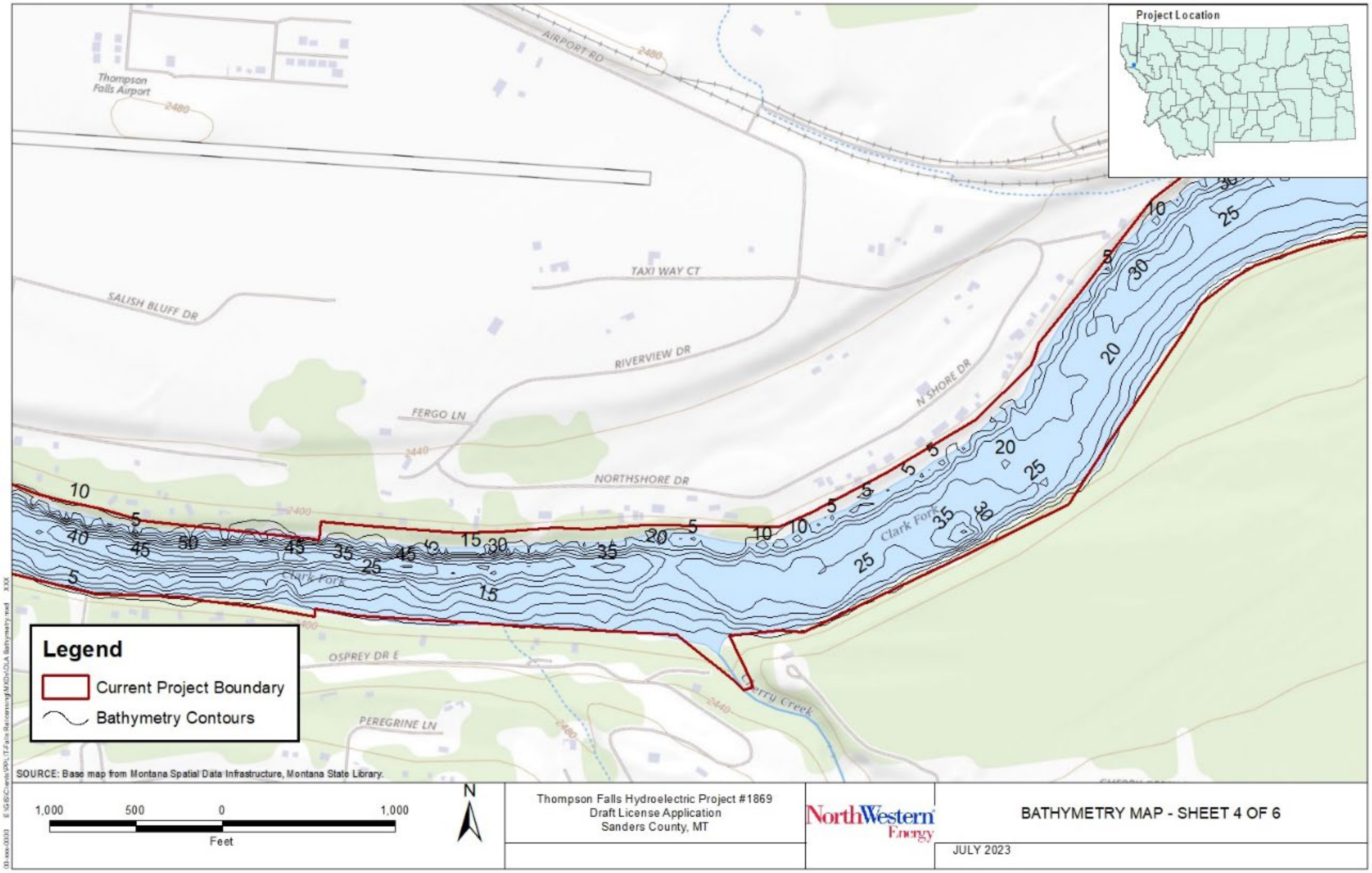


Figure 6-8: Bathymetric Map Thompson Falls Reservoir Sheet 5 of 6.

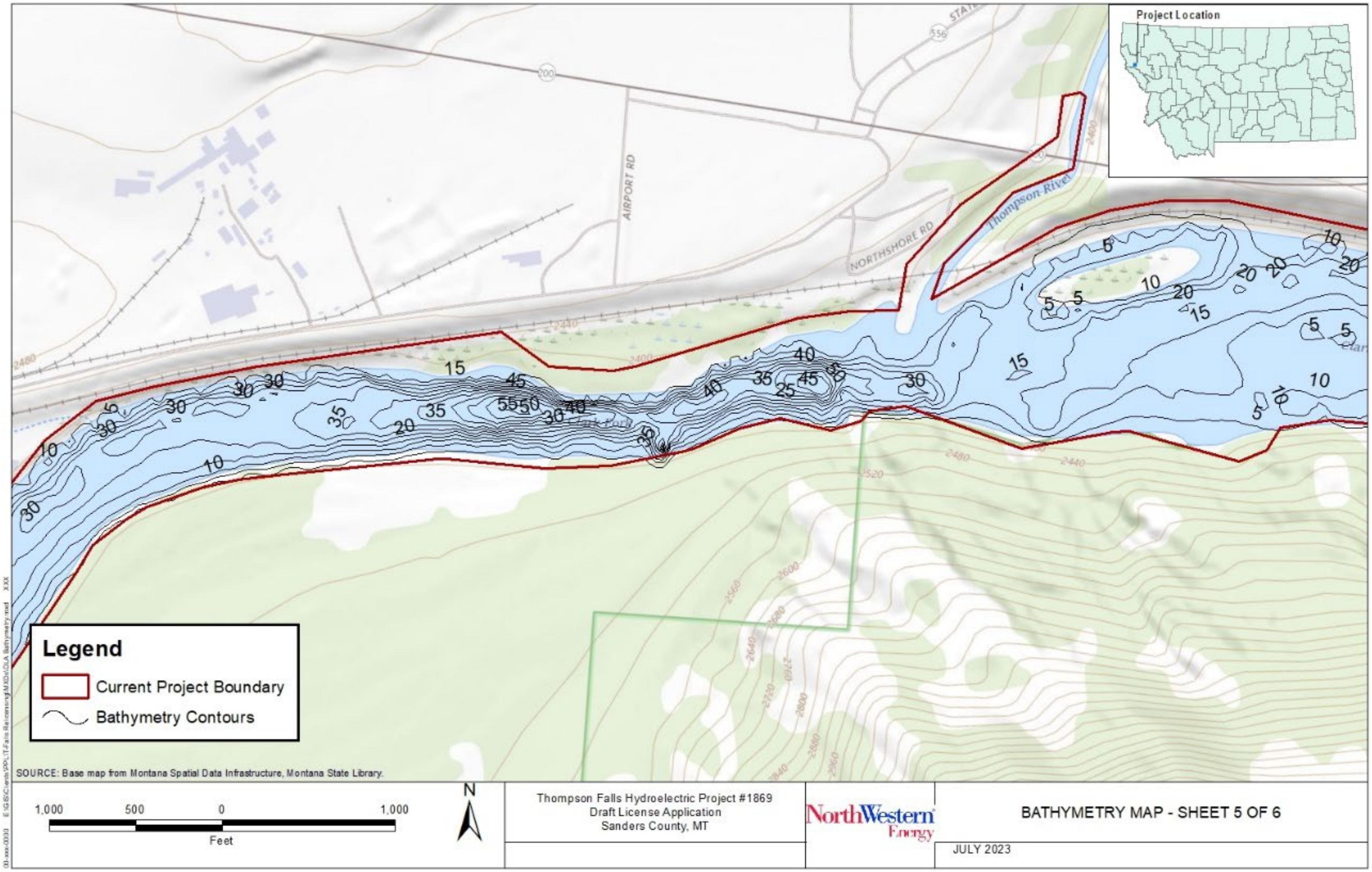
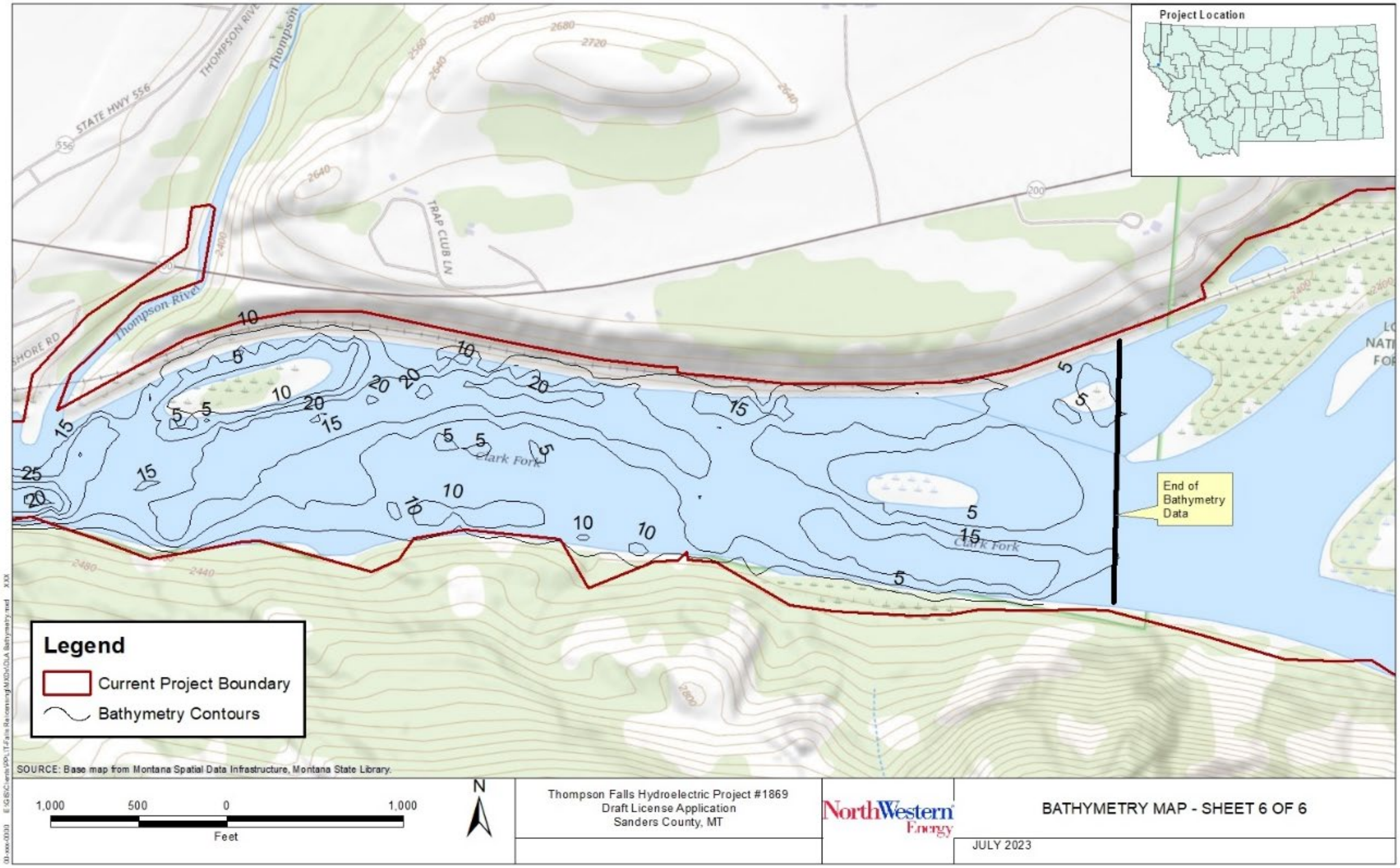
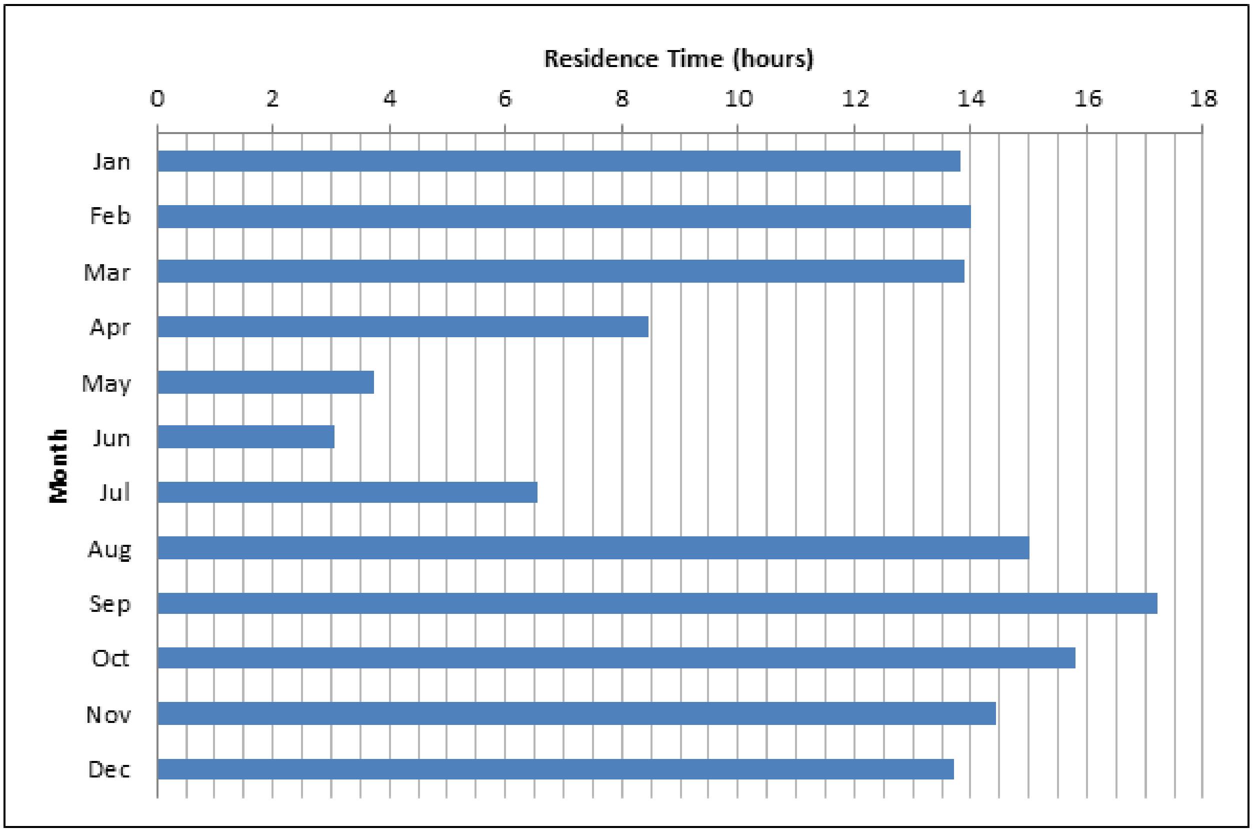


Figure 6-9: Bathymetric Map Thompson Falls Reservoir Sheet 6 of 6.



The monthly average residence time (flushing rate) is displayed in **Figure 6-10**. The results indicate that residence time in Thompson Falls Reservoir is very short, particularly in the spring when residence time is, on average, less than 4 hours. The residence time ranges from less than 4 hours (June) to approximately 17 hours (September).

Figure 6-10: Estimated average monthly residence time in Thompson Falls Reservoir.



6.6 Affected Environment - Reservoir Substrate

6.6.1 Substrate Composition

The substrates in Thompson Falls Reservoir include a combination of alluvial material and fine sediments from upstream sources, as well as several bedrock outcroppings. The upstream end of the reservoir is more riverine in nature with the south shore bring dominated by large bedrock outcroppings. The middle section of the reservoir is fairly homogeneous and riverine, while the lower reservoir contains two large bedrock islands and depositional areas of fine sediment.

6.6.2 Substrate Quality

In Montana there are 17 U.S. Environmental Protection Agency (EPA) Superfund National Priorities List (NPL) sites (EPA 2018a). Five NPL sites are located upstream of Thompson Falls Dam including one NPL site, Anaconda Aluminum Co. Columbia Falls Reduction Plan (listed in September 2016) located along the Flathead River in Columbia Falls, Montana and four sites located along or near tributaries to the Clark Fork River. The four NPL sites located in the Clark Fork River basin include Milltown Reservoir Sediments located at the former Milltown Dam upstream of Missoula (listed in 1983), Anaconda Co. Smelter in Anaconda (listed in 1983), Silver Bow Creek/Butte Area (listed in 1983), and Montana Pole and Treating in Butte (listed in 1987). Details of these NPL sites are available on the EPA's Superfund NPL site: https://www.epa.gov/superfund/national-priorities-list-npl-sites-state#MT.

In addition to the NPL sites, the Smurfit-Stone Frenchtown Mill site is proposed for NPL listing and is located adjacent to the Clark Fork River near Frenchtown, Montana which is about 111 miles upstream of the Project. The Smurfit-Stone Mill site was a former pulp and paper mill site that operated from 1957 to 2010. This site is being actively investigated and monitored, and details are available on the EPA's Superfund site for Smurfit-Stone Mill Frenchtown: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0802850.

Although the Project is over 100 miles downstream, before Milltown Dam was removed as part of the remediation of the Milltown Dam Sediments' NPL site, sediment quality (arsenic and copper) in Thompson Falls Reservoir was characterized in May 2006 to establish a baseline. Characterization of the sediment concluded that sediment in the Thompson Falls Reservoir was not of concern for human or ecological receptors (HDR 2008).

Following the Baseline Study, sediment traps were established in locations where hydraulic conditions were conducive to sedimentation. The sediment traps were used to monitor the effects of remedial work at the Milltown Site on metal concentrations in sediments transported to Thompson Falls Reservoir. Samples of total arsenic, cadmium, copper, lead, and zinc were analyzed. Results showed all metal concentrations increased and remained elevated after the 2007 spring runoff event and through the end of 2007, except for arsenic (HDR 2008). The average concentrations in Thompson Falls Reservoir sediment trap samples from the four sampling events between May and October 2007 was 14 milligrams per kilogram (mg/kg) of arsenic and 195 mg/kg of copper (HDR 2008).

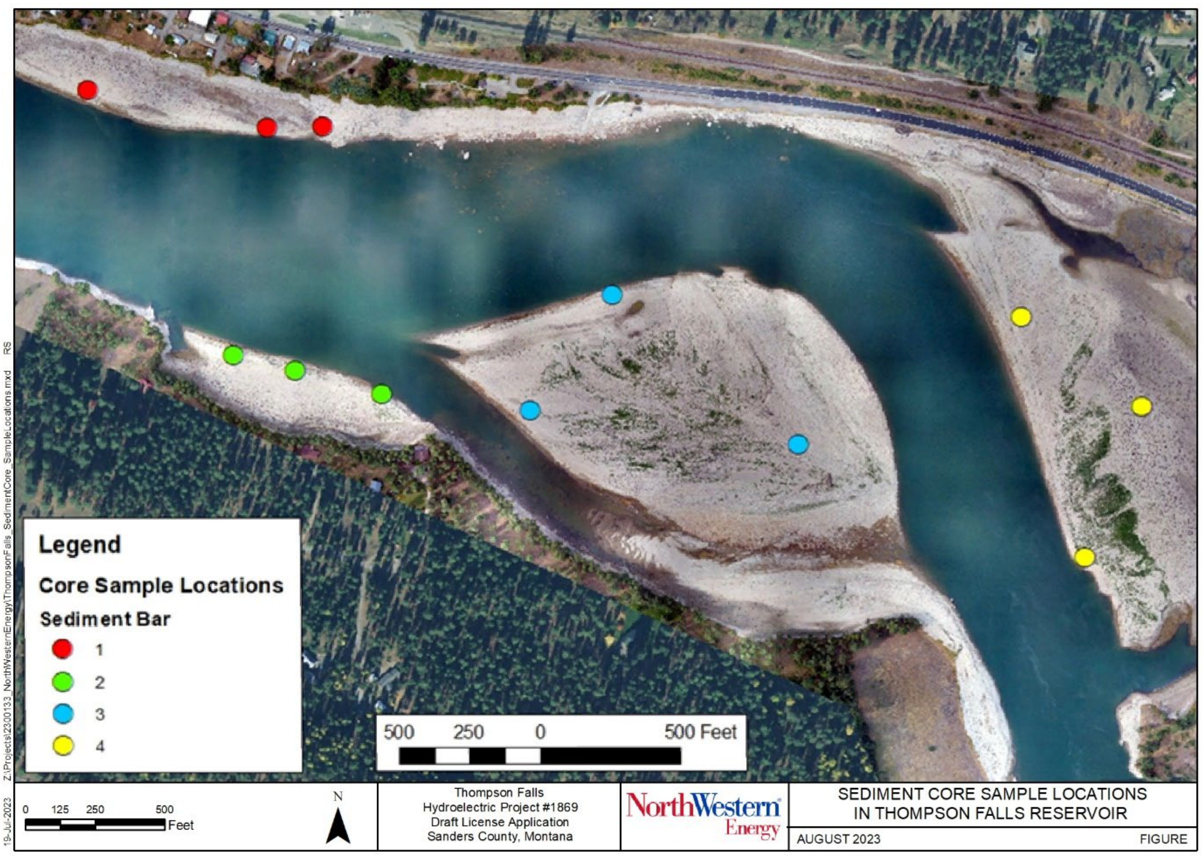
Surface water chemical data (arsenic, copper, lead, and zinc) collected on June 20, 2007, around the Milltown work area were used along with USGS flow data to perform a mass balance resulting in an estimate of metal loading originating from the Milltown Reservoir (HDR 2008). The results suggest a significant portion of metal load measured below Milltown Dam originated from the Milltown Reservoir on the sampling day, June 20, 2007. This evidence indicates that the increases in contaminant concentrations observed in the Thompson Falls Reservoir sediment result from the Milltown remediation.

Sediment sampling conducted after 2007 showed a spike in metal concentrations in sediment in Thompson Falls Reservoir in spring/summer of 2008, just after the breaching of Milltown Dam. Subsequent sediment sampling found that the concentration of metals arriving at the Thompson Falls Reservoir steadily decreased and eventually returned to at or near baseline conditions (unpublished file data maintained by NorthWestern).

In 2020, sediment sampling was conducted in Thompson Falls Reservoir (NorthWestern 2022a). Four sediment bars were sampled in the lower portion of the reservoir using a core sampler to characterize the sediment in the lower reservoir. The reservoir was lowered 1 foot from normal full pool level that day to assist in accessing the sediment deposits via boat, and an attempt was made to sample the maximum possible depth of sediment at each location. Sediment sample depths were generally limited by substrate hardness and composition. Each sediment bar was sampled at three locations and those three samples were composited into one representative sample for each sediment bar, which were analyzed by Energy Laboratories and Pace Analytical for Metals, PCBs, and Dioxins.

Figure 6-11 is a map showing the locations of each core sample from the lower reservoir in relation to the City. The aerial imagery in Figure 6-11 is from 2018 when the reservoir elevation was down to replace the stanchions on the dam and is not representative of the day that these samples were collected. This imagery was selected to show the extent of the sediment deposits in the lower reservoir. Under normal full-pool reservoir elevations the locations of these sample sites are underwater.

Figure 6-11: Sediment core sample locations in Thompson Falls Reservoir on 7/13/20.



Analytical results from the sediment core samples are shown in **Table 6-2** through **Table 6-4**, below. Table 6-2 shows the results of the Toxicity Characteristic Leaching Procedure (TCLP) metals analysis for each composite sample. TCLP is an analysis used to determine the potential for the leaching of a toxic substance from soil particles and is useful in understanding the toxic risk associated with a particular sediment sample. All sample results reported were below detectable levels for TCLP metals.

Table 6-2: TCLP metals analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20. Metals TCLP Extractable (mg/L).

Sediment Bar Sample	Mercury	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver
Bar 1	ND	ND	ND	ND	ND	ND	ND	ND
Bar 2	ND	ND	ND	ND	ND	ND	ND	ND
Bar 3	ND	ND	ND	ND	ND	ND	ND	ND
Bar 4	ND	ND	ND	ND	ND	ND	ND	ND

Notes: mg/L = milligrams per liter; ND = that the sample result was not found at a detectable concentration; TCLP = Toxicity Characteristic Leaching Procedure

Table 6-3 shows the results from the Polychlorinated Biphenyl (PCB) analysis conducted on each composite sediment sample. All samples were reported to be at non-detectable levels for PCBs.

Table 6-3: PCB analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20.

Polychlorinated Biphenyls (PCBs) (mg/kg-Dry)									
Sediment Bar Sample	**Arochlor 1016**	**Arochlor 1221**	**Arochlor 1232**	**Arochlor 1242**	**Arochlor 1248**	**Arochlor 1254**	**Arochlor 1260**	**Arochlor 1262**	**Arochlor 1268**
Bar 1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 4	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes: mg/kg-Dry = milligrams per kilogram dry weight; ND = that the sample result was not found at a detectable concentration

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Each sample was also analyzed for dioxins, which are a group of toxic compounds that are generally found to originate from industrial activities. The two dioxin compounds of concern are 1,2,3,7,8,9 HxCDD[19] and 2,3,7,8-TCDD[20], with 2,3,7,8-TCDD being the most toxic compound. Sample analysis results for both 1,2,3,7,8,9-HxCDD and 2,3,7,8-TCDD were at non-detectable levels (**Table 6-4**) for all samples.

Since 2,3,7,8-TCDD is the most toxic dioxin compound, all other remaining dioxins are grouped together and a total equivalence (TEQ) to 2,3,7,8-TCDD is calculated. For example, if a particular dioxin compound is 10 percent as toxic as 2,3,7,8-TCDD, then the measured concentration of that compound in nanograms per kilogram (ng/kg) is weighted by a factor of 0.1 and that number is added to the calculated toxic equivalencies of the other remaining dioxin compounds to calculate the overall TEQ for the sample.

The TEQ is used as a way to look at the combined toxicity of the remaining dioxin compounds, since all have varying levels of toxicity. The TEQ calculations for each composite sample were calculated by Pace Analytical, and the results can be found in Table 6-4. TEQ results for each composite sediment sample were well below the TEQ screening level of 22 ng/kg.

Table 6-4: Dioxin analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20.

Dioxin Screening (ng/kg)			
Sediment Bar Sample	**1,2,3,7,8,9-HxCDD**	**2,3,7,8-TCDD**	**TEQ**
Screening Level	*470*	*22*	*22*
Bar 1	ND	ND	0.52
Bar 2	ND	ND	0.59
Bar 3	ND	ND	0.51
Bar 4	ND	ND	0.57

Notes: HxCDD = Hexachlorodibenzo-p-dioxin; ND = the sample result was not found at a detectable concentration; ng/kg = nanograms per kilogram; TCDD = Tetrachlorodibenzo-p-dioxin; TEQ = (Total 2,3,7,8-TCDD Equivalence) calculated by Pace Analytical

Based on the analytical results of the sediment core samples collected from the lower portion of Thompson Falls Reservoir on July 13, 2020, there does not appear to be any indication of toxicity related to the sediment collected at these sites. The sampling locations and core depths were representative of sediment deposits in the lower reservoir that might either be exposed and/or mobilized during normal reservoir operations.

6.7 Affected Environment – Water Quality

Under Montana Code Annotated 75-5-301 et. seq. the Montana DEQ establishes classification of all state waters in accord with their present and future most beneficial uses. The Clark Fork River at the Thompson Falls Project is classified as B-1 in the Administrative Rules of Montana

[19] Hexachlorodibenzo-p-dioxin
[20] Tetrachlorodibenzo-p-dioxin

(ARM 17.30.607) implemented by the Montana DEQ. Waters classified B-1 are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply.

Montana's Surface Water Quality Standards and Procedures includes language specific to dams. ARM 17.30.602 defines "naturally occurring" as "conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Conditions resulting from the reasonable operation of dams in existence as of July 1, 1971, are natural." ARM 17.30.636 (1) states that owners and operators of water impoundments that cause conditions harmful to prescribed beneficial uses of state water shall demonstrate to the satisfaction of the department that continued operations will be done in the best practicable manner to minimize harmful effects.

Montana's water quality standards include numeric and narrative criteria as well as non-degradation policy that applies to any activity of humans resulting in a change in existing water quality occurring on or after April 29, 1993. The numeric surface water quality standards were developed for numerous parameters to protect human health and aquatic life and are located in the Circular DEQ-7 (Montana DEQ 2019). The acute and chronic freshwater aquatic life and human health standards for certain metals are included in **Table 6-5**.

Table 6-5: 6Summary of acute and chronic freshwater aquatic life and human health standards for metals (in *ug*/L).

Metals	Aquatic Life Standards		Human Health Standards	
	Acute	Chronic	Surface Water	Ground Water
Aluminum	750	87	-	-
Arsenic	340	150	10	10
Cadmium	0.49*	0.25*	5	5
Chromium (III)	579*	27.7*	100	100
Chromium (IV)	16	11	-	-
Copper	3.79*	2.85*	1,300	1,300
Iron	-	1000	-	-
Lead	13.98*	0.545*	15	15
Mercury	1.7	0.91	0.05	2
Nickel	145*	16.1*	100	100
Selenium	20	5	50	50
Silver	0.374*	-	100	100
Zinc	37*	37*	7,400	2,000

Notes: * Metals are expressed as a function of total hardness (mg/L, $CaCO_3$); table values were calculated using a total hardness of 25 mg/L; *ug*/L = micrograms per litre;

CaCO3 = Calcium carbonate; dash [-] = the lack of a standard; mg/L = milligrams per liter
Source: Montana DEQ 2019.

The Montana DEQ Department Circular DEQ-12A contains the base numeric nutrient standards and their implementation (Montana DEQ 2014). Nutrient standards, including total nitrogen (TN) and phosphorus for the Clark Fork River downstream of the Flathead River confluence, have not been developed, so the narrative standard in ARM 17.30.637(1)(e) applies. The narrative standard states, "…surface waters must be free from substances attributable to municipal, industrial, agricultural practices or other discharges that will create conditions which produce undesirable aquatic life" (Montana DEQ 2019). For reference, the numeric nutrient standards for the Clark Fork River from the confluence of the Blackfoot River to the confluence of the Flathead River (upstream of the Project area) are as follows: Total Phosphorus = 39 micrograms per litre (*ug*/L), Total Nitrogen = 300 *ug*/L, Chlorophyll-a = 100 milligrams per meter squared (mg/m^2)(summer mean) and 150 mg/m^2 (maximum). These standards apply seasonally from June 21 to September 21 (ARM 17.30.631(2)(b)).

Numeric nutrient standards for wadeable streams like the Thompson River were developed based on Ecoregion, and for the Northern Rockies Ecoregion, the following nutrient standards apply: Total Phosphorus = 25 *u*g/L, Total Nitrogen = 275 *u*g/L, Chlorophyll-a = 125 mg/m^2 (Montana DEQ 2014). There is not currently a numeric nutrient standard for Nitrate+Nitrite, but Montana DEQ recommends using a Nitrate+Nitrite concentration of 100 *ug*/L for a water quality target in wadeable streams (Montana DEQ 2013).

For waters classified as B-1, a 1ºF maximum increase above naturally occurring water temperature is allowed within the range of 32 to 66 ºF; within the naturally occurring range of 66º to 66.5 ºF, no discharge is allowed which will cause the water temperature to exceed 67 ºF; and where the naturally occurring water temperature is 66.5 °F or greater, the maximum allowable increase in water temperature is 0.5 °F. A 2 °F per-hour maximum decrease below naturally occurring water temperature is allowed when the water temperature is above 55 ºF. A 2 °F maximum decrease below naturally occurring water temperature is allowed within the range of 55 to 32 °F (ARM 17.30.623(e)).

The freshwater aquatic life standards for dissolved oxygen (DO) for the Clark Fork River at the Thompson Falls Project are presented in **Table 6-7** (Montana DEQ 2017). The early life stage water column concentrations are the concentrations recommended to achieve the required inter-gravel DO concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the numerical values in the parentheses apply. Early life stages include all embryonic and larval stages and all juvenile fish for 30 days following hatching. Note that early life stages in the vicinity of the Thompson Falls Project are found in the water column, therefore the relevant standards for "Early Life Stages" (**Table 6-7**) are those that are in parentheses.

Table 6-7: Freshwater aquatic life standards for Dissolved Oxygen (mg/L) for the Clark Fork River around the Thompson Falls Project.

	Early Life Stages[1,2]	Other Life Stages
30 Day Mean	N/A[3]	6.5
7 Day Mean	9.5 (6.5)	N/A[3]
7 Day Mean Minimum	N/A[3]	5.0
1 Day Minimum[4]	8.0 (5.0)	4.0

Notes: [1] These are water column concentrations recommended to achieve the required inter-gravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column, the numerical values in parentheses apply.
[2] Includes all embryonic and larval stages and all juvenile forms of fish for 30 days following hatching.
[3] N/A = not applicable
[4] All minima should be considered as instantaneous concentration to be achieved at all times.
Source: Montana DEQ 2019

Montana Water Quality Standards Circular DEQ-7 (Montana DEQ 2019) sets a standard of 110 percent of saturation for total dissolved gas (TDG) in the Clark Fork River near the Project. This water quality standard was developed to protect fish from high levels of TDG, which may cause Gas Bubble Trauma (GBT). ARM 17.30.637(7) also includes a TDG standard, "no pollutants may be discharged, and no activities may be conducted which, either alone or in combination with other wastes or activities, result in the total dissolved gas pressure relative to the water surface exceeding 110 percent of saturation."

The water quality standard for *Escherichia coli* bacteria (E-coli) varies according to season.

> From April 1 through October 31, the geometric mean number of E-coli may not exceed 126 colony forming units per 100 milliliters and 10 percent of the total samples may not exceed 252 colony forming units per 100 milliliters during any 30-day period. Additionally, from November 1 through March 31, the geometric mean number of E-coli may not exceed 630 colony forming units per 100 milliliters and 10 percent of the samples may not exceed 1,260 colony forming units per 100 milliliters during any 30-day period (ARM 17.30.623(a)).

The maximum allowable increase above naturally occurring turbidity is 5 nephelometric turbidity units (NTU) except as permitted in 75-5-318, MCA (ARM 17.30.623(d)).

Montana's standard restrictions on induced variation of hydrogen ion concentration (pH) within the range of 6.5 to 8.5 must be less than 0.5 pH. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0 (ARM 17.30.623(c)).

There is to be no increase of concentrations of sediment or suspended sediment, settable solids, oils, or floating solids above naturally occurring concentrations (ARM 17.30.623(f)). The color cannot be increased more than five color units about the naturally occurring[21] color (ARM 17.30.623(g)). Concentrations of carcinogenic, bioconcentrating, toxic, radioactive, nutrient, or harmful parameters may not exceed the applicable standards set forth in the 2017 DEQ-7, unless a nutrient standards variance has been granted in the Department Circular DEQ-12A (ARM 17.30.623(h)).

6.7.1 Water Chemistry

6.7.1.1 Water Chemistry Methods

Water chemistry was monitored at nine sites in and around the Project from 2019 through 2021 (**Figure 6-12**). These nine sites included four recurring monitoring sites on the Clark Fork River, three additional sites downstream of Project infrastructure for source assessment purposes, and two tributary sites. The tributary monitoring sites were located on the Thompson River, which enters Thompson Falls Reservoir near the upstream end of the Project, and Prospect Creek, which enters the Clark Fork River downstream of Project infrastructure.

The water quality sampling consisted of the collection of either single point depth integrated samples, or depth integrated equal width increment composites at each monitoring location. Grab samples were collected from the bank in a well-mixed portion of the river, or from a bridge at equal width increments and composited in a Teflon churn splitter. The sampling methodology and quality assurance/quality control conforms to current standard operating procedures used by the Montana DEQ (Makarowski 2019).

Table 6-8 includes a description of the purpose, methods, and parameters measured at each of the water chemistry monitoring sites. For further details of the sampling methodology, refer to **Appendix A – Water Quality Monitoring Report**.

[21] As stated above, "Naturally occurring" means conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied…Conditions resulting from the reasonable operation of dams in existence as of July 1, 1971, are natural (ARM 17.30.602(17)).

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Figure 6-12: Map showing locations of the Thompson Falls water quality monitoring sites.

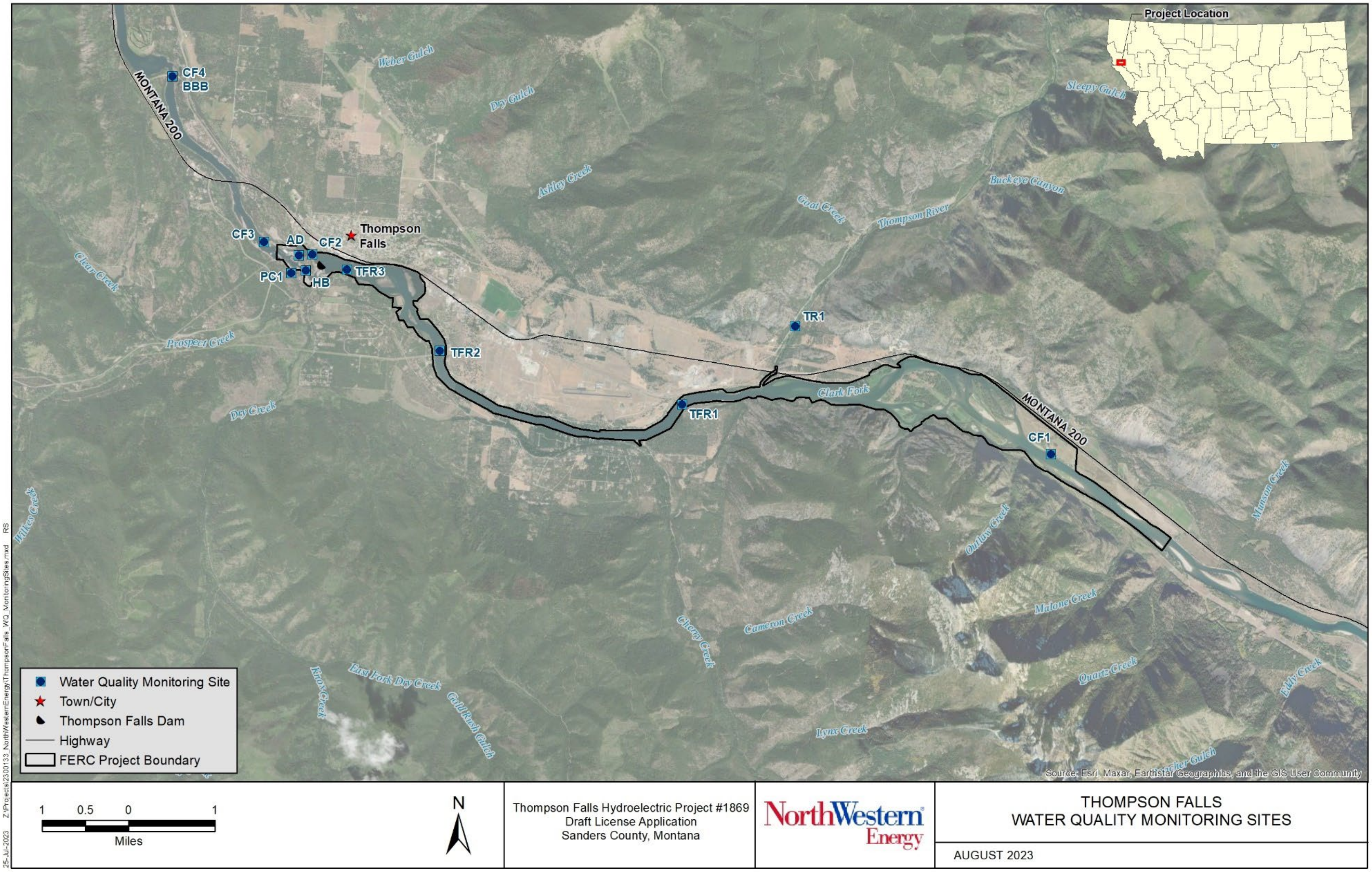

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Table 6-8: Description of purpose, methods, and parameters measured at water chemistry monitoring sites.

Site Name	Site Purpose	Sampling Method	Analyte Groups
CF1	Incoming water quality to the Project	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature, Chlorophyll-*a*
CF2	Water quality leaving the reservoir, upstream of the powerhouses	Equal width increment composite sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature
CF3	Water quality downstream of the old powerhouse	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature, Chlorophyll-*a*
CF3.1	Water quality downstream of the new powerhouse (Metals source assessment)	Single point grab sample	Metals
CF3.2	Water quality near the HWY 200 bridge (Metals source assessment)	Single point grab sample	Metals
CF3.3	Water quality near Thompson Falls State Park (Metals source assessment)	Single point grab sample	Metals
CF4	Water quality leaving the Project	Equal width increment composite sample, Hydrolab HL7 Sonde	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature
TR1	Water quality of the Thompson River	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature
PC1	Water quality of Prospect Creek	Single point grab sample, Hydrolab HL7 Sonde	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters

Water Chemistry Monitoring Results

6.7.1.1.1 Nutrients

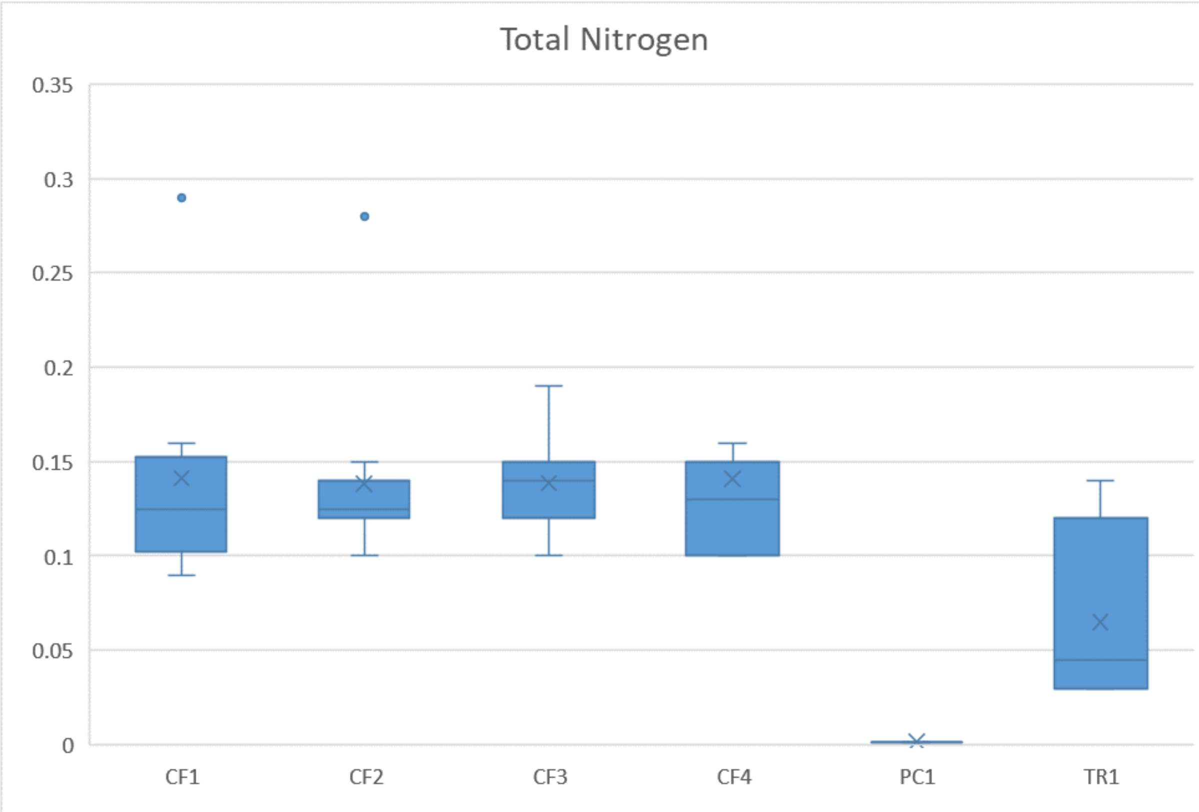
Nutrients within the Thompson Falls Project are generally low in concentration, which is reflected in both the water chemistry data as well as the biological data. Water chemistry samples were collected throughout the year, so nutrient concentrations may reflect conditions outside of the summertime window of July 1 through September 1 when most of the biological growth is occurring in the waterbody. Outside of this summertime window, nutrient concentrations in the water column are typically higher because they are not being consumed by biological growth as readily.

Total Nitrogen

Total nitrogen (TN) concentrations remain consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), but are lower at the two tributary monitoring sites (PC1 and TR1)

(**Figure 6-13**). There are relatively few nitrogen inputs between the upstream end of the Project boundary (CF1) and the upstream end of Noxon Reservoir (CF4), which is reflected in the data.

Figure 6-13: Total nitrogen concentrations across all water quality monitoring sites (in mg/L).

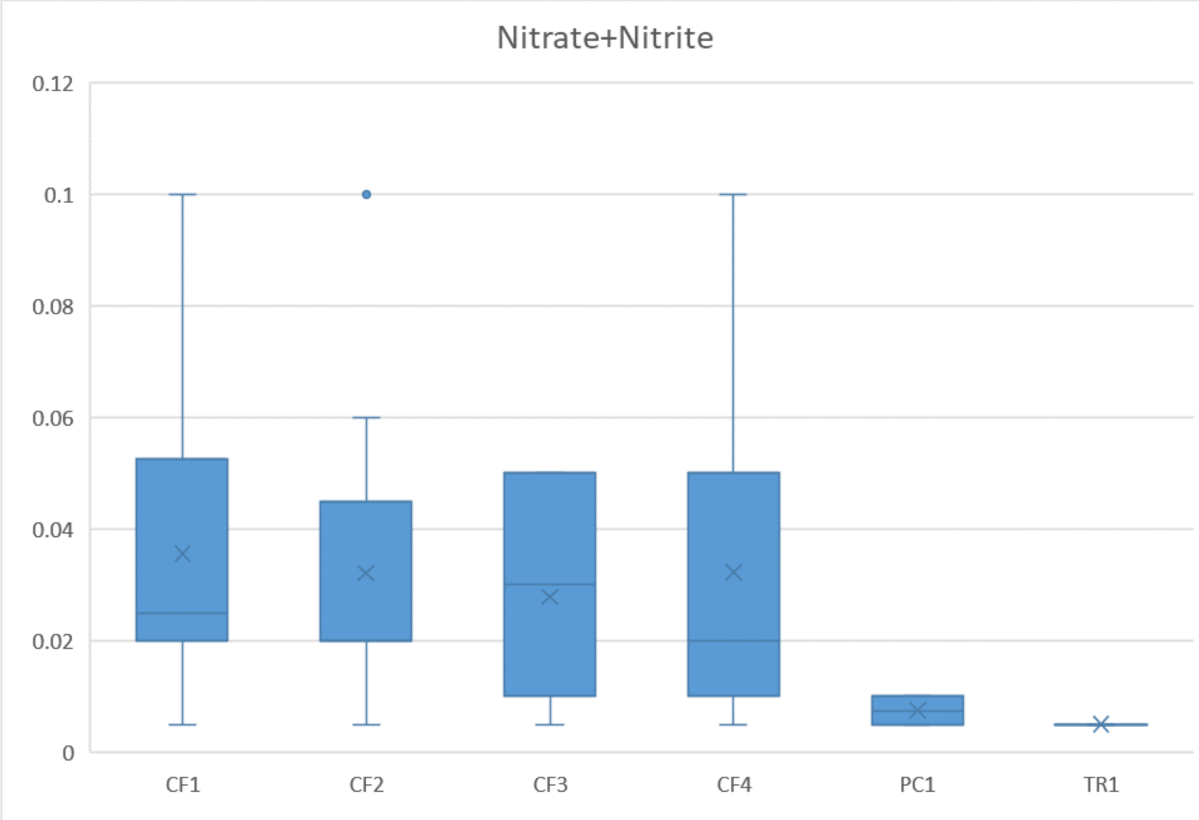


Note: mg/L =milligrams per liter

Nitrate+Nitrite

Nitrate+Nitrite (NO_3+NO_2) concentrations show a similar pattern to TN concentrations, with little to no change across the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4). As with TN, the tributary sites (PC1 and TR1) also showed lower concentrations of NO_3+NO_2. **Figure 6-14** below shows the NO_3+NO_2 concentrations across all monitoring sites.

Figure 6-14: Nitrate+Nitrite concentrations across all water quality monitoring sites (in mg/L).

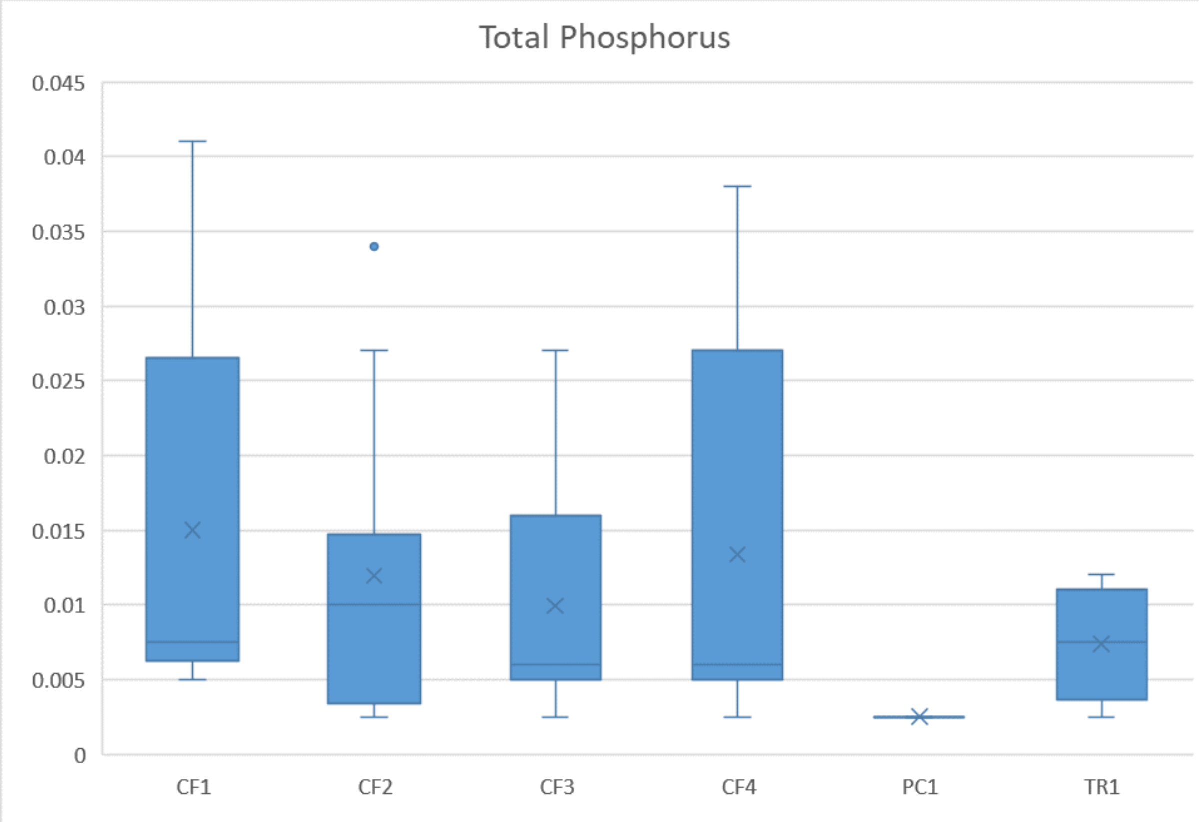


Note: mg/L =milligrams per liter

Total Phosphorus

Total phosphorus (TP) concentrations follow a similar pattern to TN and NO_3+NO_2 concentrations across the Project. The lowest TP concentrations on the Clark Fork sites (CF1, CF2, CF3, and CF4) were found at sites CF2 and CF3, which are located just upstream and downstream of the dams and powerhouses respectively (**Figure 6-15**). Phosphorus has a tendency to bind tightly to soil particles, many of which settle out in the reservoir, which would explain the slightly lower TP concentrations found at sites CF2 and CF3 as compared to site CF1, which is located at the upstream end of the reservoir. As with TN and NO_3+NO_2, the concentrations of TP were found to be lower at the tributary sites (PC1 and TR1) than at the Clark Fork sites.

Figure 6-15: Total phosphorus concentrations across all water quality monitoring sites (in mg/L).

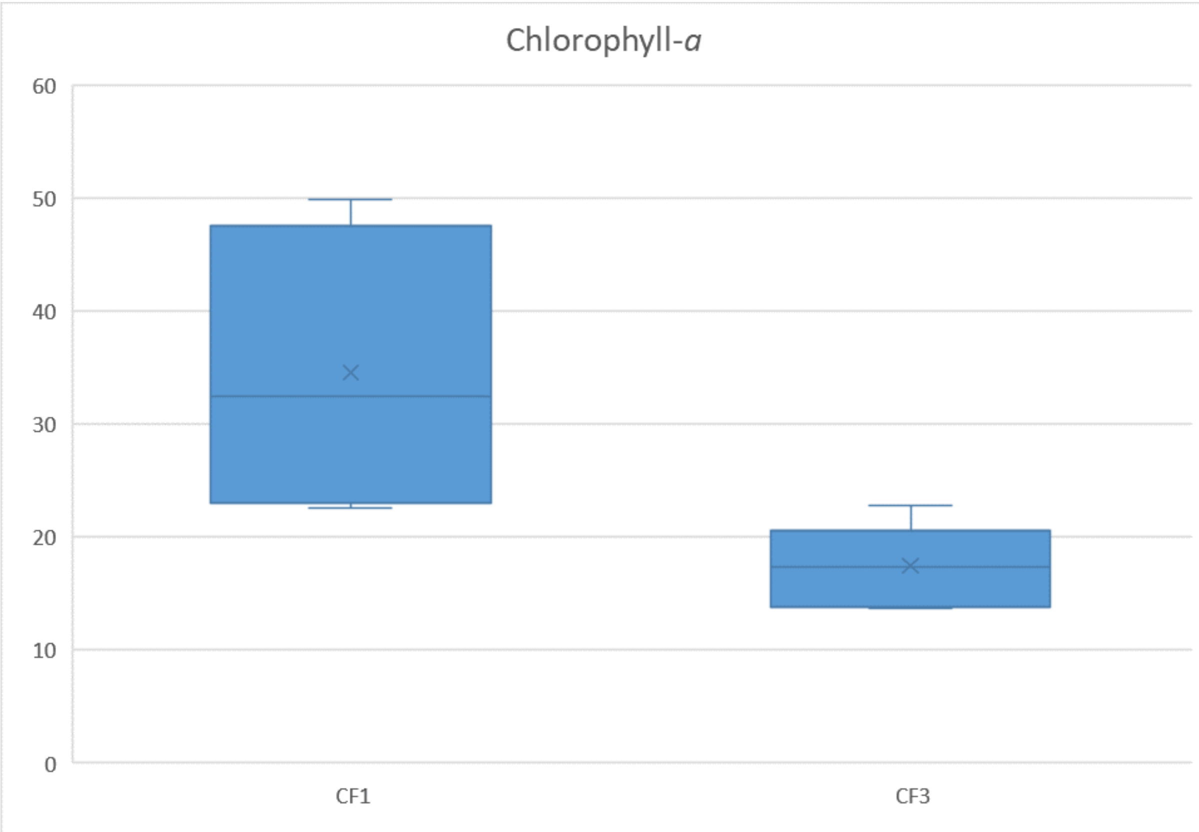


Note: mg/L =milligrams per liter

Chlorophyll-a

Chlorophyll-*a* samples were collected at two locations in 2019; site CF1 to represent conditions upstream of Thompson Falls Reservoir and site CF3 to represent conditions downstream of Thompson Falls Reservoir. Upstream chlorophyll-*a* concentrations were found to be higher at site CF1 versus the downstream chlorophyll-*a* concentrations at site CF3 (**Figure 6-16**). This likely indicates that some nutrient uptake and attenuation is occurring in Thompson Falls Reservoir, and therefore less nutrients are available downstream to be consumed by phytoplankton.

Figure 6-16: Chlorophyll-*a* concentrations upstream and downstream of Thompson Falls Reservoir (in mg/m²).



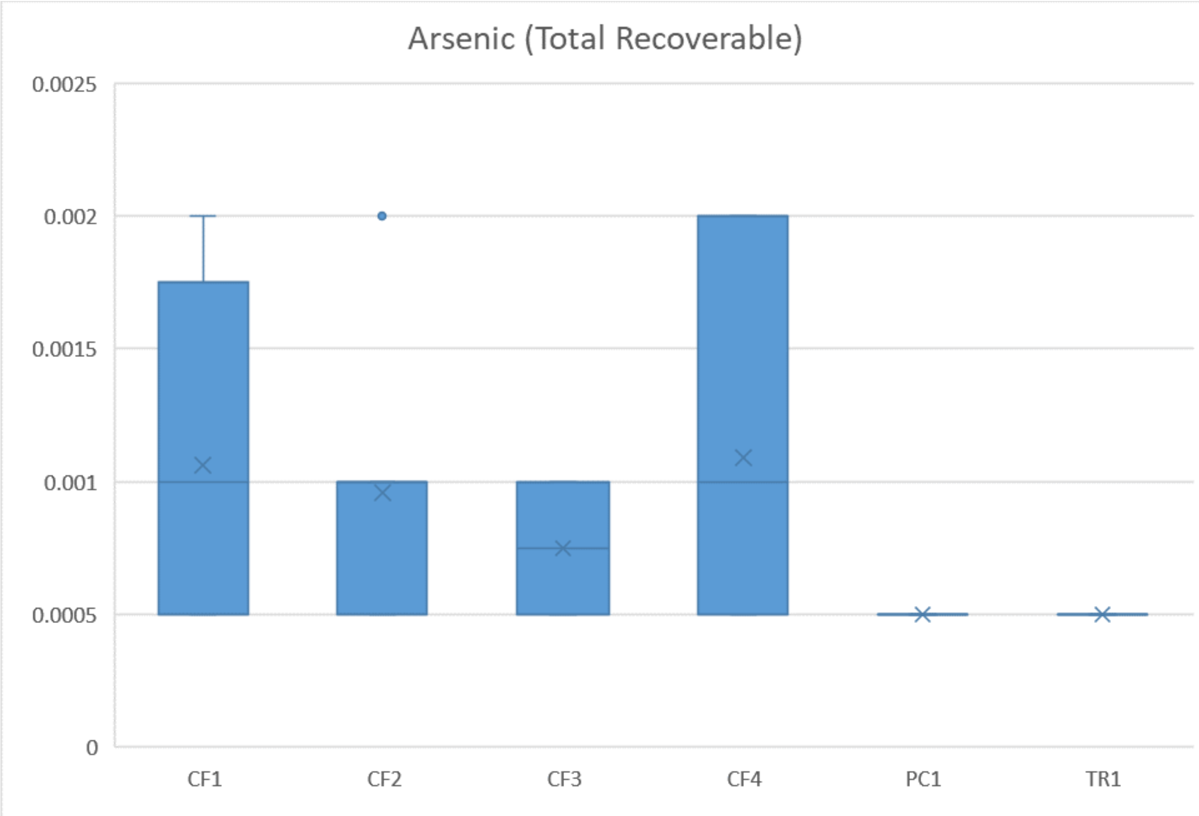
6.7.1.1.2 Metals

Generally, aqueous metal concentrations within the Project are meeting water quality standards at all sites with the exception of three samples from Birdland Bay Bridge (site CF4) which showed lead levels exceeding the water quality standard for chronic aquatic life. Site CF4 is located downstream of the Project and is used to characterize the water quality as it enters Noxon Reservoir. These three samples were collected during both high and low flow periods, and the source of the lead is unknown because all other sites had low or non-detectable concentrations of lead. Additional source assessment sampling for lead was conducted in the fall of 2020 and detailed in this section below. All other metals analyzed were found to be at concentrations below water quality standards.

Arsenic

Arsenic concentrations at all sites were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), with a greater variation in sample concentrations found at sites CF1 and CF4 (**Figure 6-17**). Tributary site (PC1 and TR1) arsenic concentrations were found to be at non-detectable levels.

Figure 6-17: Arsenic concentrations across all water quality monitoring sites (in mg/L).



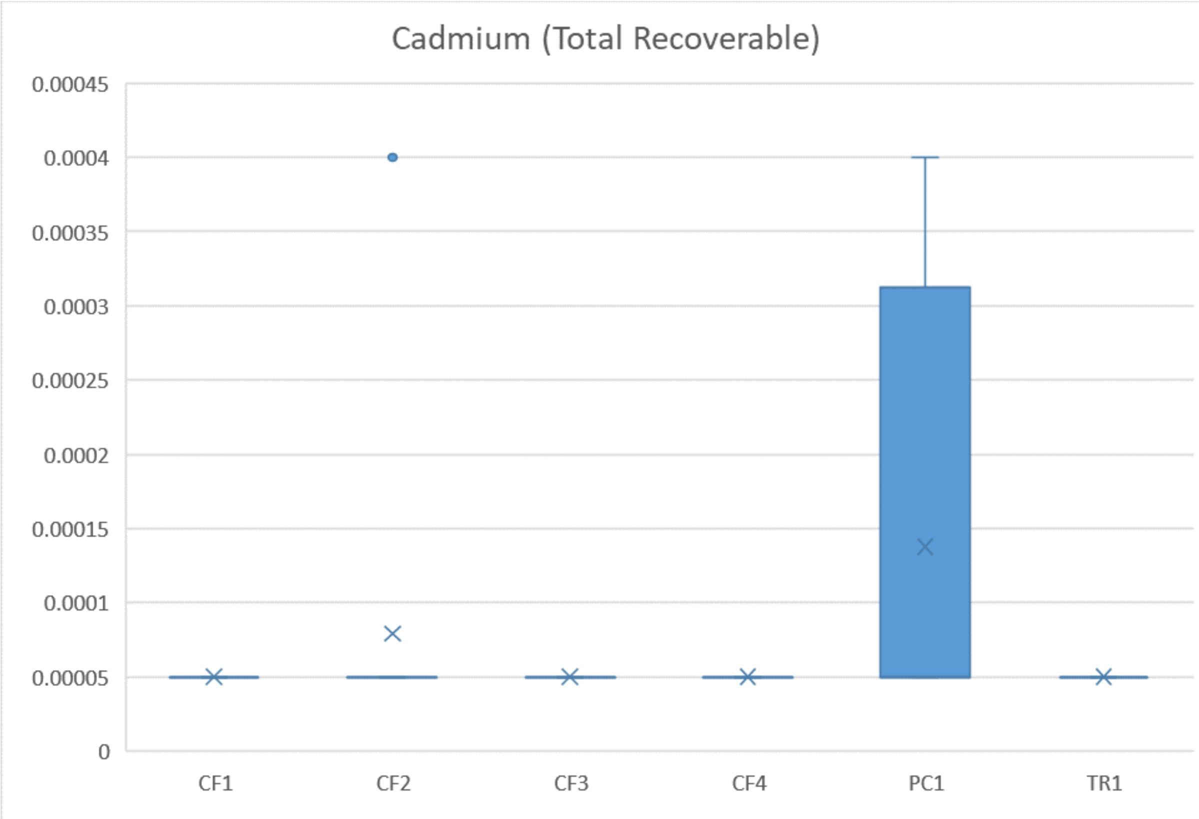
Note: mg/L =milligrams per liter

Cadmium

Cadmium concentrations at all Clark Fork sites (CF1, CF2, CF3, and CF4) were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites. All of the Clark Fork samples, with the exception of two samples at site CF2, were found to be at non-detectable concentrations of cadmium (**Figure 6-18**). Cadmium toxicity is dependent on water hardness, and when the hardness of the Clark Fork River is factored in, the two cadmium detections at site CF2 were below water quality standards for aquatic life.

Cadmium concentrations in the Thompson River were non-detectable, but cadmium concentrations in Prospect Creek exceeded the water quality standard for chronic aquatic life when the water hardness of Prospect Creek is factored in. Prospect Creek has a history of mining in the watershed, so mining activity is a potential source of cadmium in Prospect Creek. Prospect Creek enters the Clark Fork River downstream of the Main Channel Dam, and therefore has no influence on the water quality of Thompson Falls Reservoir.

Figure 6-18: Cadmium concentrations across all water quality monitoring sites (in mg/L).

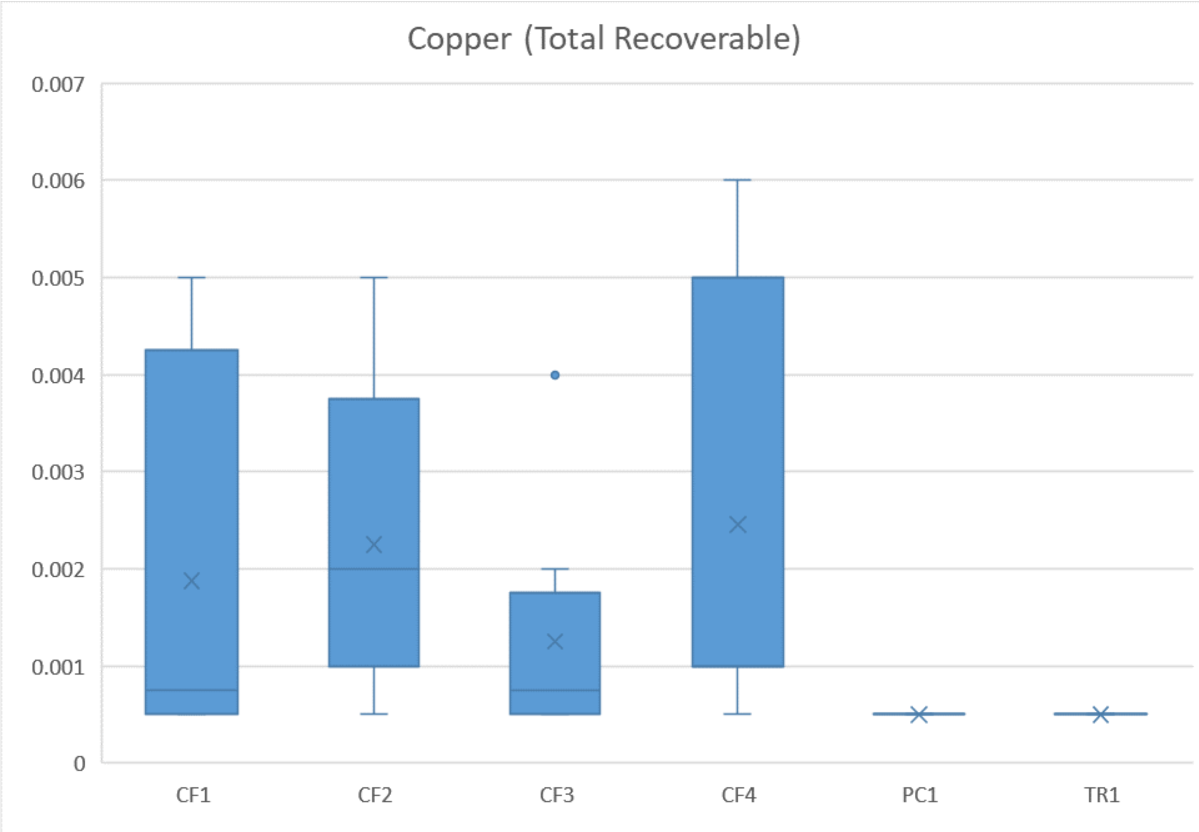


Note: mg/L =milligrams per liter

Copper

Copper concentrations remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), with the lowest concentrations found at site CF3, downstream of the old powerhouse (**Figure 6-19**). Copper toxicity is dependent on water hardness, and when the hardness is factored in, the copper concentrations at all sites were below water quality standards for aquatic life. Tributary site (PC1 and TR1) copper concentrations were found to be at non-detectable levels.

Figure 6-19: Copper concentrations across all water quality monitoring sites (in mg/L).

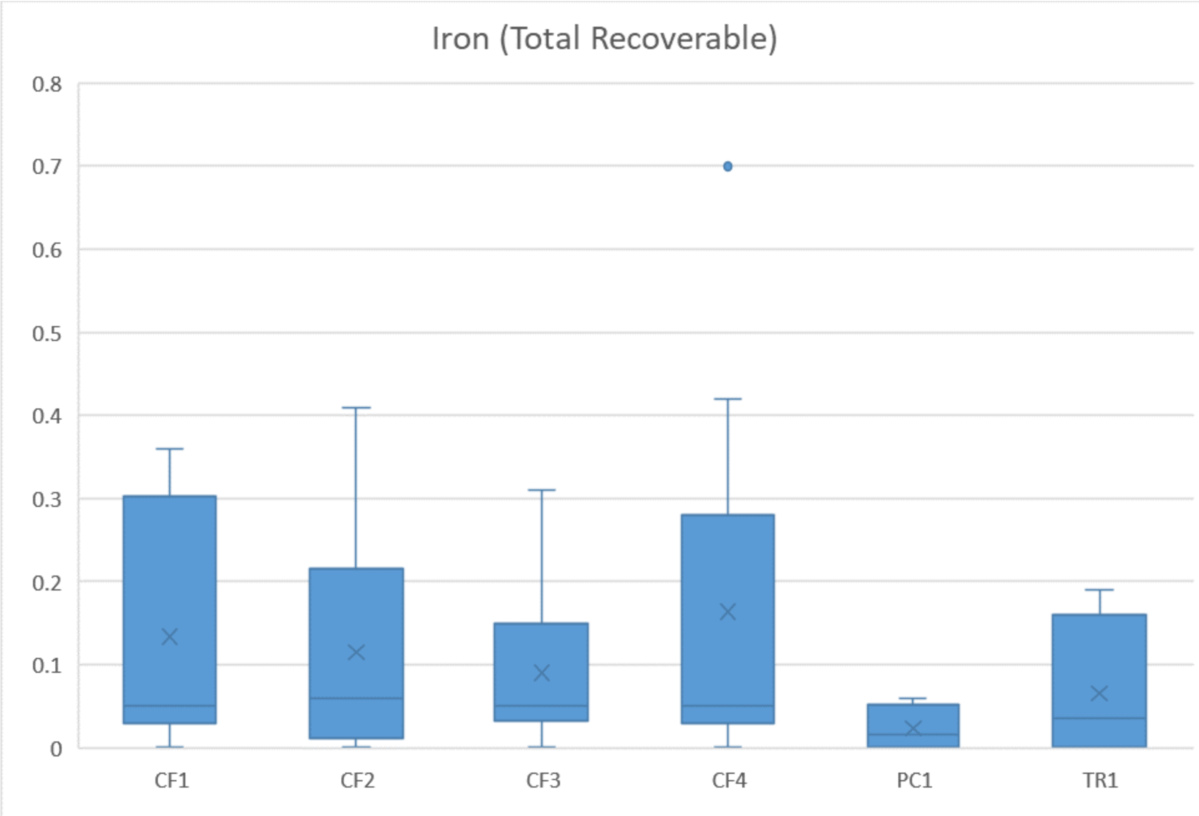


Note: mg/L =milligrams per liter

Iron

Iron concentrations at all sites were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4) (**Figure 6-20**). Tributary site (PC1 and TR1) iron concentrations were also found to be at low levels, with the Thompson River having slightly higher concentrations of iron than Prospect Creek.

Figure 6-20: Iron concentrations across all water quality monitoring sites (in mg/L).

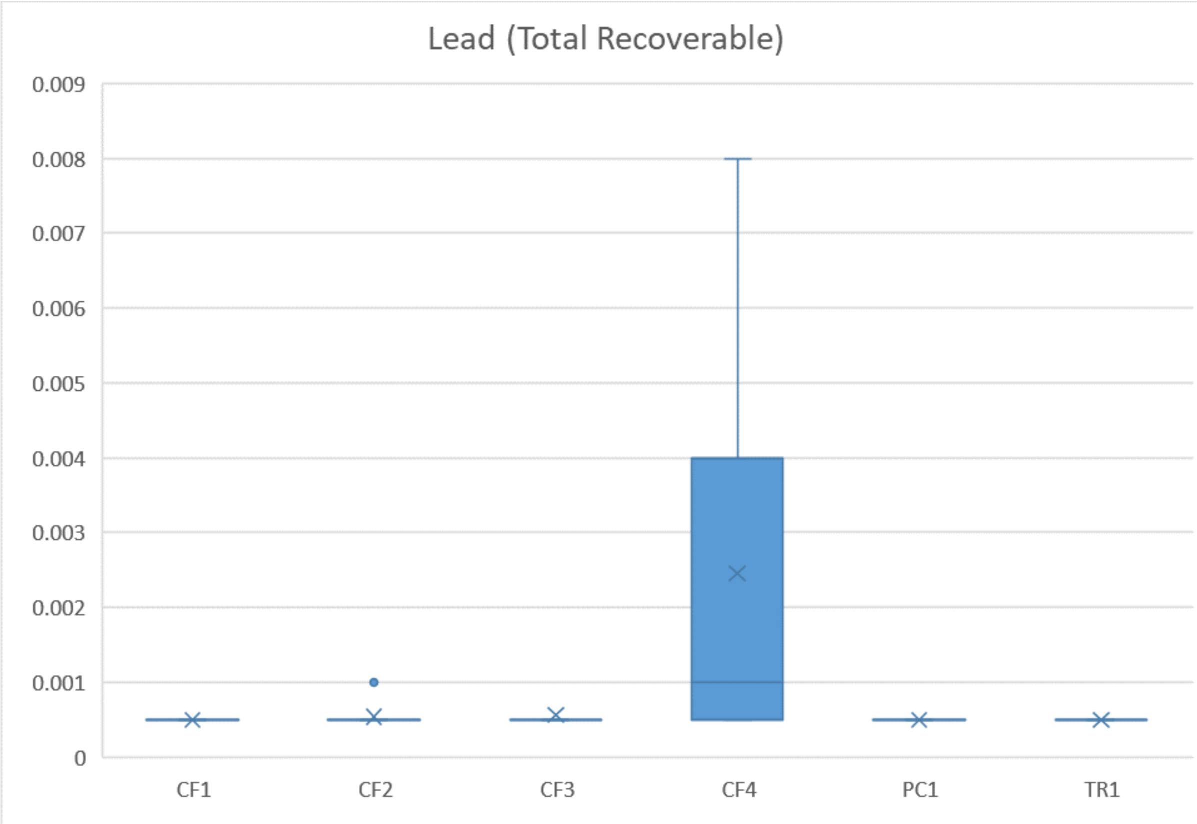


Note: mg/L =milligrams per liter

Lead

Lead concentrations were at low to non-detectable levels at all sites except site CF4 (**Figure 6-21**). Lead toxicity is dependent on water hardness, and when the hardness of the Clark Fork River is factored in, three lead samples at site CF4 were above water quality standards for chronic aquatic life. Site CF4 is located at Birdland Bay Bridge, which is downstream of the Project (*refer to* Table 6-8).

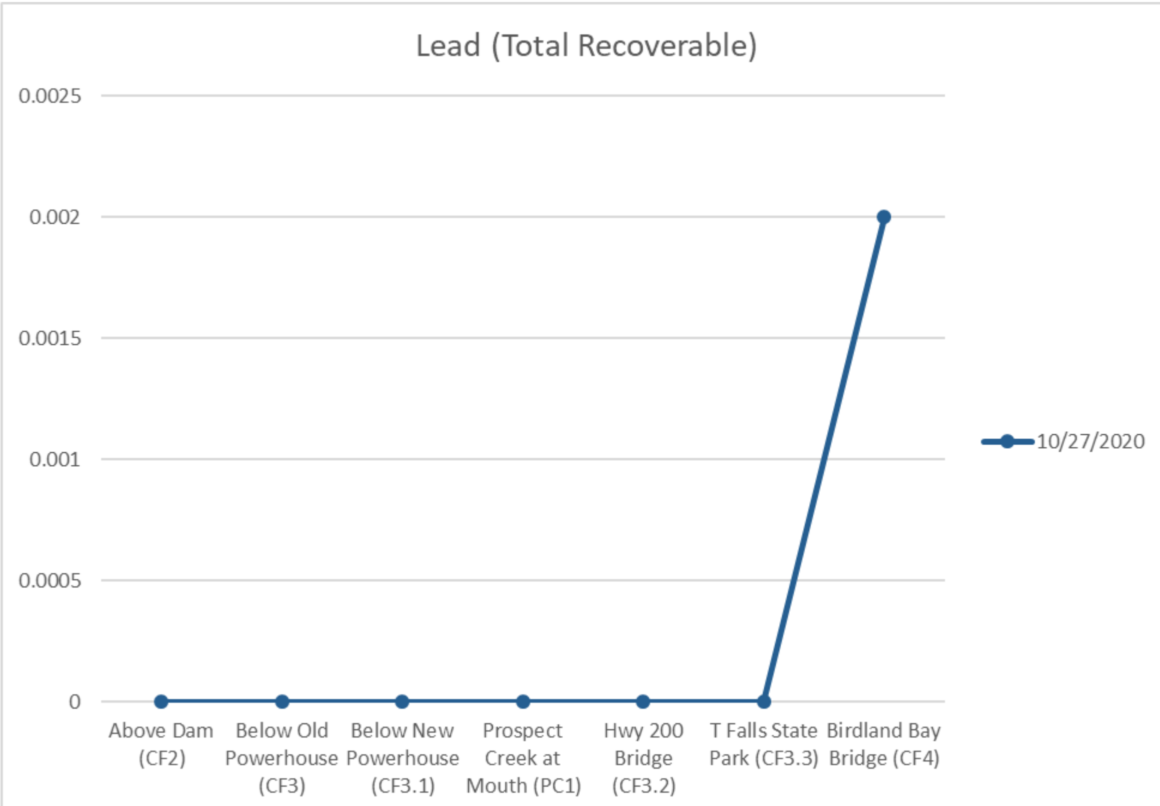
Figure 6-21: Lead concentrations across all water quality monitoring sites (in mg/L).



Note: mg/L =milligrams per liter

In response to the initial lead detection in 2019, additional monitoring sites were added at Prospect Creek (PC1) and downstream of the old powerhouse (CF3) for the 2020 monitoring season. With continued lead detections at site CF4 in 2020, and no clarity on potential lead sources, a synoptic monitoring event was conducted in October 2020 to provide information for a more detailed source assessment. This monitoring event included samples at site CF2 (above the dam), site PC1 (Prospect Creek), site CF3 (below the old powerhouse), site CF3.1 (below the new powerhouse), site C3.2 (near the Highway 200 bridge), site CF3.3 (near Thompson Falls State Park), and site CF4 (Birdland Bay Bridge). The results of this monitoring event showed that lead was found at non-detectable concentrations at all sites except site CF4 (**Figure 6-22**). The potential source of lead at site CF4 still remains unknown but has been isolated to the area between Birdland Bay Bridge and upstream 0.65 mile. This source area is located downstream of the Project, and there is no evidence to suggest the source of lead at site CF4 is related to the Project or Project operations.

Figure 6-22: Lead concentrations from an upstream to downstream orientation for the synoptic monitoring event on October 27, 2020 (in mg/L).

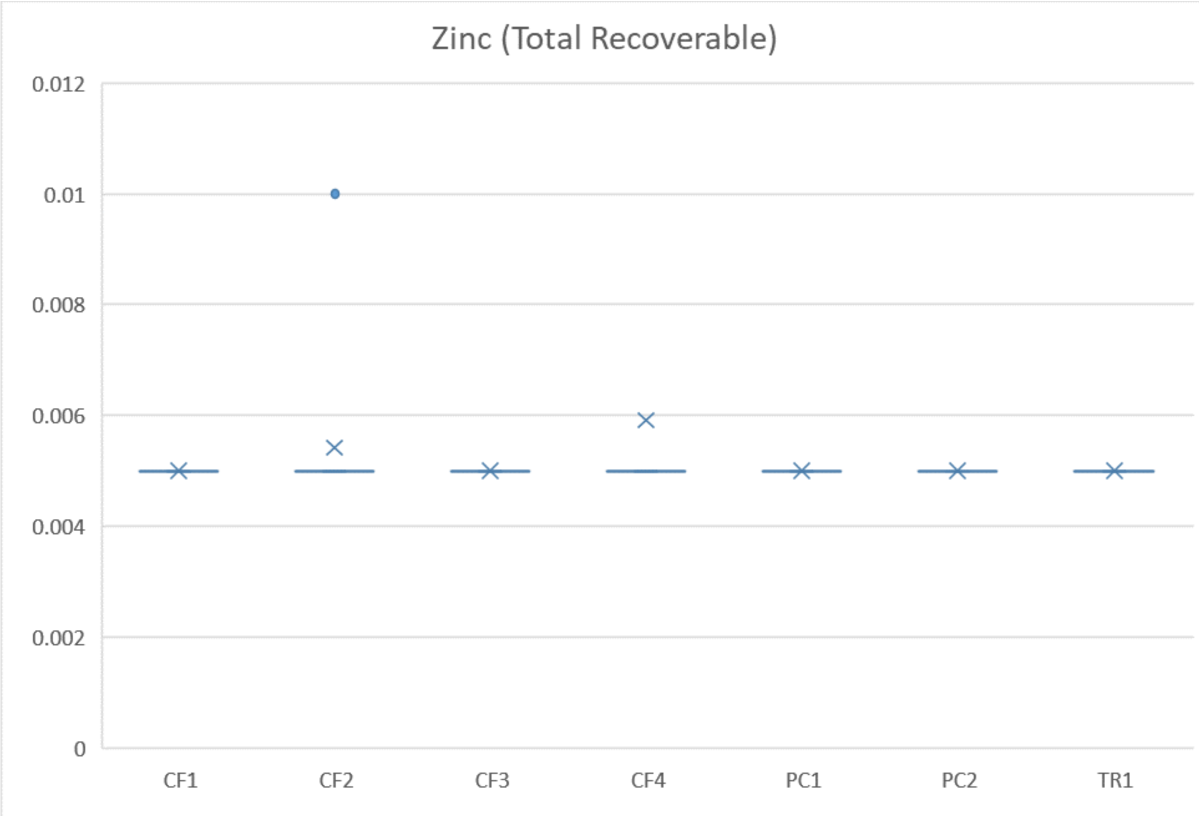


Note: mg/L =milligrams per liter

Zinc

Zinc concentrations in the Project were at low to non-detectable levels at all monitoring sites (**Figure 6-23**). Zinc toxicity is dependent on water hardness, and when the hardness is factored in, all samples containing detectable concentrations of zinc were below water quality standards for aquatic life.

Figure 6-23: Zinc concentrations across all water quality monitoring sites (in mg/L).



Note: mg/L =milligrams per liter

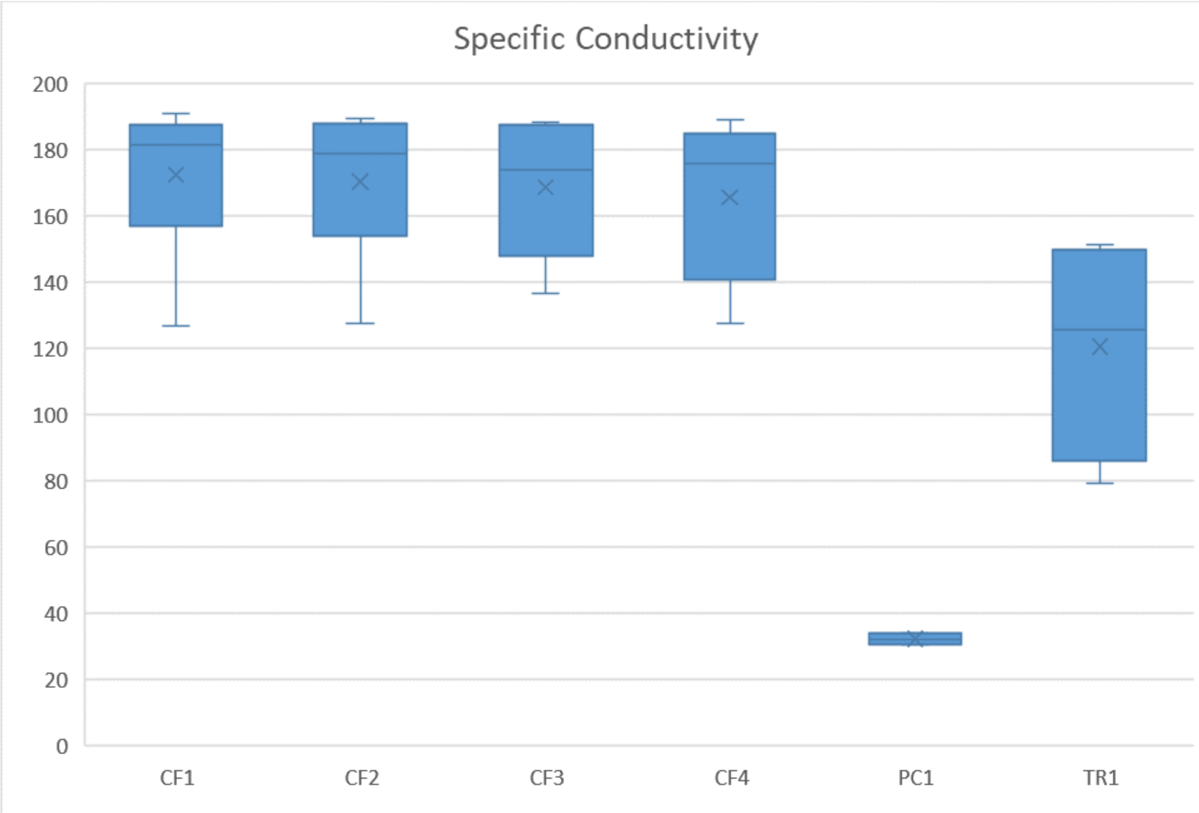
6.7.2 Field Parameters

Field parameters were collected during each water chemistry monitoring event using a Hydrolab HL7 sonde as a part of the overall site characterization. Parameters measured included depth, water temperature, specific conductivity, pH, turbidity, and DO. The Hydrolab sonde was laboratory calibrated prior to each monitoring event to ensure instrument accuracy. Total dissolved gas (TDG) monitoring was also conducted in 2021 and 2022 as a separate FERC approved study. The results of the 2022 TDG study can be found in the Final Study Report, TDG Study that was submitted to FERC in May 2023 (NorthWestern 2023).

6.7.2.1 Specific Conductivity

Specific conductivity changed very little across the Clark Fork sites (CF1, CF2, CF3, and CF4) (**Figure 6-24**), but was significantly lower at the tributary sites (PC1 and TR1). Prospect Creek had the lowest conductivity values of all sites, and the conductivity of the Thompson River was slightly lower than the Clark Fork sites.

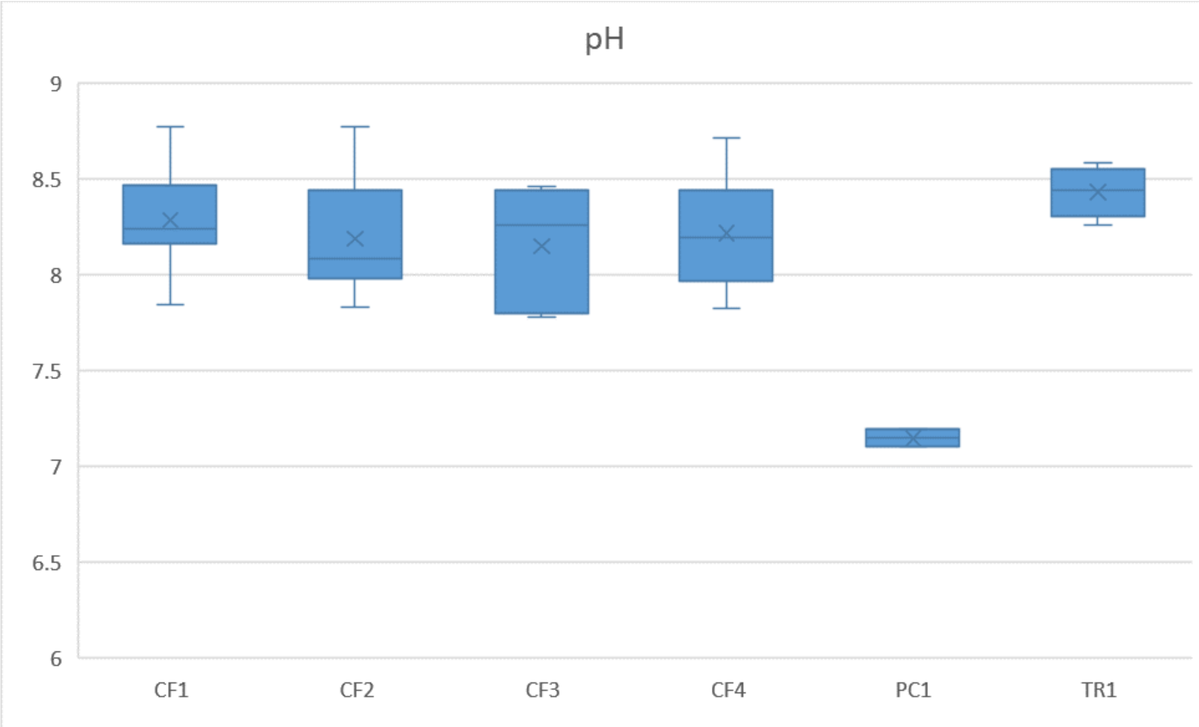
Figure 6-24: Specific conductivity across all water quality monitoring sites (in µS/cm).



6.7.2.2 pH

The measurement of pH at the Clark Fork sites (CF1, CF2, CF3, and CF4) showed relatively little change in pH from site to site, but the pH of Prospect Creek was significantly lower than the Clark Fork sites, and the pH of the Thompson River was more similar to the pH of the Clark Fork sites (**Figure 6-25**). The pH of Prospect Creek is closer to a neutral pH of 7, whereas all other sites have a high pH generally falling in the 8-8.5 range.

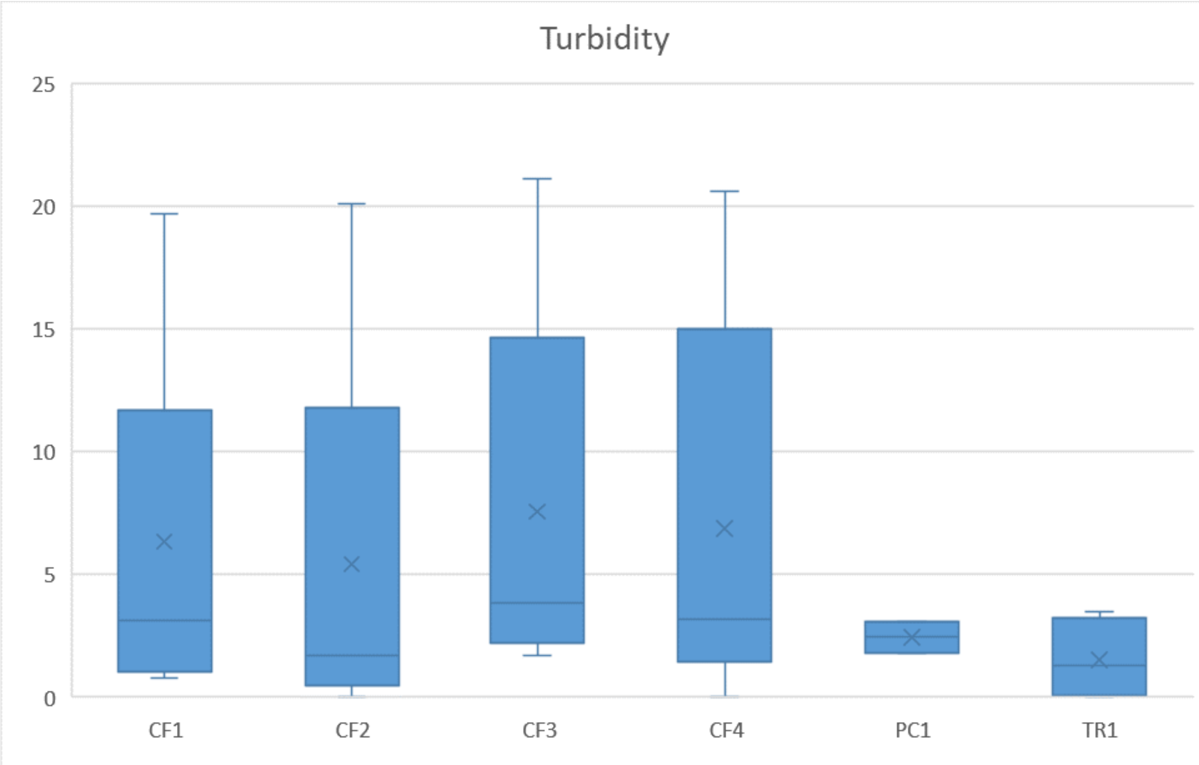
Figure 6-25: pH measurement across all water quality monitoring sites (in units).



6.7.2.3 Turbidity

Turbidity, or the measure of relative clarity in water, remained fairly consistent throughout the Clark Fork sites (CF1, CF2, CF3, and CF4) with elevated turbidity (~20 NTU) occurring during the spring runoff period, and low to no turbidity (<1 NTU) occurring throughout the rest of the year (**Figure 6-26**). Turbidity measurements in Prospect Creek and the Thompson River remained low (<5 NTU) throughout the entire monitoring period.

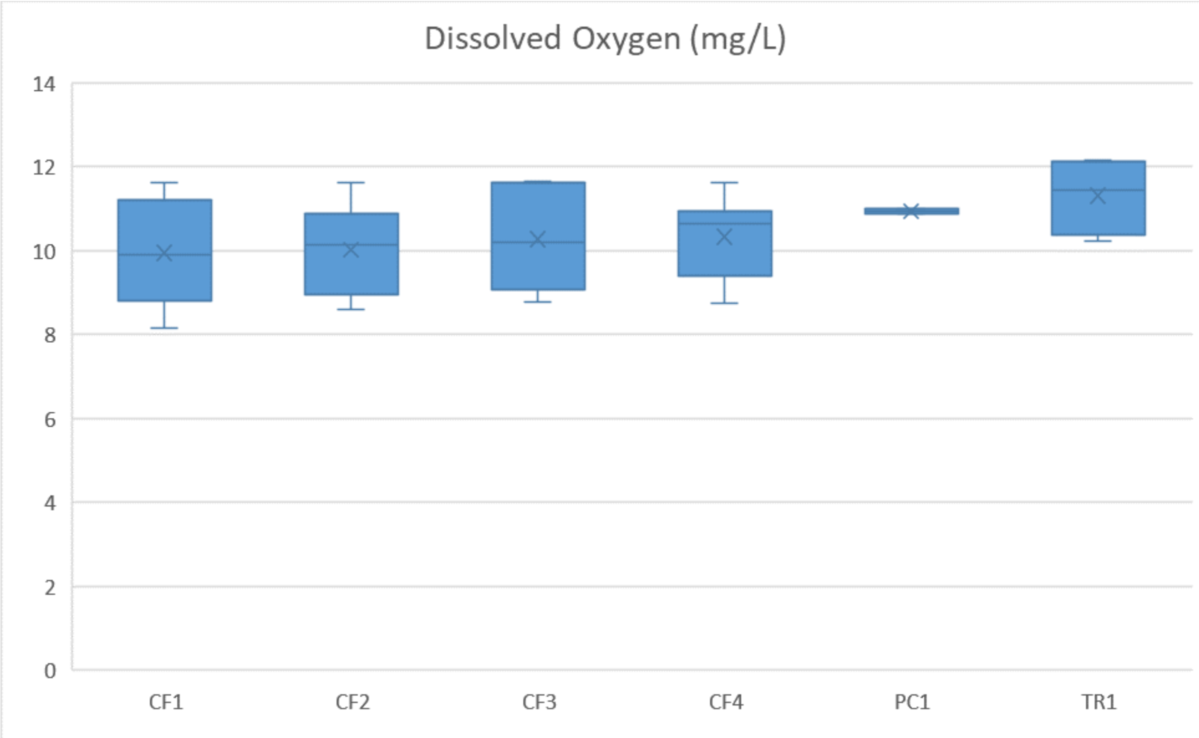
Figure 6-26: Turbidity measurement across all water quality monitoring sites (in NTU).



6.7.2.4 Dissolved Oxygen

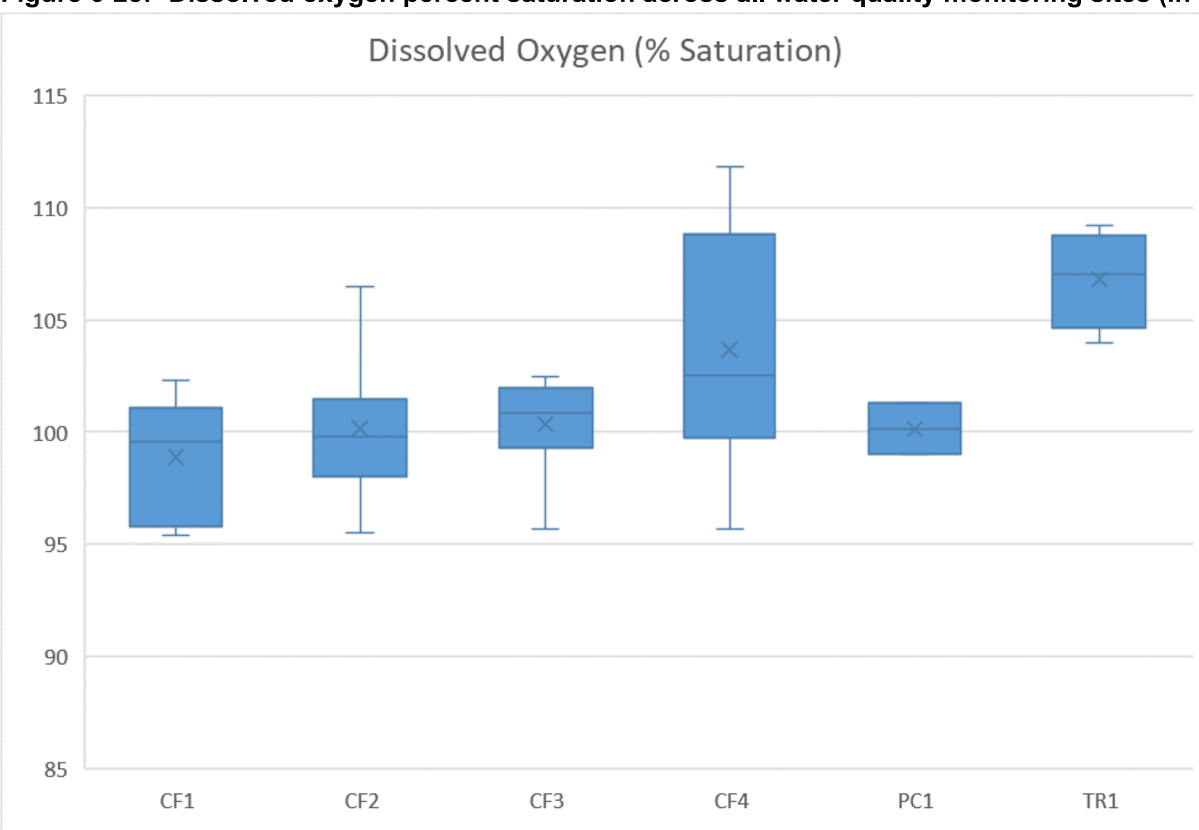
DO is measurement of the amount of oxygen that is present in water and can be represented as a concentration (in milligrams per liter [mg/L]) or as a saturation percentage. Concentrations of DO showed little change across the Clark Fork sites (CF1, CF2, CF3, and CF4), while DO concentrations in the Thompson River were slightly higher than the other sites, and Prospect Creek DO concentrations were similar to those of the Clark Fork sites (**Figure 6-27**). DO percent saturation values showed a similar pattern to the measured DO concentrations except the range of DO percent saturation at site CF4 was much greater than the other sites (**Figure 6-28**). This is likely due to the influence of spillway water during periods of high flow.

Figure 6-27: Dissolved oxygen concentration across all water quality monitoring sites (in mg/L).



Note: mg/L =milligrams per liter

Figure 6-28: Dissolved oxygen percent saturation across all water quality monitoring sites (in %).



6.7.3 Water Temperature

In 2019 and 2021, water temperature data were collected at multiple locations throughout the Project to characterize the existing thermal regime of the reservoir, its inputs and outputs. After high river flows receded, thermographs were placed at four locations in 2019 and seven locations in 2021 (**Table 6-9**) across the Project and monitored water temperature at 15-minute intervals throughout the summer months. Instantaneous maximum water temperatures were reported as the warmest instantaneous measurement for the dataset. 7-Day maximum water temperatures were calculated and reported as an average of the daily maximum temperatures for the seven warmest consecutive days.

In 2019, the instantaneous and 7-day maximum water temperatures in the Clark Fork River upstream of Thompson Falls Reservoir were just slightly higher than the comparable measurements collected downstream of the Project at the Birdland Bay Bridge (Table 6-9, **Figures 6-29 and 6-30**). Water temperature in the Thompson River is cooler than water temperature in the Clark Fork River, with the 7-day maximum water temperature being significantly lower than the comparable measurement in the Clark Fork River (Table 6-9). This pattern was consistent throughout the summer of 2019, with the Thompson River being cooler than the Clark Fork River from late June until early October (Figure 6-29). In addition, the three measurement sites on the Clark Fork River all had very similar water temperature from late June until early October (Figure 6-30). These data support the conclusion that water temperature is consistent from upstream to downstream of the Project.

Monitoring in 2021 included the same sites as 2019, but data were also collected at additional sites as a part of the FERC approved Thompson Falls Relicensing Operations Study. The additional monitoring sites included a site at the furthest upstream extent of the Project boundary, a site located in the island complex downstream of site CF1, and site CF3, which is located directly downstream of the old powerhouse (*refer to* **Table 2-4**). Similar to 2019, water temperatures remained relatively stable throughout the Clark Fork monitoring sites and the Thompson River was significantly cooler than the Clark Fork River (Table 6-9, **Figures 6-31 and 6-32**).

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Table 6-9: Summary of 2019 and 2021 water temperature data.

Site Name	Site Description	Variable	2019 Date of Sample	2019 Temp (°F)	2021 Date of Sample	2021 Temp (°F)
Upstream Project Boundary	Clark Fork River at the edge of the upstream Project boundary	Instantaneous Maximum Temperature	N/A		7/31/21	77.28
		7-Day Maximum	N/A		7/29/21-8/4/21	76.53
CF1	Clark Fork River upstream of Thompson Falls Reservoir	Instantaneous Maximum Temperature	8/8/19	74.79	7/31/21	77.28
		7-Day Maximum	8/3/19-8/9/19	73.93	7/29/21-8/4/21	76.28
Island Complex	Clark Fork River in the Island complex downstream of CF1	Instantaneous Maximum Temperature	N/A		7/31/21	77.10
		7-Day Maximum	N/A		7/29/21-8/4/21	76.20
CF2	Clark Fork River upstream of dam in Thompson Falls Reservoir	Instantaneous Maximum Temperature	8/9/19	73.75	8/1/21	76.88
		7-Day Maximum	8/3/19-8/9/19	73.33	7/30/21-8/5/21	75.93
CF3	Clark Fork River downstream of old powerhouse	Instantaneous Maximum Temperature	N/A		7/31/21	77.28
		7-Day Maximum	N/A		7/29/21-8/4/21	76.28
CF4	Clark Fork River at Birdland Bay Bridge	Instantaneous Maximum Temperature	8/7/19	73.47	8/1/21	76.40
		7-Day Maximum	8/3/19-8/9/19	73.15	7/30/21-8/5/21	75.51
TR1	Thompson River at mouth	Instantaneous Maximum Temperature	8/3/19	65.85	7/29/21	65.55
		7-Day Maximum	8/1/19-8/7/19	65.00	7/29/21-8/4/21	63.78

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Figure 6-29: Thompson Falls Project water temperatures from June 27 – October 6, 2019.

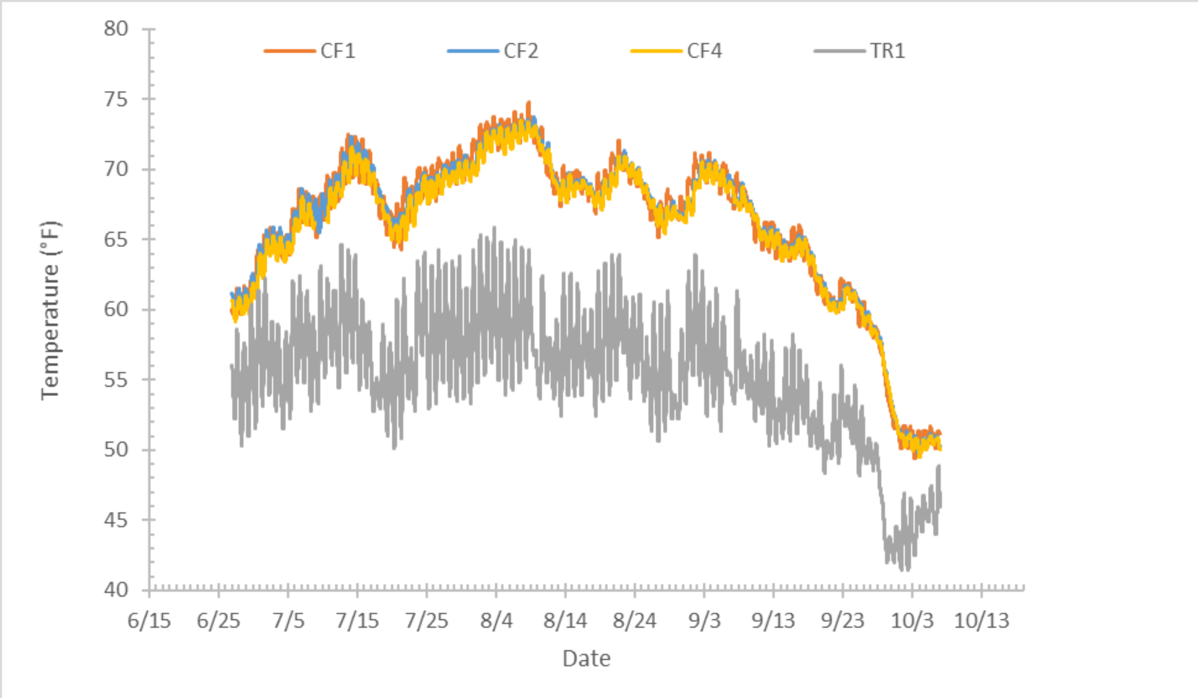


Figure 6-30: Upstream and downstream water temperature comparison from June 27 – October 6, 2019.

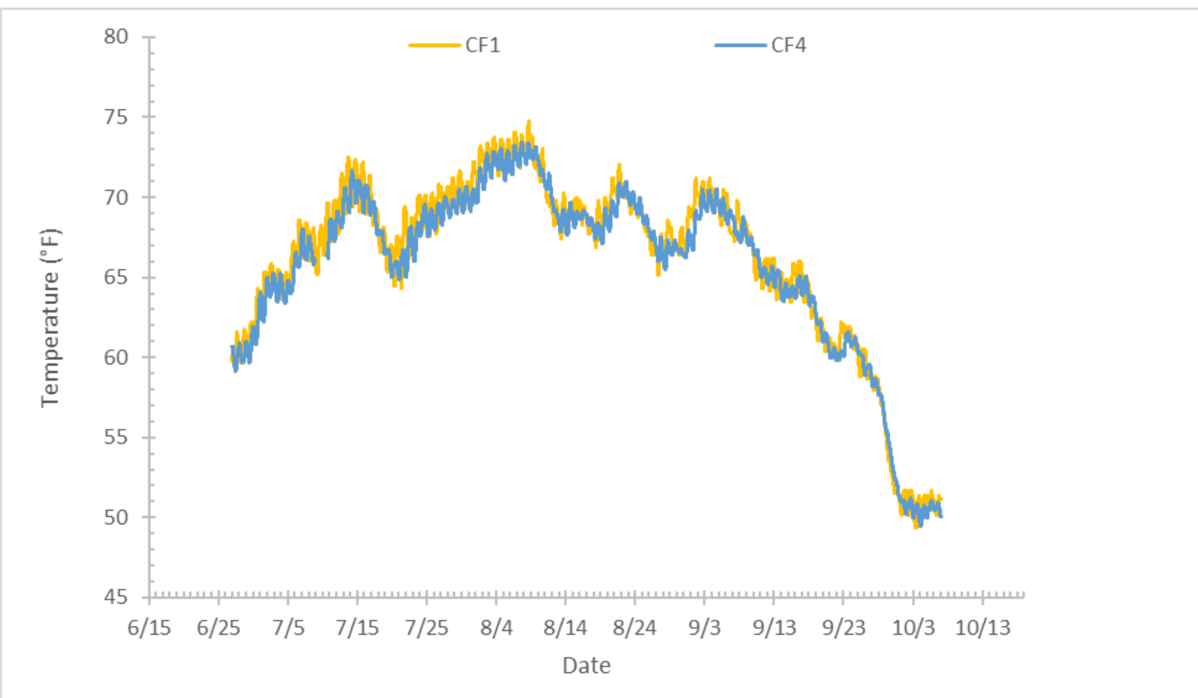


Figure 6-31: Thompson Falls Project water temperatures from July 15 – September 15, 2021.

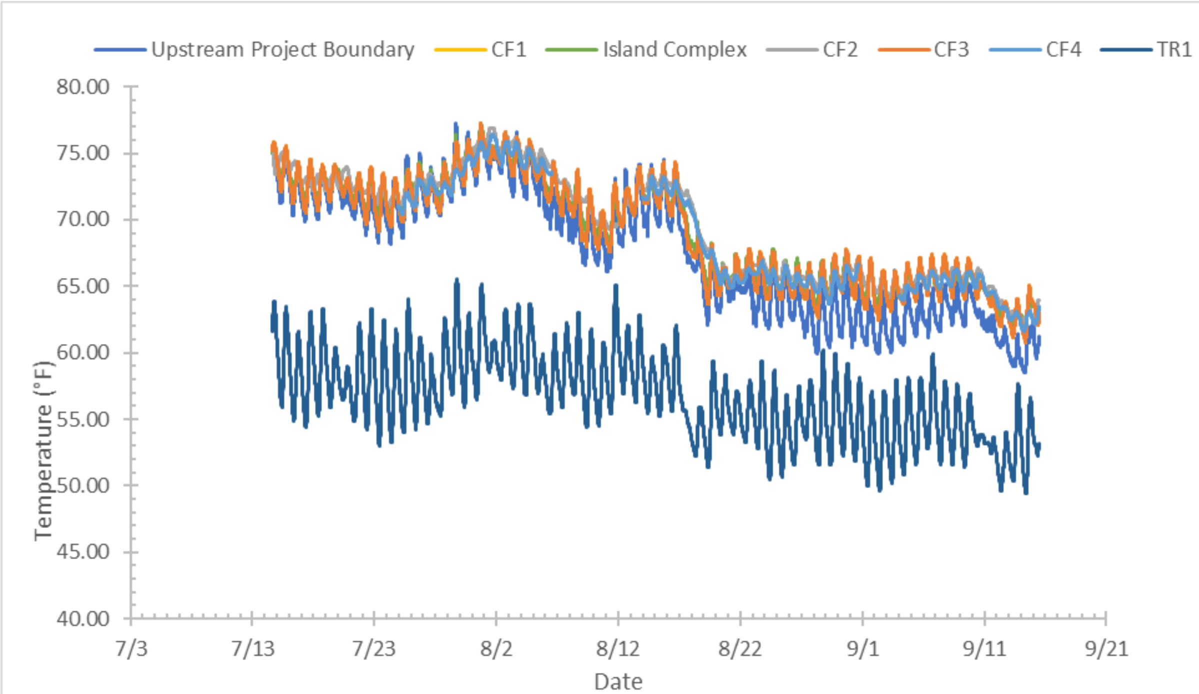
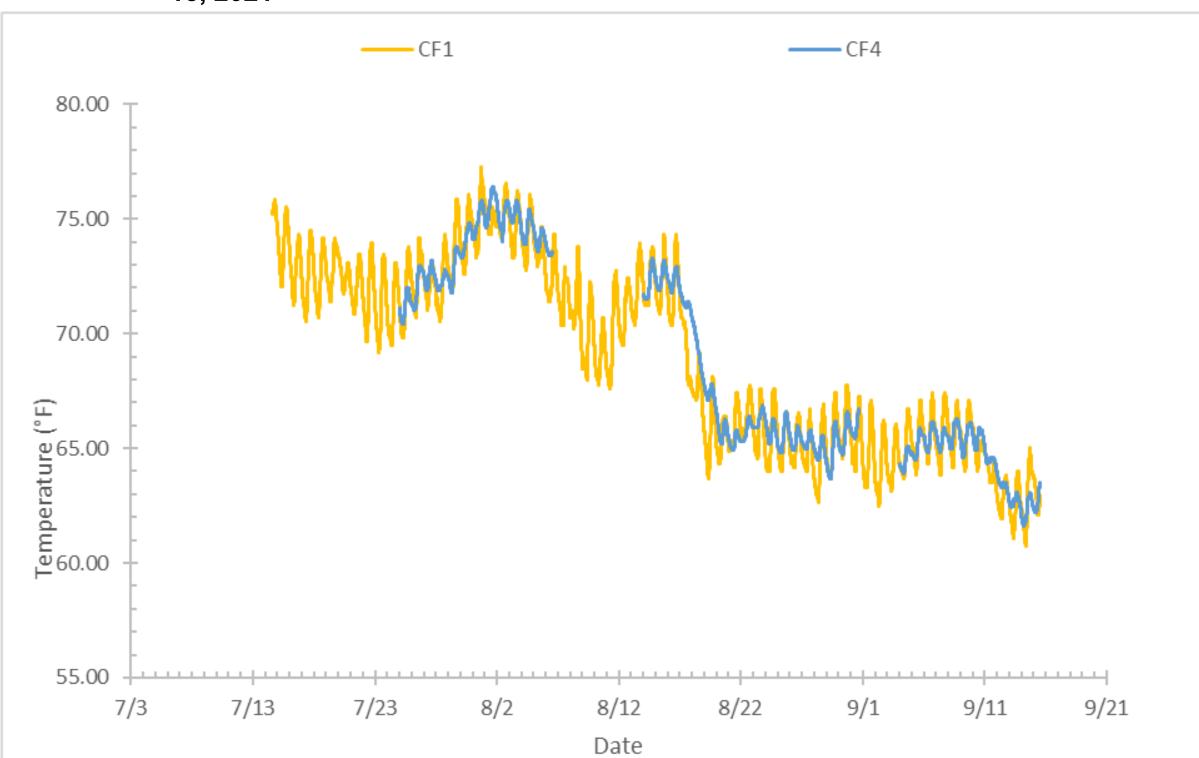


Figure 6-32: Upstream and downstream water temperature comparison from July 15 – September 15, 2021



6.7.4 Total Dissolved Gas

Total dissolved gas, or TDG, is a measurement of the total concentration of atmospheric gas saturation in water. This can occur naturally from hydraulic features in a waterbody or from human actions on the environment. When water plunges into a pool, air becomes entrained regardless of whether the plunge is a natural waterfall or a dam spillway (Weitkamp and Katz 1980). Supersaturation at hydroelectric projects is primarily caused by water containing gas that was dissolved under a higher than atmospheric pressure. The Montana DEQ has set the water quality standard for TDG at 110 percent of saturation (Montana DEQ 2019). The 110 percent of saturation water quality standard was developed to protect fish from high levels of TDG, which may cause gas bubble trauma (GBT), a condition that affects many aquatic organisms residing in fresh or marine waters which are supersaturated with atmospheric gases. GBT can cause injury and, in severe cases, death to fish. Montana's Surface Water Quality Standards and Procedures include language specific to dams. ARM 17.30.602 defines "naturally occurring" as "conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Conditions resulting from the reasonable operation of dams in existence as of July 1, 1971, are natural." ARM 17.30.636 (1) states that "owners and operators of water impoundments that cause conditions harmful to prescribed beneficial uses of state water shall demonstrate to the satisfaction of the department that continued operations will be done in the best practicable manner to minimize harmful effects."

At many dams, water passing over the dam (known as spill) plunges into a deep armored stilling basin. Stilling basins are designed to confine energy dissipation in the armored zone, so that erosion does not scour and undermine the spillway. As spill plunges, a turbulent energy dissipation zone is created, characterized by unsteady flow and high shear forces. Vertical circulation cells often take turbulence aeration to depth, where hydrostatic pressure collapses bubbles, forcing gas into solution and elevating TDG levels (gas absorption).

At the Thompson Falls Project, the spillway is built on bedrock. Therefore, scour is not a concern and thus there is no formal spillway stilling basin and no plunge pool. The depth of the bedrock shelf immediately downstream of the spillway apron appears not to be deep enough for appreciable gas absorption to occur on the basis of required hydrostatic pressure. The rock shelf extends downstream to a waterfall which has a deeper downstream pool where there is enough depth for appreciable TDG uptake.

The Project was built on a natural river falls (**Photographs 6-1, 6-2**). No data on TDG during the pre-Project time period are available. However, the natural waterfalls likely elevated TDG in the Clark Fork River.

Photograph 6-1: View of Thompson Falls, Montana (in background) and the Clark Fork River (in foreground), at the site of the Main Channel Dam of the Thompson Falls Project. Circa 1908. Woodworth Photo. Photo courtesy of the University of Montana, K. Ross Toole Archives.

Photograph 6-2: **View of Thompson Falls, Montana (in background) and the Clark Fork River (in foreground), circa 1908. Woodworth Photo. Photo courtesy of the University of Montana, K. Ross Toole Archives.**

TDG carrying capacity depends on temperature and ambient pressure. TDG supersaturation is an unstable condition, and if the river channel downstream of a spillway is sufficiently wide and shallow, and with an appreciable enough hydraulic gradient, channel boundary roughness will force flow to "tumble" in a manner where there is increased water surface exposure of ambient air conditions. Where this kind of open-channel flow conditions occur, TDG levels rapidly drop back to near the stable, 100 percent saturation level. The distance that is required for this to happen varies from site to site.

However, if there is a downstream reservoir impounded near the powerhouse tailrace, as is the case at the Project, the normal river gradient is reduced, and the flow regime becomes more stable. Lower reservoir velocities result in less turbulence, and elevated TDG levels often persist above saturation after entering the impoundment. If there are elevated wind levels, enough shear can be created to induce the vertical circulation necessary to reduce TDG levels. Otherwise, the elevated reservoir TDG levels wane slowly, by delayed replenishment by lower level TDG inflows.

6.7.4.1 TDG Monitoring

NorthWestern and the prior licensee monitored TDG in the Clark Fork River most years from 2003 to 2022. These data have helped to inform the optimal operations scenario to minimize TDG concentrations. The prior Licensee developed a TDG Control Plan in 2010 in consultation with the Montana DEQ (PPL 2010**)**. The TDG Control Plan outlines operational practices used during the spring runoff period to minimize TDG concentrations in the Clark Fork River downstream of the Project. Since 2010, the TDG Control Plan has been implemented annually.

In late 2018, construction was completed on two new radial spill gates, resulting in a total of four radial gates on the Main Channel Dam. Because these new radial gates are a change from the spill panels that were previously in use, NorthWestern proposed additional TDG monitoring to assess the effect on TDG from the new radial gates. Data collection occurred in 2019, 2020, 2021, and 2022. These data have resulted in a better understanding of TDG concentrations at a wider range of discharge levels.

Hydrolab instruments (through 2021) and Eureka Manta instruments (2022) were deployed at three locations to capture TDG concentrations above the dam, below the Main Channel Dam at the High Bridge, and downstream of the Project at Birdland Bay Bridge). **Table 6-10** provides the locations of each of these monitoring sites.

Table 6-10: Descriptions and Latitude and Longitude of TDG Monitoring Sites.

Site Name	Site Description
Above Dam (AD)	Upstream face of the Dry Channel Dam
High Bridge (HB)	Downstream of the Main Channel Dam
Birdland Bay Bridge (BBB)	Clark Fork River downstream of Project at Birdland Bay Bridge

The monitoring locations were chosen to represent the TDG concentrations of incoming water upstream of the Project, TDG concentrations of the spill water downstream of the Main Channel Dam, and TDG concentrations leaving the Project which captures a mixture of water from the powerhouse discharge and the spillway discharge. **Figures 6-33 and 6-34** show the location of the TDG monitoring sites in relation to Project infrastructure.

Figure 6-33: TDG monitoring locations.

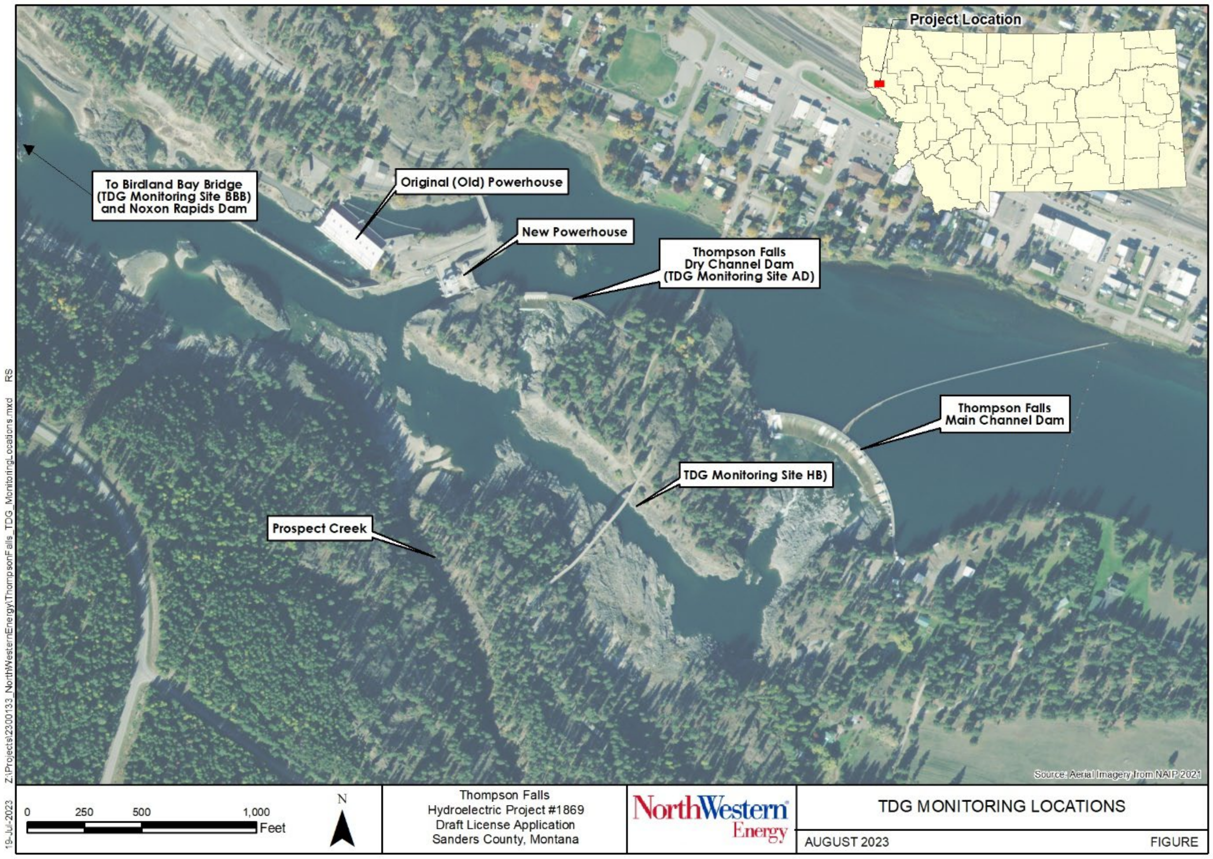
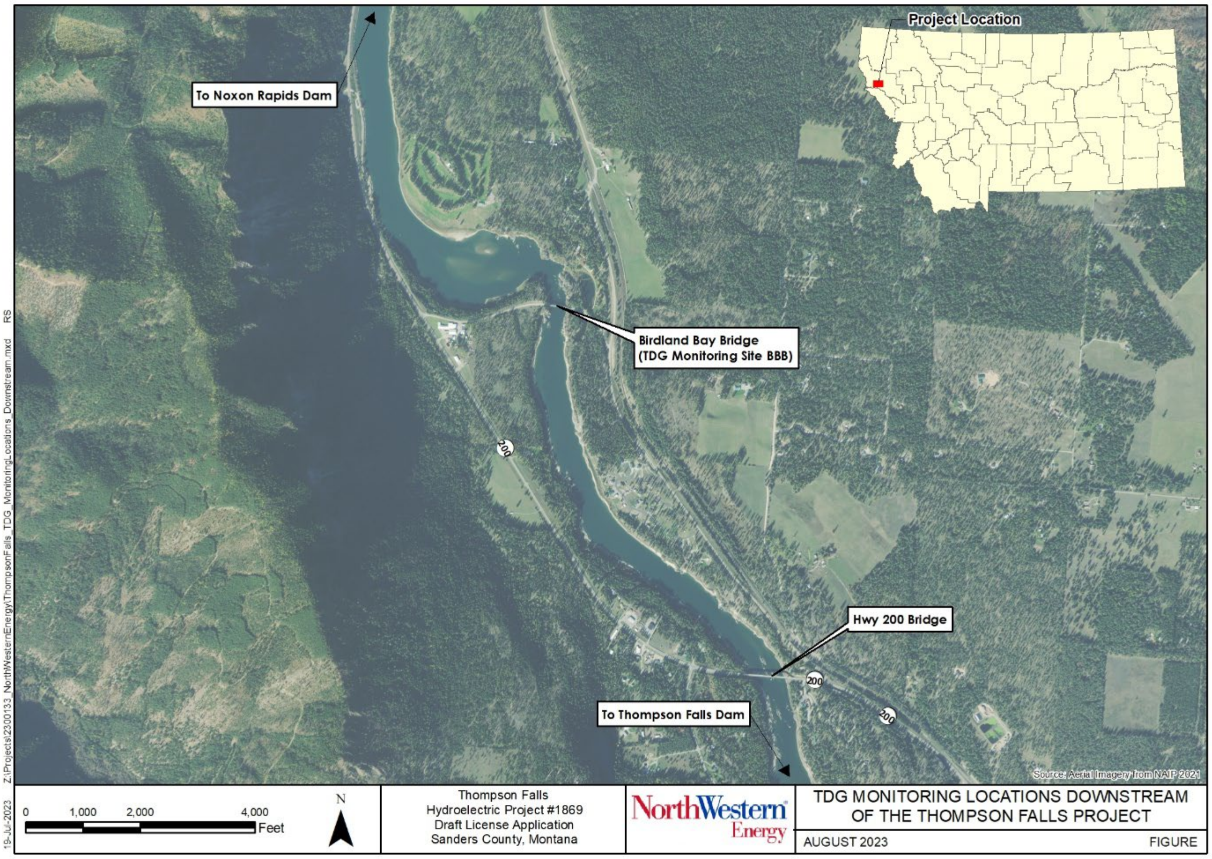


Figure 6-34: TDG monitoring locations downstream of the Thompson Falls Project.



TDG concentrations are highest during spring runoff, so data collection is focused on the early May through early July time period. Current TDG monitoring methods have been used since the TDG Control Plan was put in place in 2010. Per the 2010 TDG Control Plan, NorthWestern monitors TDG when the April 1 Natural Resource Conservation Service most probable (50%) runoff forecast for the Clark Fork River is at or above 125 percent. Decisions to monitor dissolved gas outside of the runoff forecast conditions is made annually by the TAC.

TDG data are collected throughout the spring runoff season to capture the variability of TDG entrainment in relation to flow rate in the Clark Fork River. Datasondes are used to measure TDG on 15-minute intervals throughout this monitoring period and are calibrated on a bi-weekly basis to ensure sensor accuracy.

As a part of the FERC approved TDG study, operators of the Project tested various configurations of spill through the Main Channel Dam using different combinations of the four radial gates for the purposes of measuring changes in TDG. Each gate spill configuration was held for approximately 4 hours to allow the downstream TDG levels to stabilize.

6.7.4.2 TDG Monitoring Results

TDG upstream of the Thompson Falls Project, measured in the forebay, is generally between 100 and 108 percent of saturation regardless of river flow (NorthWestern 2019 and NorthWestern 2023).

The Project routes flow through the powerhouses at a discharge less than 23,000 cfs, with no need to operate the spillways except a small discharge released at the Main Channel Dam for fish passage purposes. TDG measurements collected above the Project and below the powerhouses in 2003 found that TDG in the powerhouse tailrace was generally 1 to 2 percent lower than TDG in the forebay (PPL Montana 2010). Therefore, passing flow through the powerhouses results in slight de-gassing of the flow. For this reason, during the time periods when the spillways are not in use, TDG as measured at the Birdland Bay Bridge is generally equal to or slightly less than the TDG measured above the dams (PPL Montana 2010).

When river discharge exceeds the capacity of the powerhouses, flow passes over the spillways, then passes over the natural falls, adding TDG at both points. Higher flows create higher levels of TDG, up to a point, though the relationship between flow and TDG is non-linear. At the highest levels of discharge, TDG at sites downstream of the Project increases with increasing discharge, but at a much slower rate.

During the highest discharge, the tailwater elevation downstream of the spillway and falls rises enough to backwater the falls, and there is a reduced plunging action into the deep pool below the falls. During peak discharge time periods, when flow at the Project site exceeds 60,000 cfs, TDG exceeds 120 percent at the High Bridge, which is downstream of the Main Channel Dam but upstream of the powerhouses' tailrace channels.

TDG dissipates downstream of the High Bridge. In addition, low TDG water from the powerhouses mixes with higher TDG water that has passed over the spillways and falls. Therefore, TDG is lower at the Birdland Bay Bridge than it is at the High Bridge. While the levels of TDG with discharge varies from year to year, as shown in **Table 6-11**, there does not appear to be a pattern of changing TDG over time.

During the 2021 and 2022 study seasons, testing was conducted on various configurations of spill through the Main Channel Dam using different combinations of the four radial gates (**Figure 6-35**). Each gate spill configuration was held for approximately 4 hours to allow the downstream TDG levels to stabilize. TDG was measured below the main channel dam at the High Bridge site to monitor changes in TDG concentrations as radial gate configurations were tested. **Table 6-12** shows a summary of the results of this testing as well as data from previous testing conducted in 2019 and 2020.

Overall, the study found that while the radial gate operational scenario that entrained the least amount of TDG differed at various river flows, opening non-adjacent radial gates generally entrains less TDG downstream than opening adjacent radial gates. While opening non-adjacent radial gates during spill operations will most likely reduce the amount of TDG entrained downstream, operation in this manner may not be practical at all times due to the need to flush large woody debris from the trash boom to prevent the debris from building up on the face of the dams.

The buildup of large woody debris on the upstream faces of the Main Channel and Dry Channel dams can lead to situations where the stanchions need to be removed to ensure adequate flow passage and to maintain the structural integrity of the dams. The stanchions hold the dam panels in place which control reservoir elevation. When the stanchions are removed, NorthWestern loses the ability to control reservoir elevation as well as the ability to operate the fish ladder until spring runoff recedes and the dams have been repaired.

In previous instances where the removal of the stanchions has occurred, there was a large increase in the percent of TDG entrained downstream due to uncontrolled releases through the dam. In 2018, which was the last time the stanchions were removed, there was a 5 percent increase in TDG at the High Bridge site following the stanchion removal (NorthWestern 2019). The drastic increase in TDG entrainment from stanchion removal is far more significant than the differences in TDG entrainment from operating adjacent radial gates vs non-adjacent radial gates, therefore radial gate operations should be conducted in a way to facilitate passage of debris and minimize the need for emergency stanchion removal.

Table 6-11: **Mean TDG (%) recorded over a range of discharge at the Birdland Bay Bridge on the Clark Fork River, Montana, 2003-2022.**

Total Flow (thousand cfs)	>23, <30	>30, <40	>40, <50	>50, <60	>60, <70	>70, <80	>80, <90	>90, <10	>100, <110	>110, <120
2003	102.1	104.7	109.5	111.0	112.9	113.2	N/A	N/A	N/A	N/A
2004	103.5	105.0	107.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2005	103.6	107.1	110.4	112.7	114.1	114.0	N/A	N/A	N/A	N/A
2006	103.6	106.7	110.6	114.3	115.7	115.7	N/A	N/A	N/A	N/A
2007	102.5	105.2	109.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2008	102.2	105.6	110.6	114.9	116.0	115.9	N/A	N/A	N/A	N/A
2009	102.6	105.2	109.2	113.0	113.1	N/A	N/A	N/A	N/A	N/A
2010	102.0	106.6	110.9	111.6	N/A	N/A	N/A	N/A	N/A	N/A
2011	102.9	105.8	108.1	111.0	113.5	116.0	116.8	119.7	120.6	119.9
2012	102.3	104.4	108.8	111.2	113.0	112.7	112.5	N/A	N/A	N/A
2014	102.7	104.7	108.6	111.5	114.8	115.4	116.2	N/A	N/A	N/A
2017	103.0	105.2	108.7	113.9	115.2	115.6	116.6	N/A	N/A	N/A
2018	104.0	106.8	110.1	113.3	112.5	115.0	115.7	N/A	N/A	N/A
2019	102.5	104.6	110.5	112.9	113.2	N/A	N/A	N/A	N/A	N/A
2020	102.5	105.5	109.1	112.0	114.3	115.8	116.1	N/A	N/A	N/A
2021	102.9	105.1	108.7	111.8	N/A	N/A	N/A	N/A	N/A	N/A
2022	102.6	105.1	108.9	113.0	115.5	117.5	117.0	118.1	N/A	N/A
Mean 2003-2022	**102.8**	**105.5**	**109.4**	**112.5**	**114.1**	**115.2**	**115.8**	**118.9**	**120.6**	**119.9**

Notes: N/A = data not available at that flow range.

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Figure 6-35: View of the Thompson Falls Main Channel Dam Radial Gates Looking Upstream.

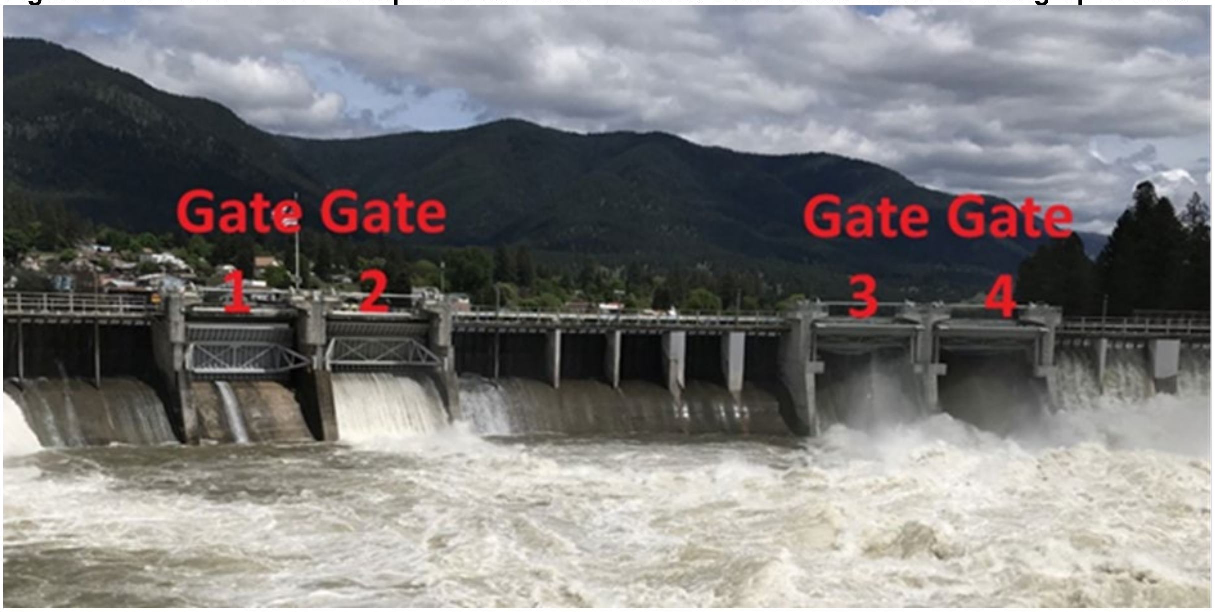

Table 6-12: Maximum and minimum TDG by flow range at the High Bridge, 2019-2022

Total Flow Range (cfs)	Max TDG at HB (% saturation)	Gate Setting at Max TDG	Min TDG at HB (% saturation)	Gate Settings Min TDG
30,000-35,000	112.5	1 full open, 2 4' open	107.5	4-partially open
40,000-45,000	114.4	1 and 2 open	111.7	1 and 4 open
45,000-50,000	118.8	1 and 4 open	116.2	2 and 4 open
[1]55,000-60,000	121.6	3 and 4 open	119.6	1 and 2 open
[2]55,000-60,000	122.2	1 and 2 open	119.9	2 and 4 open
65,000-70,000	122.7	3 and 4 open	119.8	1 and 3 open
75,000-80,000	123.1	1 and 2 open	121.2	2 and 3 open
80,000-85,000	124.1	3 and 4 open	120.6	1 and 3 open

Notes: cfs = cubic feet per second
[1] Partial testing was conducted in 2019
[2] Full testing was conducted in 2022

6.7.5 Biological Monitoring

Biological indicators are an important part of monitoring the overall ecological health of a waterbody. These biological indicators typically respond to changes in water quality and can be studied to see a response to changing water quality conditions.

Aquatic macroinvertebrates and periphyton, the assemblage of aquatic organisms that attach to substrate, are strong bioindicators of stream health. Healthy streams support diverse macroinvertebrate communities of mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*), caddisflies

(*Trichoptera*), true flies (*Diptera*), beetles (*Coleoptera*), and many others. Macroinvertebrate and periphyton assemblages reflect cumulative impacts of all pollutants, such as toxic substances, organic pollution, or excessive sediment loading.

Zooplankton found in a lake or reservoir can be an important food source for fish and other aquatic organisms. Their presence and species composition can be used as an indicator of biological community health of a lake or reservoir.

Fish species can accumulate environmental contaminants in their muscle tissue over time through bioaccumulation. Typically, top trophic level predator species have the highest concentrations of contaminants, while lower trophic level prey species have the lowest concentrations of contaminants. Monitoring and tracking the concentrations in fish tissue contaminants over time can be used as an indicator of the environmental health of a waterbody.

6.7.5.1 Biological Monitoring Methods

Biological monitoring occurred at two sites for macroinvertebrate and periphyton collection, three sites for zooplankton collection, and a reservoir-wide sampling effort for fish tissue biocontaminants. (**Table 6-13**).

In 2019, macroinvertebrate and periphyton samples were collected at sites CF1 and CF3 to determine if there were any changes in the biological community upstream and downstream of the reservoir (**Figure 6-36**). Macroinvertebrate sampling methods used were consistent with NorthWestern's large river macroinvertebrate sampling methodologies. Sites CF1 and CF3 were chosen because the riffle habitat at these sites was the only appropriate habitat available in the Project area that meets the large river sampling criteria.

In addition to the macroinvertebrate and periphyton samples collected upstream and downstream of the reservoir, zooplankton samples were also collected at three sites on the reservoir, TFR1, TFR2, and TFR3 to determine the existing species composition and densities (Figure 6-36). These sites were chosen to be representative of the upper, middle, and lower areas of Thompson Falls Reservoir. Vertical plankton tows were collected using an 80 µm (micron, or micrometer) mesh Wisconsin plankton net, and tow lengths were from the reservoir bed to the water surface.

Fish tissue samples were collected in the fall of 2019 as a part of NorthWestern's Thompson Falls Reservoir fisheries surveys. Gillnets were placed at multiple locations in the reservoir to capture representative fish populations throughout the reservoir. An attempt was made to analyze tissue from multiple species including both predator species and bottom-dwelling prey species. Multiple fish were collected of each species and each predator fish (Rainbow Trout and Northern Pike) was filleted and the fillets were composited by species to run as one representative composite sample per species. Bottom-dwelling prey species (Largescale Sucker) were processed whole and composited for one representative sample for that species.

Table 6-13: Description of methods and parameters measured at water chemistry monitoring sites.

Site Name	Site Purpose	Sampling Method	Samples Collected
CF1	Biological communities upstream of the reservoir	Kicknet, Scrape method	Macroinvertebrates, Periphyton
CF3	Biological communities downstream of the reservoir	Kicknet, Scrape method	Macroinvertebrates, Periphyton
TFR1	Upper reservoir sampling site	Wisconsin plankton net	Zooplankton
TFR2	Middle reservoir sampling site	Wisconsin plankton net	Zooplankton
TFR3	Lower reservoir sampling site	Wisconsin plankton net	Zooplankton
Thompson Falls Reservoir	Representative fish community sample	Gillnet	Fish tissue

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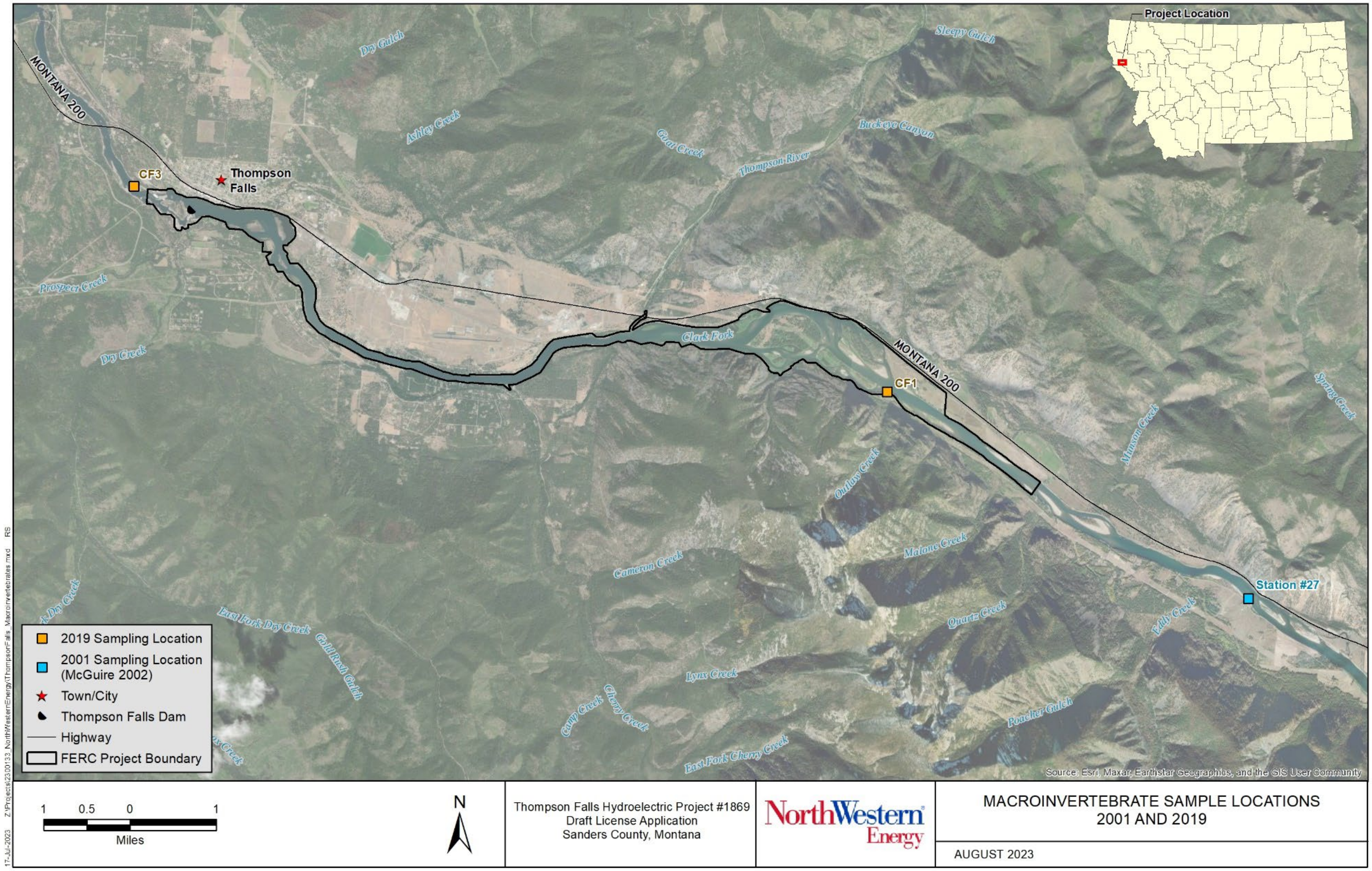
Figure 6-36: Locations of 2019 macroinvertebrate sampling (CF1, CF3) and McGuire's (2002) sampling in 2001 (Station #27).



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6.7.5.2 Benthic Macroinvertebrates

Macroinvertebrate data were collected upstream (site CF1) and downstream (site CF3) of Thompson Falls Reservoir in 2019 to compare the biological communities and look at any effects on those communities from the Project. **Table 6-14** shows a comparison of the macroinvertebrate data collected at monitoring sites CF1 and CF3. The 2019 biological monitoring found that the Clark Fork River upstream (CF1) and downstream of Thompson Falls (CF3) support very similar macroinvertebrate benthic densities. Late-July density estimates at CF3 reported 5,560 (±563) benthic macroinvertebrates per square meter (1,390 per sample), while upstream (CF1) densities averaged 5,115 (±950) per m^2.

In years of higher-than-normal discharge, macroinvertebrate densities are typically lower due to the flushing effect of high flows. Higher flows can reduce benthic macroinvertebrate densities by directly removing less velocity tolerant organisms (scuds, snails) or by removing silt in the gravels that favor midges and aquatic worms. Although higher than normal flows were observed in 2018 and 2019, midges (Diptera family: Chironomidae) still dominated the samples at both sites (Montana Biological Survey/Stag Benthics 2019).

Table 6-14: Mean macroinvertebrate values for 8 metrics used in the bioassessment scores for 2019 samples.

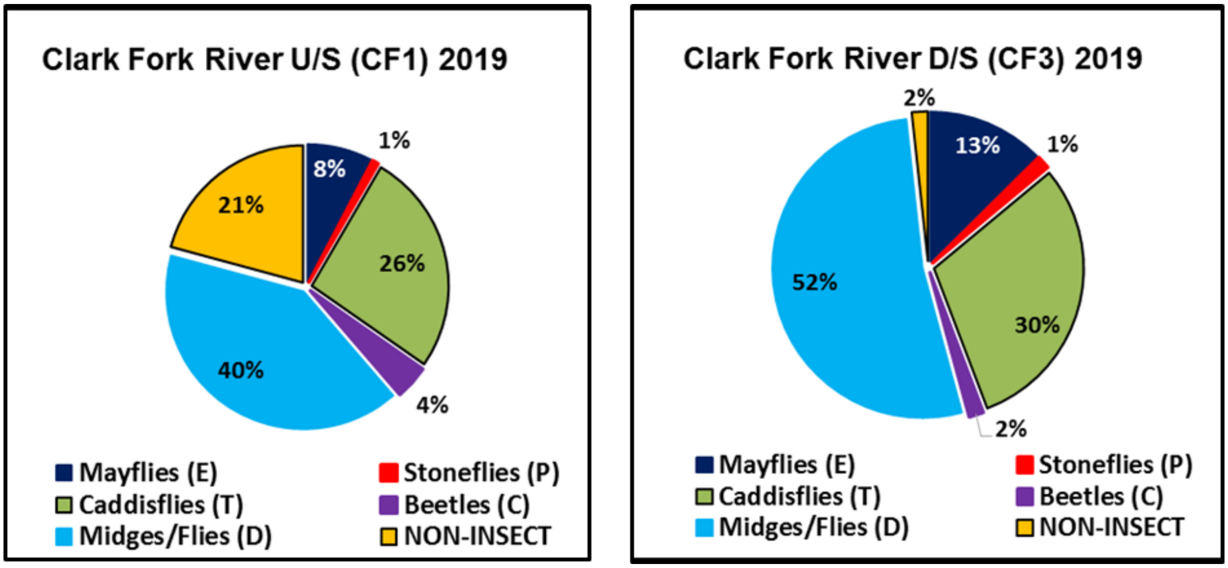
Metric	CF1	CF3
Taxa Richness	37	38.4
EPT Richness	16.4	19.6
Shannon Diversity (log2)	3.6	3.4
Biotic Index	5.3	5.0
% EPT	36%	44%
% Chironomidae	40%	48%
% Filterers	49%	67%
EPT/EPTC	47%	48%
Mean Densities (per m^2)	5,115 (± 956)	5,568 (± 563)
Metals Tolerance Index	2.5	2.9

Note: An average of 37 benthic macroinvertebrate taxa, including 16 EPT (*Ephemeroptera*, *Plecoptera*, and *Tricoptera*) species were collected per sample upstream of Thompson Falls, while 38 total taxa and 20 EPT taxa were collected downstream in 2019**.**

Macroinvertebrate community composition was also fairly similar upstream and downstream of Thompson Falls Dam except for a higher relative abundance of non-insect taxa reported at the CF1 site (**Figure 6-37**). The large non-insect taxa component at CF1 was largely comprised of *Lymnaeidae* and *Physidae* snails in the genera *Fossaria* and *Physella*, respectively. Dipterans accounted for 40 and 52 percent of the benthic community composition for CF1 and CF3 in 2019, respectively; this was largely composed of the midges, *Chironomidae*. Riffle beetles (*Coleoptera*:

family *Elmidae*) made up a small, but not insignificant, component of the benthic community at each Clark Fork River site (Montana Biological Survey/Stag Benthics 2019).

Figure 6-37: Macroinvertebrate community composition for sites CF1 and CF3.



Mayflies and caddisflies are important components of the Clark Fork River benthic community and to the bioassessment metrics, while Stoneflies represent a relatively small component (~1%) (**Figure 6-37**). Caddisflies were the most abundant of the EPT taxa in the Clark Fork River samples collected in 2019, representing 26 and 30 percent of the upstream (CF1) and downstream (CF3) communities, respectively. Of the 11 species of caddisflies collected at these sites, populations of three net-spinning caddisflies (*Cheumatopsyche, Hydropsyche occidentalis* and *H. morosa gr.*) were most abundant below the dam at site CF3, while the net-spinner, *Cheumatopsyche* and the long-horned caddisflies, *Ceraclea* and *Oecetis* were most abundant upstream of the reservoir at site CF1 (Montana Biological Survey/Stag Benthics 2019).

Mayflies were the third most abundant invertebrate group at the downstream site (CF3) in 2019, while upstream (CF1) they were the fourth most abundant group (*refer to* Figure 6-37). Of the 13 species of mayflies reported at site CF3, the most common were Tricos (mayflies in the genera *Tricorythodes*), *Tricorythodes minutus,* Blue-winged Olives *Acentrella and Baetis tricaudatus* and *Macaffertium* in the family *Heptageniidae*. A few *Attenella margarita* have been collected at this site. Site CF1 reported 8 species of mayflies with the dominant being Tricos, two *Heptageniidae* species, *Macaffertium* and *Heptagenia* and *Attenella margarita* (Montana Biological Survey/Stag Benthics 2019).

6.7.5.3 Periphyton

In the periphyton assemblage, there were two predominant taxa found upstream and downstream of the reservoir, *Achnanthidium minutissimum* and *Achnanthidium subatomus*. These two species comprised of 57.17 percent of the upstream sample and 55.97 percent of the downstream sample.

There was little change between the upstream and downstream metric scores, which ranged from good to excellent (**Table 6-15**).

Table 6-15: 2019 Clark Fork periphyton metric scores upstream and downstream of Thompson Falls Reservoir.

Site Name	Site Description	Date of Sample	Metric	Value	Rating
CF1	Clark Fork River upstream of Thompson Falls Reservoir	7/31/19	Shannon H	3.394	Excellent
			Species Richness	44	Excellent
			Dominant Taxon Percent	40.82%	Good
			Siltation Taxa Percent (Sediment)	11.24%	Excellent
			Pollution Index (Nutrients)	2.792	Excellent
			Disturbance Taxa Percent (Metals)	40.82%	Good
			Abnormal Cells Percent (Metals)	0.00%	Excellent
			Bioindex (Montana DEQ Mountains)	N/A	Good
CF3	Clark Fork River downstream of Old Powerhouse	7/31/19	Shannon H	3.670	Excellent
			Species Richness	52	Excellent
			Dominant Taxon Percent	30.22%	Good
			Siltation Taxa Percent (Sediment)	9.83%	Excellent
			Pollution Index (Nutrients)	2.729	Excellent
			Disturbance Taxa Percent (Metals)	30.22%	Good
			Abnormal Cells Percent (Metals)	0.00%	Excellent
			Bioindex (Montana DEQ Mountains)	N/A	Good

6.7.5.4 Zooplankton

Zooplankton were collected at three sites in Thompson Falls Reservoir in July 2019, using a vertical plankton tow. Results of the zooplankton tows are displayed in **Table 6-16**. Zooplankton concentrations in the reservoir were quite low, which is not surprising given the short residence time of water in the reservoir. Reservoir residence times of greater than 18 days are generally required to support a sustainable zooplankton population (Brook and Woodward 1956). This time is needed for the zooplankton to successfully reproduce before being flushed downstream. Typical residence times of water in Thompson Falls Reservoir range from less than 4 hours in June to approximately 17 hours in September (*refer to* **Figure 6-10**).

Table 6-16: Zooplankton data collected from Thompson Falls Reservoir in 2019.

Taxon		Site TFR1 (Upstream end of TF Reservoir) 2019		Site TFR2 (Mid TF Reservoir) 2019		Site TFR3 (Downstream end of TF Reservoir) 2019	
		Count	Cells / ml	Count	Cells / ml	Count	Cells / ml
Cladocera	Chydoridae	0	0	0	0	1	0.00000161
Copepoda	Cyclopoida	1	0.00000189	4	0.00000821	5	0.00000804
Copepoda	Harpacticoida	0	0	1	0.00000205	0	0
Rotifera	Conochilus	0	0	2	0.00000411	0	0
Rotifera	Euchlanis	3	0.00000568	9	0.00001848	6	0.00000965
Rotifera	*Filinia longiseta*	2	0.00000378	0	0	0	0
Rotifera	*Filinia terminalis*	0	0	4	0.00000821	7	0.00001126
Rotifera	*Gastropus hyptopus*	1	0.00000189	0	0	1	0.00000161
Rotifera	*Kellicottia longispina*	9	0.00001703	3	0.00000616	4	0.00000643
Rotifera	*Keratella cochlearis*	5	0.00000946	1	0.00000205	4	0.00000643
Rotifera	*Keratella testudo*	9	0.00001703	0	0	7	0.00001126
Rotifera	Lecane	0	0	0	0	2	0.00000322
Rotifera	Monostyla lunaris	0	0	0	0	1	0.00000161
Rotifera	Pompholyx	0	0	2	0.00000411	3	0.00000483
Rotifera	Rotifera	4	0.00000757	6	0.00001232	8	0.00001287
Rotifera	Synchaeta	1	0.00000189	0	0	0	0
Rotifera	*Trichotria tetractis*	1	0.00000189	0	0	0	0

6.7.5.5 Fish Tissue Biocontaminants

In the fall of 2019, fish tissue samples were collected in Thompson Falls Reservoir for the purpose of quantifying concentrations of biocontaminants in fish. Eleven fish in total were collected as a part of this effort. Lengths and weights were recorded for each fish, and the fish from each species were composited into a single representative sample for the species (**Table 6-17**). Two predator species were represented in this sampling, Northern Pike and Rainbow Trout, and one bottom-dwelling prey species was represented, Largescale Sucker for a total of three representative composite samples.

Table 6-17: Individual fish length and weight data for composited fish tissue samples collected in 2019.

Fish Species	Length (mm)	Weight (g)
Largescale Sucker	230	140
Largescale Sucker	265	222
Largescale Sucker	260	218
Largescale Sucker	250	196
Northern Pike	720	3238
Northern Pike	640	2592
Northern Pike	625	2138
Northern Pike	530	908
Northern Pike	495	723
Rainbow Trout	420	1098
Rainbow Trout	460	1080

Notes: g = gram; mm = millimeter

Results of the fish tissue analysis are shown below in **Table 6-18**. These data were provided to FWP to supplement their fish consumption advisory dataset. FWP samples Thompson Falls Reservoir once every 5 years to maintain and update any fish consumption advisories that may be in place. Currently, there are fish consumption advisories for Northern Pike, Rainbow Trout, Smallmouth Bass, and Yellow Perch from Thompson Falls Reservoir due to the presence of Mercury (FWP 2021).

Table 6-18: 2019 Fish tissue biocontaminant analysis results by species.

Analyte	Rainbow Trout	Northern Pike	Largescale Sucker
Strontium	ND	0.8	26.2
Copper	1	1	4
Manganese	ND	2	36
Nickel	ND	ND	ND
Zinc	17	18	61
Arsenic	ND	ND	0.4
Cadmium	ND	ND	ND
Chromium	ND	ND	0.4
Selenium	0.9	0.6	0.7
Mercury	0.32	0.57	ND
Aluminum	ND	ND	47
Iron	30	17	115
Lead	ND	ND	ND

Notes: ND = that the sample result was not found at a detectable concentration. All results are presented in mg-kg dry

6.8 Environmental Measures

6.8.1 Existing Environmental Measures

The Licensee has frequently monitored TDG in the Clark Fork River from 2003 to 2022. NorthWestern has also conducted fisheries monitoring to assess the frequency of occurrence of GBT. In 2010, a TDG Control Plan was developed to reduce TDG in the tailrace, while maintaining operational safety and maximizing attraction flow for fish passage. The Plan has been followed since.

6.8.2 Proposed Environmental Measures

NorthWestern is proposing to implement the PM&E measure described below:

- Monitor TDG levels during high flow periods in the Clark Fork River and update the TDG Control Plan as necessary.

6.9 Environmental Effects

6.9.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section – 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the current license, reservoir water level fluctuations to 4 feet below full pool could occur periodically. A minor increase in turbidity was found when the reservoir was drawn down below 3 feet. No other impacts to water quality were detected in the assessment of the 4-foot drawdown during the 2019 operation's test.

The TDG Control Plan would continue to be implemented, and no additional impacts to TDG would be expected to occur. NorthWestern will continue to monitor TDG levels during periods of high flow in the Clark Fork River.

6.9.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations.

This section discusses the potential direct and indirect effects of proposed Project operations on water quality in Thompson Falls Reservoir (including the confluence of where the Thompson River flows into the reservoir), the bypassed reach (including the confluence of where Prospect Creek flows into the bypassed reach), and in the Clark Fork River downstream of the powerhouses. The analysis of potential effects is limited to operations, as no new construction is proposed under the new license.

Operation of the Project results in TDG levels in excess of 110 percent during periods of high flow. However, no significant adverse impacts to fish have been found as a result of the TDG levels at the Project. NorthWestern will continue to monitor TDG levels during periods of high flow in the Clark Fork River.

From 2019 through 2022, NorthWestern conducted tests to determine what effect radial gate configurations had on TDG during high flow conditions in the spring. NorthWestern proposes to use this data, in conjunction with the TDG data collected during periods of normal operation, to update the 2010 TDG Control plan to guide operations during periods of spill.

Proposed modifications to the Project boundary incorporate the lands and water that are needed for Project purposes. The proposed Project boundary modification will have no detrimental impact on water resources.

6.10 Unavoidable Adverse Impacts

Normal operation of the Project during limited periods of high streamflow that result in spill conditions, TDG may exceed the water quality standard of 110 percent. However, the standard has an exemption for reasonable operation of the Project being considered natural (MCA 75-5-306(2)).

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7. Fisheries and Aquatic Resources

7.1 Affected Environment

This Section describes the fish and aquatic resources within and outside of the FERC Project boundary. Some of the fish species in this Project area are migratory, therefore this Section includes a description of the Lower Clark Fork River Drainage upstream and downstream of the Project boundary, as well as Prospect Creek, Thompson River, and Cherry Creek, important tributaries (**Figure 7-1**).

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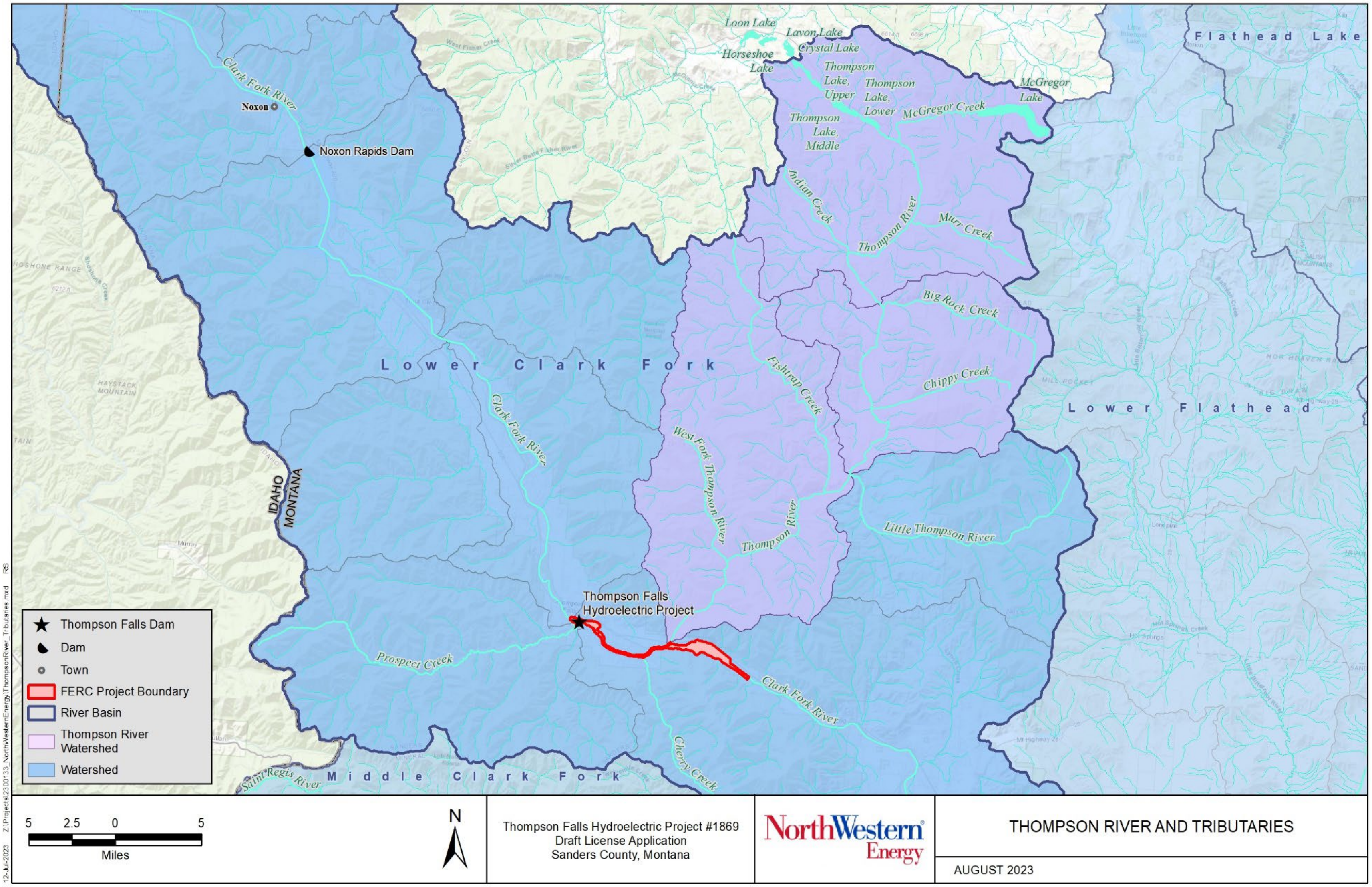
Figure 7-1: Lower Clark Fork River drainage.



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7.1.1 Aquatic Habitat

7.1.1.1 Thompson Falls Reservoir

The current Project boundary encompasses about 12 miles of river and reservoir. The maximum depth of the reservoir is approximately 90 feet. For bathymetric maps of the reservoir *refer to* **Figures 6-4** through **6-9**.

The reservoir is 400 to 1,800 feet wide. The downstream 6-miles of the reservoir provides lacustrine (lake-like) habitat and the upstream half (6-12 miles upstream) provides lotic (riverine-like) habitat.

The downstream section has substantially lower water velocity, mean widths near 1,673 feet and abundant aquatic vegetation. The upstream section of the reservoir has noticeable flowing water, average widths around 459 feet and minimal aquatic vegetation. These differing habitat characteristics influence the fish species community between the upper and lower reservoir.

Water temperature data collected in Thompson Falls Reservoir indicate that the reservoir does not stratify in the summer months and is generally thermally homogeneous. The Project does not modify water temperatures, as incoming water temperatures to the reservoir have been shown to be the same as those leaving the Project below the dam and powerhouse (*refer to* **Exhibit E - Section 6.7.3 –Water Temperature**). The cool water influence of the Thompson River extends downstream in Thompson Falls Reservoir a short distance, approximately 328 feet downstream of the Thompson River confluence and 50 feet from the right bank. Additional water temperature data indicate there may also be some cool water potentially from groundwater inflow, near Cherry Creek, approximately 2 miles downstream from the Thompson River. However, these small areas of cool water do not extend throughout the reservoir but appear to be highly localized. It does not appear that there are large cool water zones in Thompson Falls Reservoir.

Tributaries that feed into the Thompson Falls Reservoir include Cherry Creek and the Thompson River (*refer to* **Figure 7-1**). Cherry Creek enters on the south side of the reservoir and is known to provide habitat for salmonids. Cherry Creek is a relatively small tributary and averages 16 feet across at its mouth and quickly narrows to 11 feet across within about 200 feet upstream of its confluence with the Clark Fork River. Where Cherry Creek enters the reservoir there is a large plunge pool that is greater than 5 feet deep (NorthWestern 2023).

The Thompson River flows into Thompson Reservoir approximately 6 miles upstream of the Thompson Falls dams. Approximately 0.3 miles of the Thompson River at the confluence with the Clark Fork River are within the FERC Project boundary. The Thompson River is a considerably larger tributary than Cherry Creek and has more variable habitat at the confluence with the Thompson Falls Reservoir (**Photograph 7-1**).

The Thompson River has several major tributaries including the West Fork Thompson River, Fishtrap Creek, the Little Thompson River, Chippy Creek, Murr Creek, and Big Rock Creek. The confluence of the Little Thompson River is near the 17-Mile Bridge, and both Fishtrap Creek and the West Fork Thompson River join the Thompson River downstream of the mouth of the Little Thompson River. The West Fork Thompson River and Fishtrap Creek support Bull Trout spawning and rearing habitat.

Photograph 7-1: Aerial view of the confluence of the Thompson River with the Clark Fork River

7.1.1.2 Clark Fork River Downstream of Thompson Falls Dams

Downstream of the Thompson Falls Project is Noxon Rapids Reservoir, part of Avista's Clark Fork River Project (FERC Project P-2058). Noxon Rapids Reservoir is the largest reservoir in the Lower Clark Fork River basin, impounding an area of approximately 8,000 acres at full pool (FWP 2019).

The habitat in the reach of the Clark Fork River downstream of the Project is classified as riverine, but habitat conditions are influenced by the operations of Noxon Rapids Dam. Tailrace elevations immediately downstream of the Project are related to the total volume of water passing through the Project. The tailrace elevation rises with increased flow through the Project while reduced flows result in lower tailrace elevations. However, natural Clark Fork River channel features act as grade control in this reach rapidly attenuating the influence of Project outflows downstream. In addition, Noxon Rapids Reservoir operations have an influence on Clark Fork River flows all the way upstream to the tailrace of the Project. At Birdland Bay Bridge, 3.2 miles downstream of the

Project, water surface elevations are relatively stable and influenced predominately by operations of Avista's Noxon Rapids Dam (NorthWestern 2023).

Prospect Creek flows into the Clark Fork River about 2,600 feet downstream of the Main Channel Dam and directly across from the Dry Channel Dam (**Photograph 7-2**). Prospect Creek provides a cold-water refuge for salmonids during the warm summer months.

Photograph 7-2: Aerial of Thompson Falls Hydroelectric Project and Prospect Creek, June 2017.

As described in **Exhibit E - Section 6.10 – Unavoidable Adverse Impacts**, during high flows when the Project is spilling in the spring TDG in the Project tailrace may exceed 110 percent, as measured at the Birdland Bay Bridge site. Mean TDG is more than 115 percent at the Birdland Bay Bridge for short periods in the highest flow years. The percentage of time when TDG exceeds 120 percent at the High Bridge is minimal. TDG has never exceeded 120 percent at the Birdland Bay Bridge site.

Although the Clark Fork River exceeds the water quality standard of 110 percent saturation at the High Bridge and Birdland Bay Bridge sites during peak flow seasons in most years, no observed impact on fish has been detected.

Dissolved gas super-saturation can cause GBT, a variety of physiological symptoms, which can be harmful or fatal to fish and other aquatic organisms. The risk to aquatic life from elevated levels of TDG increases with dosage and exposure (Weitkamp and Katz 1980). In addition, the level of

TDG that salmonids can tolerate varies depending on species, body size, general physical condition, swimming depth and water temperature (Johnson et al. 2005). Weitkamp and Katz (1980) concluded that a dramatic change occurs in both the number of deaths and the time to death at approximately 120 to 125 percent TDG in shallow water (3 feet or less). At gas pressures below this general level, a low incidence of GBT will be found in juvenile salmonids, and deaths will occur at a low rate. Above 120 to 125 percent TDG, mortality due to GBT increases dramatically. More recent studies confirm these conclusions in natural waters. Weitkamp et al. (2003) evaluated the incidence of GBT below Cabinet Gorge Dam on the Clark Fork River and found that continuous supersaturation exceeding about 125 to 130 percent of saturation for prolonged periods produced GBT in at least some fish in the lower Clark Fork River. However, intermittent exposure to 120 to 130 percent TDG produced GBT signs in a very small number of Largescale Sucker and Yellow Bullhead. Backman and Evans (2002) examined 4,667 adult Chinook Salmon (*Oncorhynchus tshawytscha)*, 1,878 Sockeye Salmon (*O. nerka*), and 1,431 Steelhead (*O. mykiss*) at Bonneville Dam for incidences of GBT at Bonneville Dam on the Columbia River. They found GBT symptoms were uncommon (<0.5%) among all species when TDG remained below 125 percent. The severity of GBT increased as TDG increased, but most symptoms were minor. Severe symptoms were observed only when TDG exceeded 126 percent.

In 2008, 2009, 2011, 2012, and 2014 fish were captured via electrofishing during high flow downstream of the Thompson Falls Project and upstream of the Highway 200 Bridge. Fish were captured and visually inspected for signs of GBT before being released. The gills, lateral line, dorsal fin, and caudal fin were visually examined for blistering, bubbling, boils, or discoloration of the gills. The sampling efforts recorded 11 to 16 species recorded each sampling year and between 0.4 to 9 percent of the fish showing signs of GBT symptoms during a sample event (**Table 7-1**). Peak flows during the sampling years varied from 57,700 cfs to more than 100,000 cfs.

Table 7-1: Gas bubble trauma in fish collected downstream of the Thompson Falls Project, 2008-2014.

Year	Peak Flow (cfs)	# of Fish	# of Species	# of Fish with GBT Symptoms (% of fish sampled)	Species with Symptoms
2008	75,600	220	16	1 (0.4%)	L WF
2009	57,700	276	14	0	None
2010	58,000	No Sampling	-	-	-
2011	104,000	949	15	67 (7%)	RB, L WF, LS SU, PUMP, N PMN, LL
2012	75,300	295	11	3 (1%)	LS SU, SMB, RB
2013	63,700	No Sampling	-	-	-
2014	96,020	340	13	31 (9%)	RB, LL, L WF, MWF, SMB

Notes: cfs = cubic feet per second; LL = Brown Trout; N PMN = Northern Pikeminnow; LS SU =Largescale Sucker; PUMP = Pumpkinseed; L WF = Lake Whitefish; RB = Rainbow Trout; MWF = Mountain Whitefish; SMB = Smallmouth Bass

7.1.1.3 Clark Fork River Upstream of Thompson Falls Reservoir

Riverine portions of the Clark Fork River (downstream of Flathead River confluence) provide angling opportunities for smallmouth bass and northern pike. Native suckers, minnows, and whitefish are most common in this reach. Trout are limited due to warm summer water temperatures.

7.1.2 Fish Species and Distribution

7.1.2.1 Fish Populations in the Project Vicinity

Native species present in the Project area include salmonids (Westslope Cutthroat Trout, Bull Trout, and Mountain Whitefish) and non-salmonids (Longnose and Largescale sucker, Northern Pikeminnow, Peamouth, Longnose Dace, Redside Shiner, and Sculpin spp.). FWP's native species management focuses on native salmonids with emphasis on the federally threatened Bull Trout (FWP 2013, 2019) and Westslope Cutthroat Trout, Montana Species of Concern. (Westslope Cutthroat Trout are also considered a USFS Region 1 sensitive species. Bull Trout are discussed in detail in **Exhibit E - Section 10 – Threatened and Endangered Species**, of this Exhibit E. Westslope Cutthroat Trout are discussed in detail in **Exhibit E - Section 7.1.2.1 – Sensitive Fish Species or Species of Concern**, of this Exhibit E.)

Restoration, maintenance, and protection of native species and their habitats is one of FWP's high priorities under their fisheries management program (FWP 2019). Some of the more common nonnative species present in the Project vicinity include game fish such as Largemouth Bass, Smallmouth Bass, Northern Pike, Yellow Perch, Rainbow Trout, and Brown Trout (FWP 2013, 2019). Walleye (nonnative and illegally introduced), another popular sportfish for anglers, are established downstream of the Project.

NorthWestern conducts routine fisheries surveys. These surveys include fall gillnetting in Thompson Falls Reservoir since 2004, spring electrofishing in Thompson Falls Reservoir and fall electrofishing in two reaches of the Clark Fork River since 2009. The objective for these fisheries surveys is to collect information on species composition and relative abundance. Annual reports of results are submitted to FERC. This information helps track annual and long-term changes to the fish community. Fish species known to be present downstream and upstream of the Project are summarized in **Table 7-2**.

Table 7-2: Summary of fish recorded downstream of Thompson Falls Dam, at the upstream fish passage facility, and upstream of Thompson Falls Dam.

			Downstream of Thompson Falls Dam	Thompson Falls Upstream Fish Passage Facility	Upstream of Thompson Falls Dam (downstream of confluence with the lower Flathead River)	
Fish	**Common Name**	**Scientific Name**	**Noxon Reservoir**	**Work Station**	**Thompson Falls Reservoir**	**Clark Fork River (Above Islands and Paradise to Plains)**
NATIVE SPECIES						
BULL	Bull Trout	*Salvelinus confluentus*	P	P	P	P
LN DC	Longnose Dace	*Rhinichthys cataractae*	P	-	-	P
LN SU	Longnose Sucker	*Catostomus castostomus*	P	P	P	P
LS SU	Largescale Sucker	*Catostomus macrocheilus*	P	P	P	P
MWF	Mountain Whitefish	*Prosopium williamsoni*	P	P	P	P
N PMN	Northern Pikeminnow	*Ptychocheilus oregonensis*	P	P	P	P
PEA	Peamouth	*Mylocheilus caurinus*	P	P	P	P
NPMN x PEA	Northern Pikeminnow x Peamouth	*Ptychocheilus oregonensis x Mylocheilus caurinus*	P	P	-	-
RS SH	Redside Shiner	*Richardsonius balteatus*	P	-	P	P
WCT	Westslope Cutthroat Trout	*Oncorhynchus clarkii lewisi*	P	P	P	P
COT	Sculpin spp.	*Cottus spp.*	P	-	P	P
NONNATIVE SPECIES						
BL BH	Black Bullhead	*Ameiurus melas*	P	-	P	-
BULL x EB	Bull x Brook Trout Hybrid	*Salvelinus confluentus x S. fontinalis*	P	P*	-	-
EB	Brook Trout	*Salvelinus fontinalis*	P	P*	-	-
LL	Brown Trout	*Salmo trutta*	P	P	P	P
KOK	Kokanee	*Oncorhynchus nerka*	P	P	-	-
LMB	Largemouth Bass	*Micropterus salmoides*	P	P	P	-
LT	Lake Trout	*Salvelinus namaycush*	P	P*	P	-
L WF	Lake Whitefish	*Coregonus clupeaformis*	P	-	-	-
NP	Northern Pike	*Esox lucius*	P	-	P	P
PUMP	Pumpkinseed	*Lepomis gibbosus*	P	-	P	P
RB	Rainbow Trout	*Oncorhynchus mykiss*	P	P	P	P
RBxWCT	Rainbow x Westslope Cutthroat Trout hybrid	*Oncorhynchus clarkii lewisi x O. mykiss*	P	P	P	P
SMB	Smallmouth Bass	*Micropterus dolomieu*	P	P*	P	P
WE	Walleye	*Sander vitreus*	P	P*	-	-
YP	Yellow Perch	*Perca flavescens*	P	-	P	P
YL BL	Yellow Bullhead	*Ameiurus natalis*	P	-	P	-

Notes: P = present; - = not observed; *= not passed upstream of the upstream fish passage facility.
Source: J. Blakney, FWP, personal communication, March 21, 2018; PPL Montana 2010-2014; NorthWestern 2015-2023.

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7.1.2.2 Sensitive Fish Species and Species of Concern

The federally-listed threatened Bull Trout are discussed in **Exhibit E - Section 10 – Threatened and Endangered Species**, of this Exibhit E. There are two additional special status fish species, the Westslope Cutthroat Trout, and Columbia River Redband Trout. Westslope Cutthroat Trout are present in the Project vicinity but are not common. The Columbia River Redband Trout is known to occur in the Kootenai National Forest (KNF) and Kootenai River drainage but has not been documented in the lower Clark Fork River drainage (Muhlfeld et al. 2015). Therefore, only the Westslope Cutthroat Trout is discussed in detail.

Westslope Cutthroat Trout are designated as a sensitive species by the USFS Region 1 (2011) and they are also a Montana Species of Concern (SOC). These designations are due to the decline in historic range that is attributed to hybridization, most notably with Rainbow Trout, habitat loss and fragmentation, diversion and dam construction, competition from nonnative species, and overfishing and harvesting (Shepard et al. 2005; FWS 1999; Montana Natural Heritage Program [MNHP] and FWP 2018). Historically Westslope Cutthroat Trout were prevalent in headwater streams on both sides of the Continental Divide (~33,000 miles in Montana) and are now estimated to be present in about 13,000 miles (39%) of their historical range in Montana (Shepard et al. 2003; 2005).

Hybridization between Rainbow Trout and Westslope Cutthroat Trout has occurred throughout the Lower Clark Fork River drainage as a result of historic Rainbow Trout stocking efforts in the mainstem Clark Fork River and tributaries. Both visual identification and genetic testing of individuals have confirmed that hybrid Westslope Cutthroat Trout x Rainbow Trout are located within the Project area.

Westslope Cutthroat Trout life history traits and habitat requirements have been well documented (GEI 2005; FWS 1999; McIntyre and Rieman 1995; Shepard et al. 1984; Shepard et al. 2003; COSEWIC 2006). In the Lower Clark Fork River drainage, Westslope Cutthroat Trout are either migratory (fluvial/adfluvial) or resident fish. Migratory life forms are either fish that spend most of their adult lives in lakes (adfluvial) or rivers (fluvial) and migrate into tributaries to spawn. Resident Westslope Cutthroat Trout are fish that generally spend their entire lives in the tributaries in which they were born and are usually much smaller in size than their migratory counterparts.

Stream temperature is a key factor in determining distribution and persistence of Westslope Cutthroat Trout (Bear et al. 2005). Westslope Cutthroat Trout prefer clean and cold waters and have optimal growth temperatures, 56.5°F (Bear et al. 2005), similar to Bull Trout, 55.8°F (Selong et al. 2001). In general, juvenile Westslope Cutthroat Trout prefer temperatures ranging between 44.6° and 60.8°F in the tributaries and adult Westslope Cutthroat Trout prefer temperatures less than 60.8°F (McIntyre and Rieman 1995; Sloat 2001). The upper incipient lethal temperature for Westslope Cutthroat Trout (the temperature that is lethal to 50% of the test fish) was 67.3°F (95% confidence interval, 66.4°-67.8°F) (Bear et al. 2007). The salmonid fishery in Thompson Falls Reservoir appears to be concentrated at the mouths of the Thompson River and Cherry Creek, as reported by anglers (Terrazas and Kreiner 2017). These confluence areas have cooler water temperatures from the inflow of the cool tributaries and are thus more conducive to summer use by salmonids.

Migratory Westlope Cutthroat home to their natal streams and have been observed traveling over 120 miles in the Flathead River drainage (Shepard et al. 1984) and between 2.6 to 70 miles in the Upper Clark Fork River drainage (Schmetterling 2001). NorthWestern has also documented long range migratory movements of Westslope Cutthroat Trout after ascending the Project's upstream fish passage facility. After release upstream, Westslope Cutthroat Trout have been reported over 60 river miles upstream from the Project in the St. Regis River and nearly 100 river miles upstream in the South Fork Jocko River in the lower Flathead River drainage. Westslope Cutthroat floy tagged at the upstream fish passage facility have also been found in the middle Clark Fork River upstream of the town of Paradise and in the Thompson River drainage (NorthWestern 2023). Westlope Cutthroat have also been recorded making multiple ascents at the fish passage facility following these long upstream and then downstream migrations. After 12 years of operations (2011-2022), a total of 310 Westslope Cutthroat Trout (259 of which were tagged with passive integrated transponder tags [PIT tags]) have ascended the fish passage facility with a range of nine to 48 per year measuring between 180 to 486 mm. Westslope Cutthroat Trout are observed at the fish passage facility in the spring before peak streamflows in March to May, after the peak streamflows subside in June and July, occasionally in August, and again in the fall months (September and October) before the fish passage facility closes for the season (NorthWestern 2018; unpublished data). In 2014, a remote PIT tag array sensor was installed in the Thompson River and has operated year-round to present. The array has detected 54 unique Westslope Cutthroat with a history of ascending the fish passage facility and three of these fish were also detected in Fishtrap Creek, a Thompson River tributary. An average of 19 Westslope Cutthroat Trout were PIT tagged annually (2014-2022) at the fish passage facility and released upstream with about one-quarter (5) detected moving upstream and entering the Thompson River (NorthWestern unpublished data).

Although Westslope Cutthroat Trout have been collected at the fish passage facility and passed upstream into Thompson Falls Reservoir, they are rarely found in the reservoir. Summer water temperatures in the mainstem Clark Fork River, upstream and downstream of the Project are elevated (*refer to* **Exhibit E - Section 6.7.3 – Water Temperature**), and not conducive for Westslope Cutthroat Trout. PIT and floy tagging efforts at the upstream fish passage facility show that most tag returns occur in tributaries to the Clark Fork River. Only three Westslope Cutthroat Trout were captured in annual gillnetting surveys between 2005 and 2017, one in 2011 and two in 2017, providing evidence that Westlope Cutthroat spend little time in Thompson Falls Reservoir, and primarily migrate quickly through this suboptimal habitat.

7.1.2.3 Fisheries Downstream of Thompson Falls Dam

Downstream of the Project is Avista's Clark Fork River Project (P-2058), including Noxon Rapids Dam (immediately downstream of the Project) and Cabinet Gorge Dam (downstream of Noxon

Rapid Dam). Noxon Rapids Reservoir supports a popular cool water fisheries for Yellow Perch, Northern Pike, Smallmouth Bass and Largemouth bass. Noxon Rapids Reservoir hosts up to seven bass fishing tournaments annually, and currently holds the state record for Northern Pikeminnow. Native suckers and minnow have declined dramatically in Noxon Rapids Reservoir in recent years (FWP 2019).

Walleye were illegally introduced into Noxon Reservoir in the late-1980s or early-1990s and multiple introductions were reported throughout the 1990s (FWP 2019). Annual gill net surveys over the last 20 years (2000-2021) show changes in the fish community since the establishment of a naturally reproducing Walleye population in the early 2000s (FWP 2013). Walleye abundance in Noxon Rapids Reservoir has increased over the last 20 years while other native species like Largescale Sucker, Northern Pikeminnow, and Peamouth have decreased.

Walleye have not been documented upstream of Thompson Falls Dam in the Clark Fork River, and they are considered by FWP to be an undesirable species in the lower and middle Clark Fork River drainage. For this reason, the Thompson Falls fish passage facility is not operated as a volitional fish passage facility. Each fish that is collected at the fish passage facility is handled, so that undesirable species, such as Walleye, can be prevented from passing upstream.

The decline in native species in Noxon Rapids Reservoir may also be reflected in the fish collections at the Thompson Falls fish passage facility. A decline in native species captures at the upstream fish passage facility has been observed since the start of operations in 2011 (NorthWestern 2023).

7.1.2.4 Thompson Falls Reservoir Fisheries

October gillnetting has been completed annually since 2004 in Thompson Falls Reservoir. Methods include fishing 10 nylon multifilament experimental sinking gillnets, 125 feet long and 6 feet deep, with five separate 25-foot panels consisting of 0.75-, 1-, 1.25-, 1.5-, and 2-inch bar-measure square mesh for approximately 24 hours. The nets are distributed from the City, upstream to the island complex **(Figure 7-2).** The catch per net in 2022 (the most recent survey), along with the average, minimum and maximum catch per net between 2004 and 2021 is found in **Table 7-3**.

In general, salmonids are rarely observed in Thompson Falls Reservoir gillnet catches. The most common species captured by gillnetting in Thompson Falls Reservoir is Black Bullhead, with Northern Pike being the second-most common species (**Table 7-5**). In 2022, the most common species captured in the reservoir was Northern Pike followed by Yellow Perch, Pumpkinseed, Northern Pikeminnow, Smallmouth Bass, and Black Bullhead. Since upstream fish passage facility operations commenced in 2011, three PIT tagged fish passed upstream of the fish passage facility have been collected in the reservoir gillnetting (1 Rainbow Trout in 2012 and 2021, and 1 Brown Trout in 2012).

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Figure 7-2: The ten gillnet sampling sites and electrofishing site in Thompson Falls Reservoir.

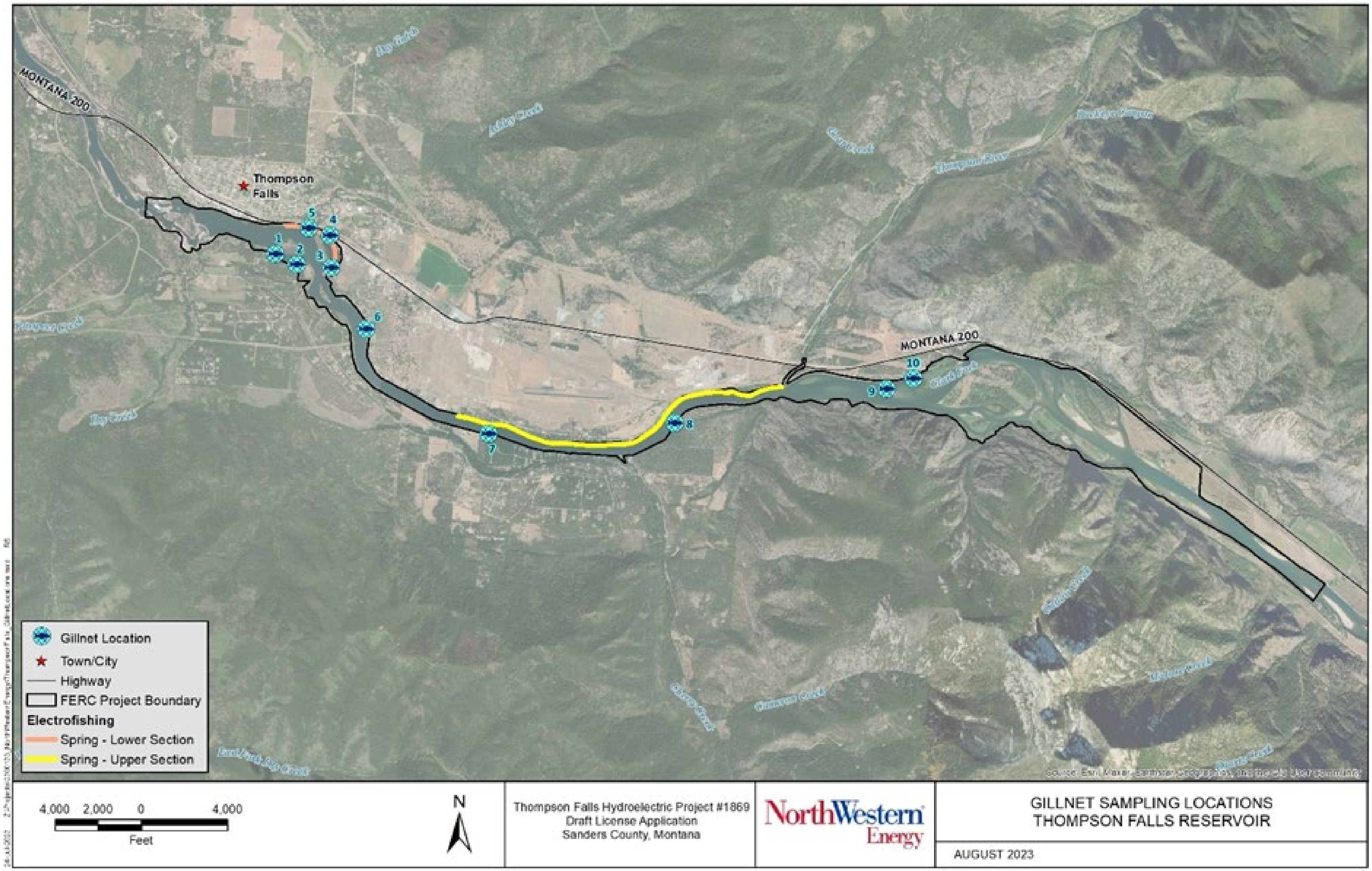

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Table 7-3: Catch per net, by species, during annual October gillnetting, Thompson Falls Reservoir.

Species	2022 Catch per Net	2004-2021 Catch Per Net		
		Avg	Min	Max
Black Bullhead	0.5	3.1	-	14.1
Brown Trout	-	-	-	0.2
Largemouth Bass	0.1	0.1	-	0.3
Longnose Sucker	-	-	-	0.5
Largescale Sucker	0.1	0.7	0.1	1.3
Lake Whitefish	-	-	-	0.1
Mountain Whitefish	0.1	-	-	-
Northern Pike	3.7	2.7	1.0	4.9
Northern Pike Minnow	0.7	0.4	-	1.0
Peamouth	-	-	-	0.1
Pumpkinseed	0.9	0.3	-	1.8
Rainbow Trout	-	0.1	-	0.4
Smallmouth Bass	0.6	0.2	-	0.5
Westslope Cutthroat Trout	-	-	-	0.2
Yellow Perch	1.1	0.7	0.1	1.8
Yellow Bullhead	-	-	-	0.1
Total	**7.8**	**8.2**	**3.3**	**23.1**

Note: A dash indicates no (zero) fish of that species was captured

In addition to gillnetting, nighttime electrofishing has been completed since 2009 to supplement gillnetting efforts and further describe the fish population in Thompson Falls Reservoir. Two reaches are sampled, with one in the lower reservoir along Highway 200, and one from the mouth of Thompson River downstream (**Figure 7-3**). The electrofishing catch per unit effort of salmonids is greater in the upstream section (29 salmonids per hour) than the downstream section (5 salmonids per hour).

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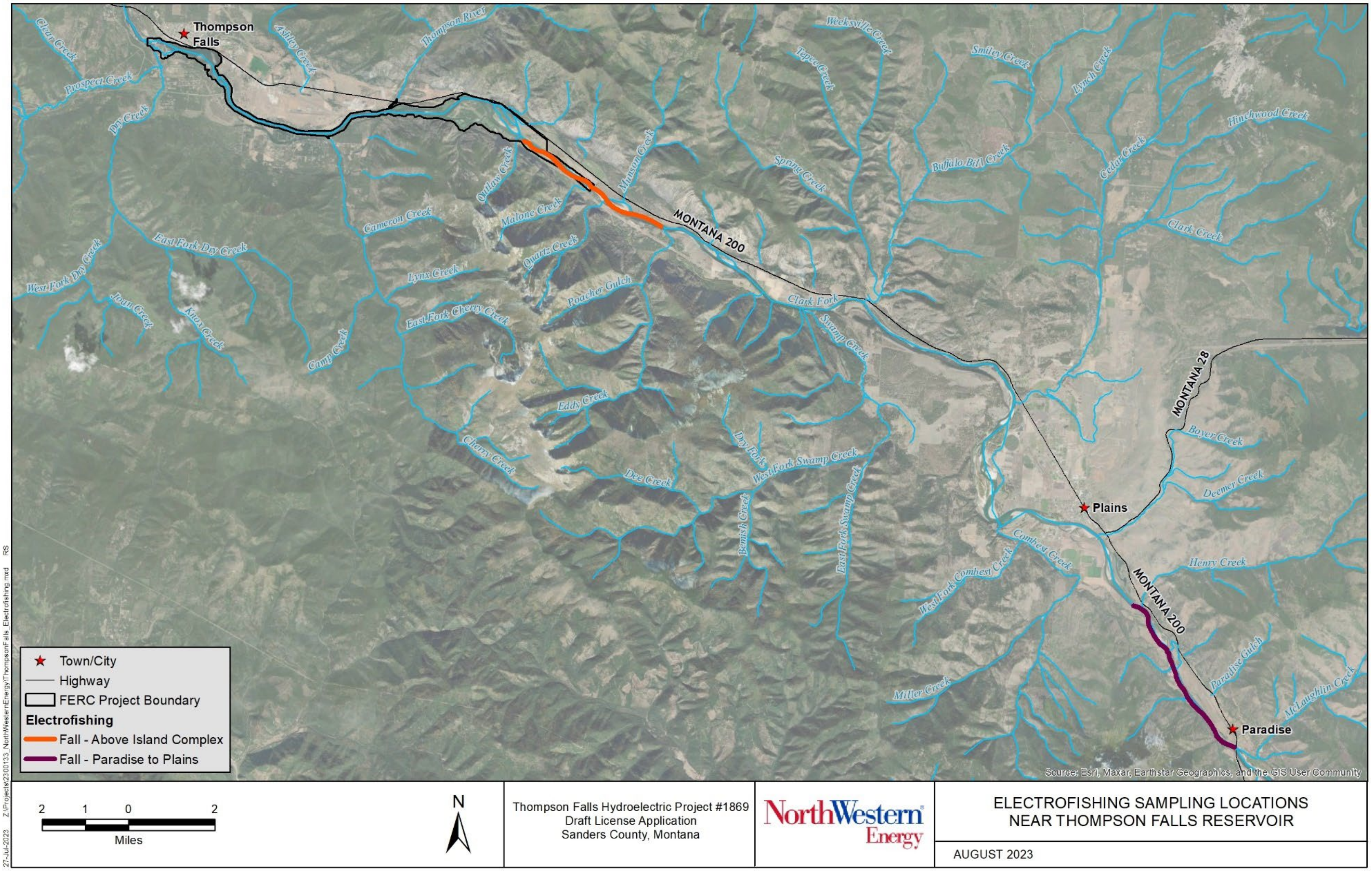
Figure 7-3: Upstream electrofishing sections on the Clark Fork River.



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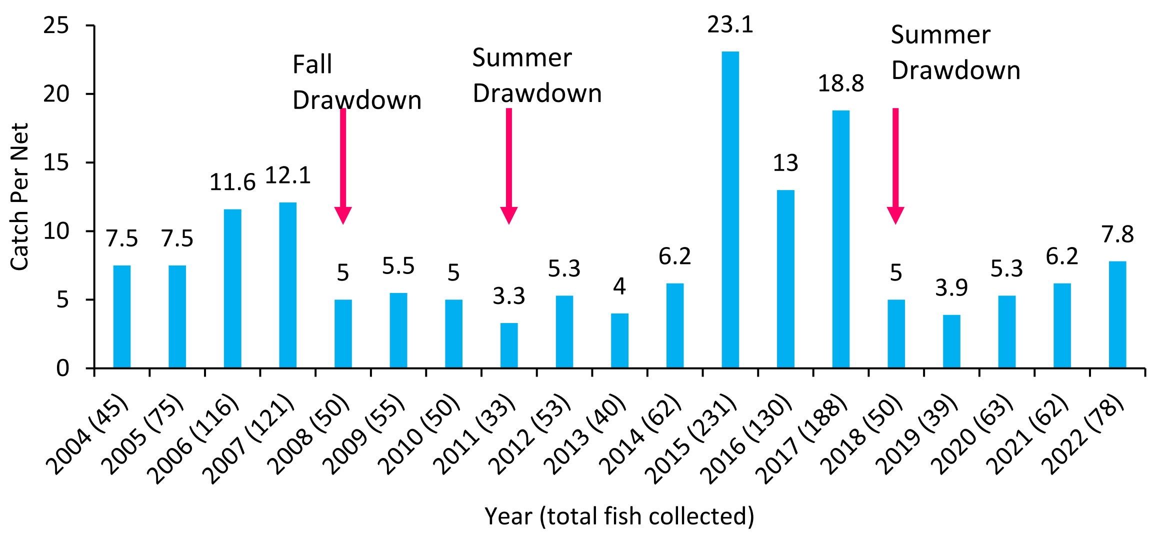
Non-salmonids such as Largemouth Bass, Northern Pike, Pumpkinseed, and Yellow Perch are on average the most common species captured in the downstream section. Largescale Suckers, Northern Pikeminnow, and Rainbow Trout are on average the most common species captured in the upstream section. The differences in species composition and abundance of salmonids are likely related to varying habitat conditions. The upstream sampling section is more of a riverine environment and the downstream sampling section is more lacustrine (lake-like).

The abundance of some fish species in Thompson Falls Reservoir appears to be related to extended drawdowns, such as occurred in 2011 and 2018. In those two years, very high flows resulted in the stanchions on the spillways being tripped. Required maintenance work on the dam resulted in a reservoir drawdown during the summer of about 13 feet during 2011 and 16 feet in 2018. Annual gillnetting results since 2004 are shown in **Figure 7-4.** Total fish caught per net declined from the previous year in years following a deep drawdown, due to maintenance requirements.

Figure 7-4: Summary of the Thompson Falls Reservoir gillnetting efforts 2004-2022. Substantial drawdowns occurred in the fall of 2008 and summers of 2011 and 2018.



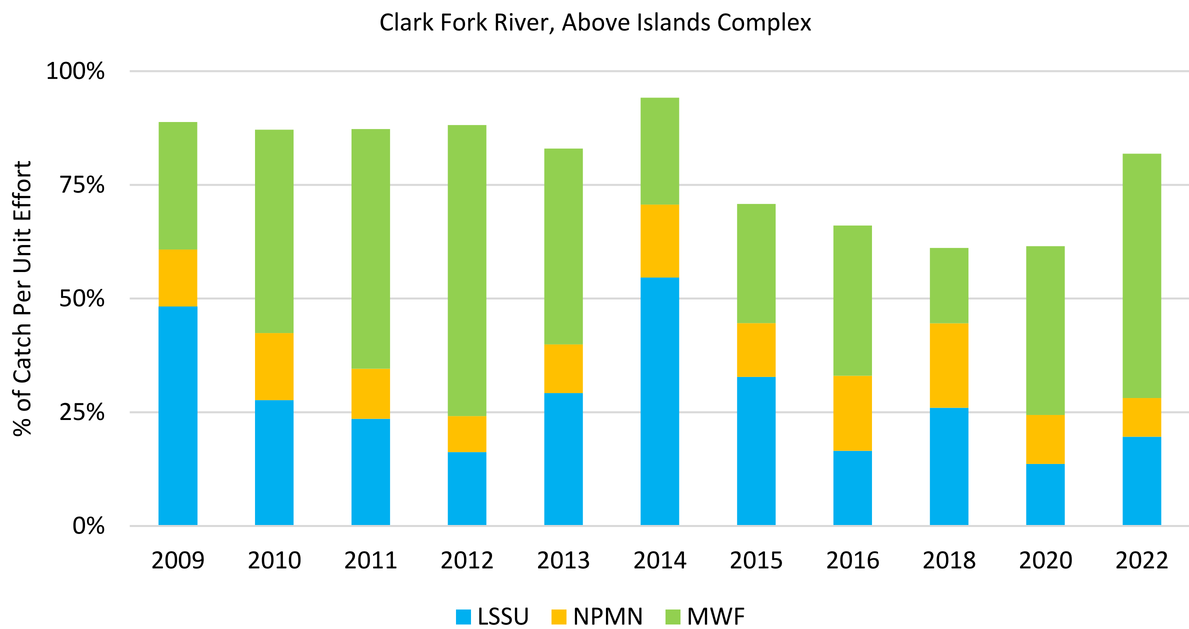
The impact of reservoir drawdowns on the population of Black Bullhead has been most apparent. Black Bullhead were the most abundant fish species caught in the years prior to the 2008 drawdown, before a precipitous decline for the years following the drawdown. Northern Pike catch rates also appear to have responded to these deep maintenance drawdowns in 2011 and 2018 (13 feet and 16 feet respectively) with lower catch rates in the years following drawdowns. Other species did not indicate any immediate response and overall catch rates per net remain low for Thompson Falls Reservoir, with Black Bullhead driving up overall catch rate numbers up in 2006, 2007, 2015, and 2017.

7.1.2.5 Clark Fork River Upstream of Thompson Falls

Upstream of the confluence with the Thompson River, NorthWestern completes routine electrofishing surveys in two locations in the Clark Fork River, the Above Islands complex reach, and the Paradise to Plains Reach *(refer to* **Figure 7-3**). The above islands reach is located within the existing Project boundary, and the Paradise to Plains Reach is approximately 20 miles upstream, and outside of the Project boundary.

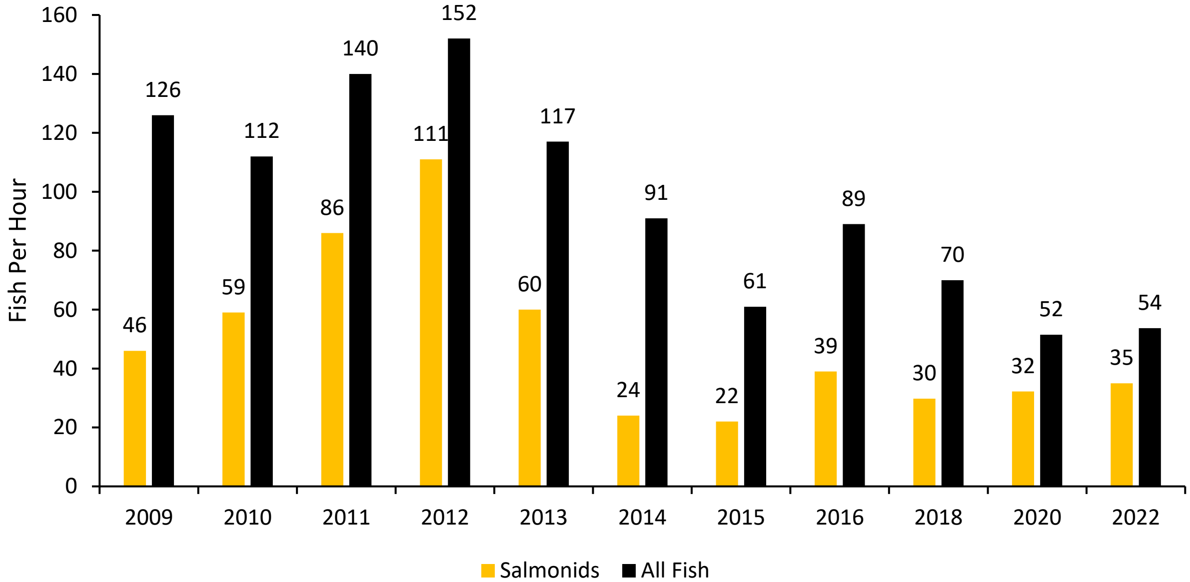
The Above Island complex reach is characterized as riverine habitat and has been surveyed 11 times since 2009. 15 species plus one hybrid, including Bull Trout, Brown Trout, Rainbow Trout and hybrid, Westslope Cutthroat Trout, Mountain Whitefish, Longnose Sucker, Largescale Sucker, Longnose Dace, Northern Pikeminnow, Northern Pike, Peamouth, Smallmouth Bass, Redside Shiner, Yellow Perch, and Yellow Bullhead have been found in the reach. The species composition in the Above Islands reach has remained consistent since sampling began in 2009 with native Largescale Sucker, Mountain Whitefish, and Northern Pikeminnow most common (**Figure 7-5**).

Figure 7-5: Percentage of Largescale Sucker (LSSU), Northern Pikeminnow (NPMN), and Mountain Whitefish (MWF) electrofishing in the Above Islands reach from 2009-2022.



Between 2009 and 2022, the number of fish captured in the Above Islands reach ranged between 219 fish and 699 fish. Catch rates for salmonids varied from a low of 22 salmonids per hour in 2015 to a high of 111 salmonids per hour in 2012 (**Figure 7-6).** Catch rates for all species has varied from a low of 52 fish per hour in 2020 to a high of approximately 152 fish per hour in 2012 (NorthWestern 2023).

Figure 7-6: Summary of the 2009-2022 annual catch rate for all salmonids and all fish captured in the Clark Fork River – Above the Island Complex.



In the Paradise to Plains reach the species composition has remained relatively consistent over the 6 years of sampling**.** As in the Above Islands complex, Largescale Sucker, Northern Pikeminnow, and Mountain Whitefish (all native species) remain the most common species (**Figure 7-7)**. Other species recorded less frequently include Bull Trout, Brown Trout, Longnose Sucker, Northern Pike, Peamouth, Pumpkinseed, Rainbow Trout and hybrid, Redsided Shiner, Smallmouth Bass, Westslope Cutthroat Trout, and Yellow Perch. Summary of annual catch rate for salmonids and all fish is provided in **Figure 7-8**. Salmonids represent approximately 28 to 43 percent of the fish recorded in the Paradise-to-Plains reach since sampling commenced in 2010 (Figure 7-8). The catch rate for salmonid species, primarily represented by native Mountain Whitefish, has varied between 43 and 136 fish per hour. The catch rate for all species has varied between 38 fish per hour (in 2020) to 314 fish per hour (in 2011) (NorthWestern 2023).

Figure 7-7: Percentage of Largescale Sucker (LSSU), Northern Pikeminnow (NPMN), and Mountain Whitefish (MWF) electrofishing in the Paradise to Plains reach from 2010-2022.

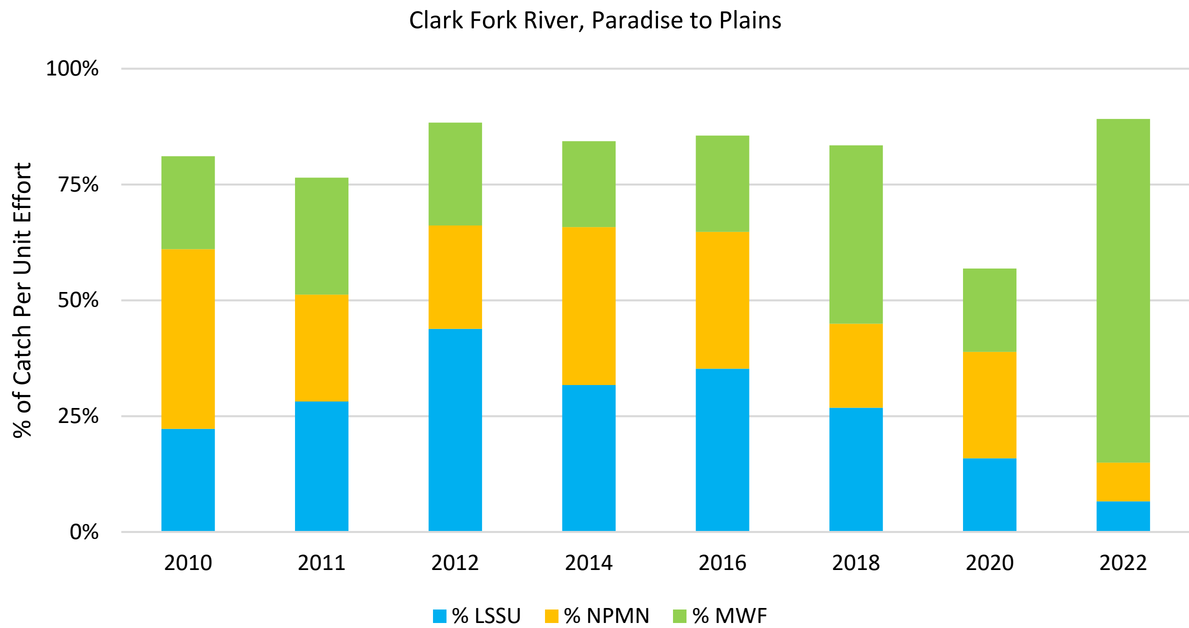
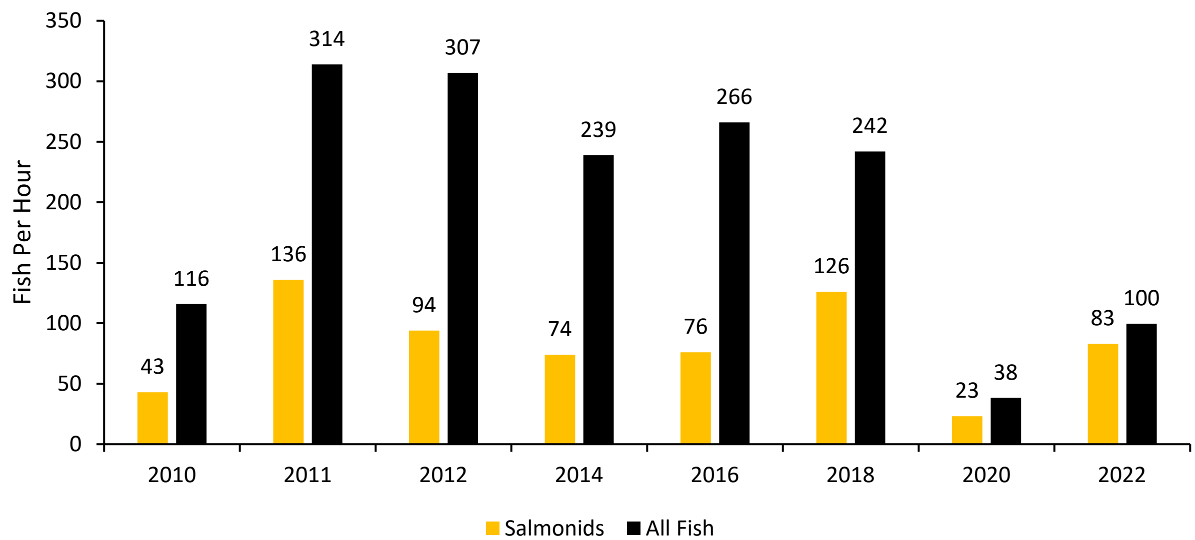


Figure 7-8: Summary of the annual catch rate for all salmonids and all fish captured in the Clark Fork River between Paradise and Plains, 2010-2022.



7.1.2.6 Tributary Fisheries

7.1.2.6.1 Prospect Creek Fisheries

Prospect Creek is located about one-half mile downstream of the Main Channel Dam. Prospect Creek provides important spawning and rearing habitat for native salmonids and sculpin. The fisheries community includes native species such as resident and migratory Bull Trout and

Westslope Cutthroat Trout, as well as Mountain Whitefish and Cedar Sculpin (*Cottus schitsuumsch*). The upstream portion of the drainage is dominated by native trout (Bull Trout and Westslope Cutthroat Trout). The downstream mainstem and tributaries are dominated by nonnative species, Rainbow Trout, Rainbow x Westslope Cutthroat trout hybrid, Brown Trout, and Brook Trout. Abundance and distribution of these fish from data collected in 2003 and 2012 by Avista are available in Moran and Storaasli (2013).

In August 2018, NorthWestern 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. The results indicate a small fraction of PIT-tagged salmonids (Rainbow Trout, Brown Trout, Westslope Cutthroat Trout) with a history of ascending the upstream fish passage facility have also entered Prospect Creek. Some of the PIT-tagged fish detected in Prospect Creek were also detected further downstream in Graves Creek, a tributary to Noxon Rapids Reservoir. During the first 3 years the PIT tag array was operating (2018-2020), approximately 2 percent (15 of 756) of tagged salmonids with a history at the upstream fish passage facility were detected in Prospect Creek.

7.1.2.6.2 Thompson River Fisheries

The Thompson River and its tributaries contain native resident and migratory Bull Trout, Westslope Cutthroat Trout, and Mountain Whitefish as well as native suckers and sculpins. Other common nonnative recreational fish in the Thompson River include Rainbow Trout and Brown Trout, and to a lesser extent Brook Trout (Copenhaver et al. 2006; Katzman 2006; GEI Consultants, Inc. and Steigers 2013; NorthWestern 2015-2023; Kreiner and Terrazas 2018).

The Thompson River is popular for fishing with about 13,000 angler days reported in 2015 with an average of 8,229 angler days per year (FWP 2019). In the 1950s and 1960s, anglers reported Rainbow, cutthroat, Brook Trout, and Mountain Whitefish as the most abundant catch (FWP 2019). Currently, Brown Trout are the most abundant game species in the upper section of the Thompson River (FWP 2019).

The Thompson River also provides designated Critical Habitat for migratory (adfluvial/fluvial) and resident Bull Trout, including spawning and rearing habitat in Fishtrap Creek and West Fork Thompson River as well as important habitat for adfluvial/fluvial and resident Westslope Cutthroat Trout. A study initiated in 2014 including 746 subadult Bull Trout PIT-tagged in these two tributaries to the Thompson River, from 2014 through June 2019, indicate the Bull Trout migratory life history form in the Thompson River drainage is less abundant than expected (Glaid 2017; Kreiner and Terrazas 2018; NorthWestern 2019a). Based on recent tagging studies, the percentage of juvenile Bull Trout found to outmigrate from the Thompson River drainage to the Clark Fork River is less than 7 percent (NorthWestern 2019a).

Since 2014, a PIT-tag antenna array located at the mouth of the Thompson River has been operated and detected 927 unique individual fish, 922 salmonids and 5 non-salmonids. These fish are predominantly Brown and Rainbow trout. The percentage of the PIT-tagged fish which previously ascended the fish passage facility (known as 'ladder fish') (2011-2021) by species detected in the Thompson River between 2014 and 2021 is presented in **Table 7-4**. The values provide a minimum estimate of the proportion of ladder fish entering the Thompson River. The annual review of the Thompson River PIT tag array system indicates about one-third of the salmonids tagged at the fish passage facility and released upstream enter the Thompson River.

Table 7-4: Percentage of 2021 PIT-tagged ladder fish released upstream of the dam detected by the remote array in the Thompson River compared to overall percentage of PIT-tagged fish (2011-2021) detected in Thompson River, 2014-2021.

Species	% Of PIT Tagged Ladder Fish (2011-2021) Detected in Thompson River, 2014-2021	# Of Individual Ladder Fish Detected in Thompson River, 2014-2021
BULL	36%	5
LL	40%	402
RB	24%	442
WCT	21%	53
RBxWCT	13%	7
MWF	12%	11
EB	50%	2
Salmonids	**28%**	**922**
NPMN	1%	2
LSSU	2%	3
Non-Salmonids	**2%**	**5**
Total	**26%**	**927**

NorthWestern installed PIT-tag antennae arrays in Fishtrap Creek and in West Fork Thompson River in 2014. These arrays are operated year-round but have functioned sporadically since installation due to challenges with batteries and access. The number of ladder fish detected in these tributaries remains relatively low, one to eight salmonids a year (**Table 7-5)**.

Table 7-5: Summary of ladder fish, by species, detected in Fishtrap Creek and West Fork Thompson River, 2014-2022.

Year	BULL	WCT	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**
Total	4	5	12	12	**33**

Source: NorthWestern 2023

The importance of the Thompson River to salmonids in the Thompson Falls Project has been affirmed by the number of fish that have been found to migrate into the Thompson River after passing the fish passage facility.

7.1.3 Upstream Fish Passage

7.1.3.1 Fish Species Recorded Ascending Fish Passage Facility

Since the upstream fish passage facility opened in 2011, nearly 39,000 fish representing 16 species and three hybrids have ascended the fish passage facility (**Table 7-6).** Fish ascending the upstream fish passage facility are collected and recorded at the work station. The majority (36,213 fish) were subsequently released upstream, except for Walleye, Lake Trout, Brook Trout (starting in 2016), Brook x Bull Trout hybrid, fish mortalities at the work station, and Smallmouth Bass starting in 2019 (NorthWestern 2023). Cumulatively, most fish recorded at the fish passage facility are native Largescale Sucker followed by native Northern Pikeminnow.

Range of lengths recorded for each species observed at the work station is provided in **Table 7-7**. Total length and weight measurements were documented for nearly all salmonids and approximately one-third of the non-salmonids captured at the upstream fish passage facility. The length of salmonids captured range from a 98 mm Rainbow Trout to a 785 mm Lake Trout. The size of non-salmonids ranged from a 69 mm Smallmouth Bass to a 610 mm Northern Pikeminnow.

Fish data collected at the upstream fish passage facility indicate the fish passage facility provides safe and timely passage for numerous species, having successfully passed over 36,200 fish since 2011 (NorthWestern 2023c).

The goals and objectives of the fish passage facility were developed by the TAC consisting of NorthWestern, FWS, FWP, and the CSKT. The TAC determined the highest priority for upstream fish passage are Bull Trout, followed by native species and non-native game salmonids. These goals and objectives have informed how the fish passage facility is operated and the seasonal timing of its operation.

Fish recorded at the upstream fish passage facility are categorized into two general groups, salmonids (trout species and mountain whitefish) and non-salmonids. To date, 16 species and 3 hybrids have ascended the fish passage facility.

In general, non-salmonids are more common and represent about 87 percent (34,035) of the fish recorded ascending the fish passage facility from 2011 to 2022. Of the non-salmonids, Largescale Sucker (58%), Northern Pikeminnow (23%) and Smallmouth Bass (19%) are the most common.

Salmonids represent about 13 percent (4,941) of the fish recorded at the fish passage facility with Rainbow (and hybrids) and Brown trout representing 53 to 32 percent of the trout recorded ascending the fish passage facility. Mountain Whitefish and Westslope Cutthroat Trout represent eight to six percent, respectively, over the last 12 years. Bull trout represent about 0.4 percent (21 of 4,941 salmonids).

Through monitoring efforts such as PIT tagging and floy tagging much has been learned about the movement patterns of fish utilizing the fishway. Many fish released upstream of the dam have been detected in tributaries during spawning season (Thompson, St. Regis, middle Clark Fork, lower Flathead rivers). Many individuals either remain upstream for multiple years or return downstream of the dam and repeat their upstream journey (via the upstream fish passage facility) for one or more years.

Table 7-6: Total fish count, by species, for each year the fish passage facility operated, 2011-2022.

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Grand Total
Largescale Sucker	418	1403	3041	2802	6327	2270	34	6	1018	805	823	631	**19,578**
Northern Pikeminnow	1000	926	387	1003	3356	707	66	10	180	41	150	35	**7,861**
Smallmouth Bass	135	34	8	1356	1244	1007	123	5	339	347*	856*	953*	**6,407**
Rainbow Trout	164	208	213	187	281	366	181	124	186	222	213	191	**2,536**
Brown Trout	28	42	111	81	184	204	108	63	210	123	249	195	**1,598**
Mountain Whitefish	17	24	2	254	54	8	-	4	4	11	3	6	**387**
Westslope Cutthroat Trout	21	21	48	36	37	36	14	14	21	33	20	9	**310**
Peamouth	-	-	-	-	122	2	-	-	-	-	-	-	**124**
Rainbow x Cutthroat hybrid	9	7	13	12	4	5	1	1	1	2	8	3	**66**
Longnose Sucker	10	-	2	1	26	6	-	-	-	-	-	-	**45**
Peamouth x Northern Pikeminnow hybrid	-	-	-	-	-	13	2	-	-	-	-	-	**15**
Bull Trout	2	2	5	1	2	3	1	-	1	1	1	2	**21**
Lake Trout	1	1	-	1	6	-	-	-	2	1	2	1	**15**
Brook Trout	-	-	-	1	2	1	-	-	-	1	1	-	**6**
Walleye	-	-	-	-	2	-	-	-	1	-	1	-	**4**
Largemouth Bass	-	-	-	-	-	1	-	-	-	-	-	-	**1**
Brook Trout x Bull Trout hybrid	-	-	-	-	-	1	-	-	-	-	-	-	**1**
Kokanee	-	-	-	-	-	-	-	-	-	-	1	-	**1**
Salmonids	**242**	**305**	**392**	**573**	**570**	**624**	**305**	**206**	**425**	**394**	**498**	**407**	**4,941**
Non-Salmonids	**1,563**	**2,363**	**3,438**	**5,162**	**11,077**	**4,006**	**225**	**21**	**1,538**	**1,193**	**1,830**	**1,619**	**34,036**
Grand Total	**1,805**	**2,668**	**3,830**	**5,735**	**11,647**	**4,630**	**530**	**227**	**1,963**	**1,587**	**2,328**	**2,026**	**38,976**

Notes: "-" = zero fish recorded for that year; * = fish were not passed upstream so fish count includes fish returning and ascending the fish passage facility multiple times during the season.

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Table 7-7: Range of fish lengths in mm recorded at the upstream fish passage facility, 2011-2022.

	Total Range Lengths (mm) at upstream fish passage facility
Species	**2011-2022**
Bull Trout	365-620
Bull TroutXBrook Trout*	248
Kokanee	365
Longnose Sucker	262-477
Largescale Sucker	128-568
Mountain Whitefish	225-441
Northern Pikeminnow	82-610
Peamouth	272-380
Northern Pikeminnow X Peamouth	295-390
Westslope Cutthrout Trout	180-486
Brook Trout	354-420
Brown Trout	107-699
Largemouth Bass	180
Lake Trout	463-785
Rainbow Trout	98-632
Rainbow Trout X Cutthroat Trout	193-610
Smallmouth Bass	69-480
Walleye	282-419

Note: mm = millimeters

7.1.3.2 Timing of Upstream Fish Passage

At the time when the Thompson Falls fish passage facility was designed, the broad seasonality of upstream fish movement at this site was not well understood. Most upstream movement of adult fish was assumed to be associated with spawning migration. The record of fish (2011-2022) indicated a much more complex pattern of movement for both Bull Trout and other species. Some species show more specificity to seasonal movement trends (e.g., Smallmouth Bass, Largescale Sucker, Mountain Whitefish) than other species (e.g., Rainbow and Brown trout) that appear to ascend the fish passage facility throughout the entire operating season (March–October).

Fish species recorded at the fish passage facility display distinct and different movement strategies. Salmonids have ascended the fish passage facility in all months of operation but peak following the descending limb of the hydrograph in early summer (June/July). This peak movement for salmonids is observed for spring spawners (Rainbow and Westslope Cutthroat Trout and hybrids) and fall spawners (Bull Trout, Brown Trout, and Mountain Whitefish).

Radio telemetry of Rainbow and Brown Trout conducted in 2021 and 2022 found little evidence of salmonid presence in the Zone of Passage (ZOP) during high flows. The data indicate that during spill at the Main Channel Dam, the detection of fish in the ZOP was limited. Rainbow Trout were essentially absent from the ZOP once spill started at the Main Channel Dam, and for the remainder of the season (**Figure 7-9**). Brown Trout that were present in the ZOP during the spring appeared to leave the ZOP during spill, and then returned in the fall (**Figures 7-10** and **7-11**). Past telemetry studies conducted in the study area from 2004-2006 also found that few fish were present in the study area during the peak of spring runoff (GEI 2007a). While the telemetry data indicate that many fish leave the study area during high flow, a few fish remain and manage to find the fish passage facility. Fish are known to ascend the fish passage facility in limited numbers during high flows..

Figure 7-9: Monthly manual tracking of 23 individual Rainbow Trout, March-June 2022. No Rainbow Trout were recorded July–October. Number of individual fish detected in the ZOP each month provided.

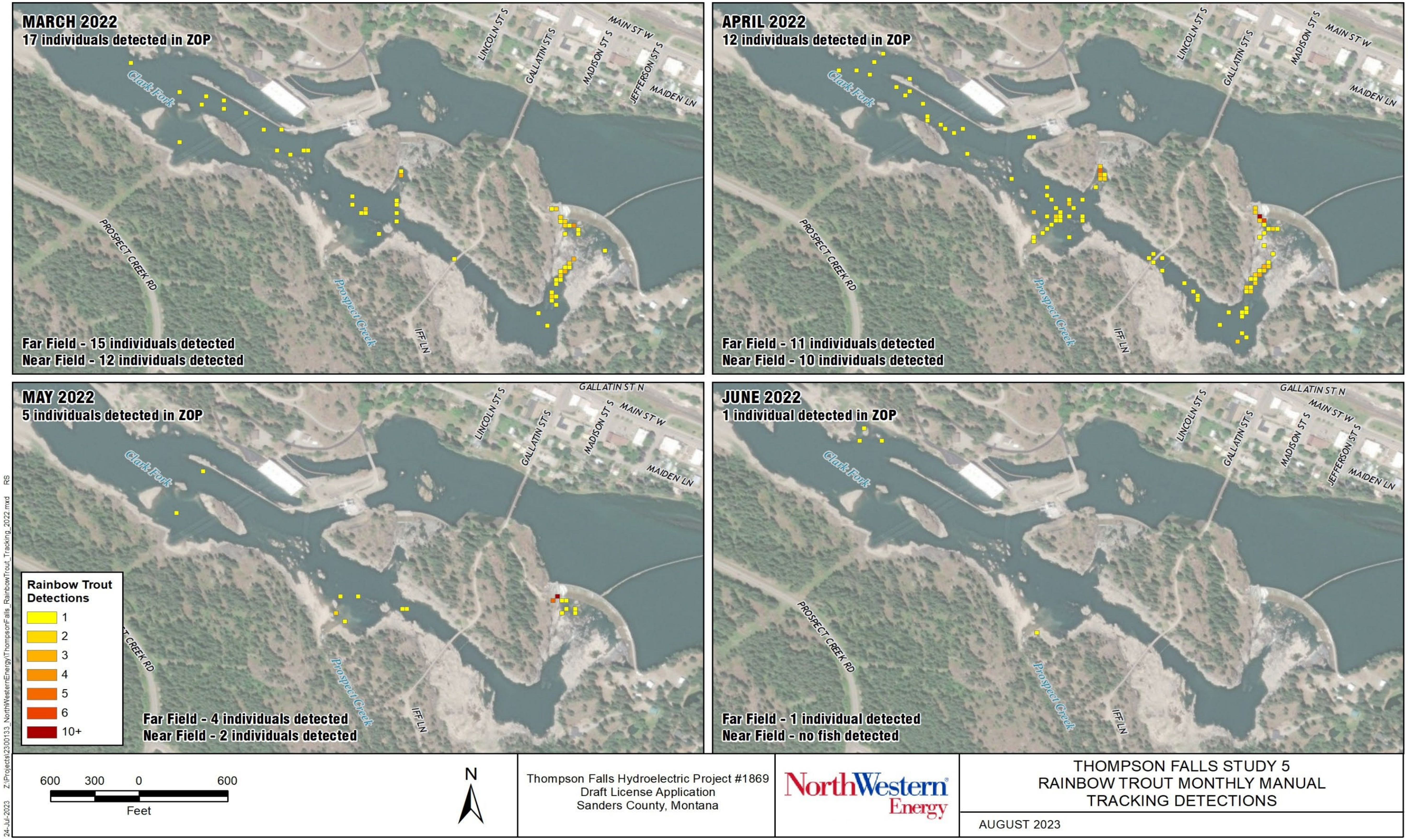


Figure 7-10: Monthly Manual Tracking of Brown Trout, March – June 2022. Number of Individual Fish Detected in the ZOP Each Month Provided.

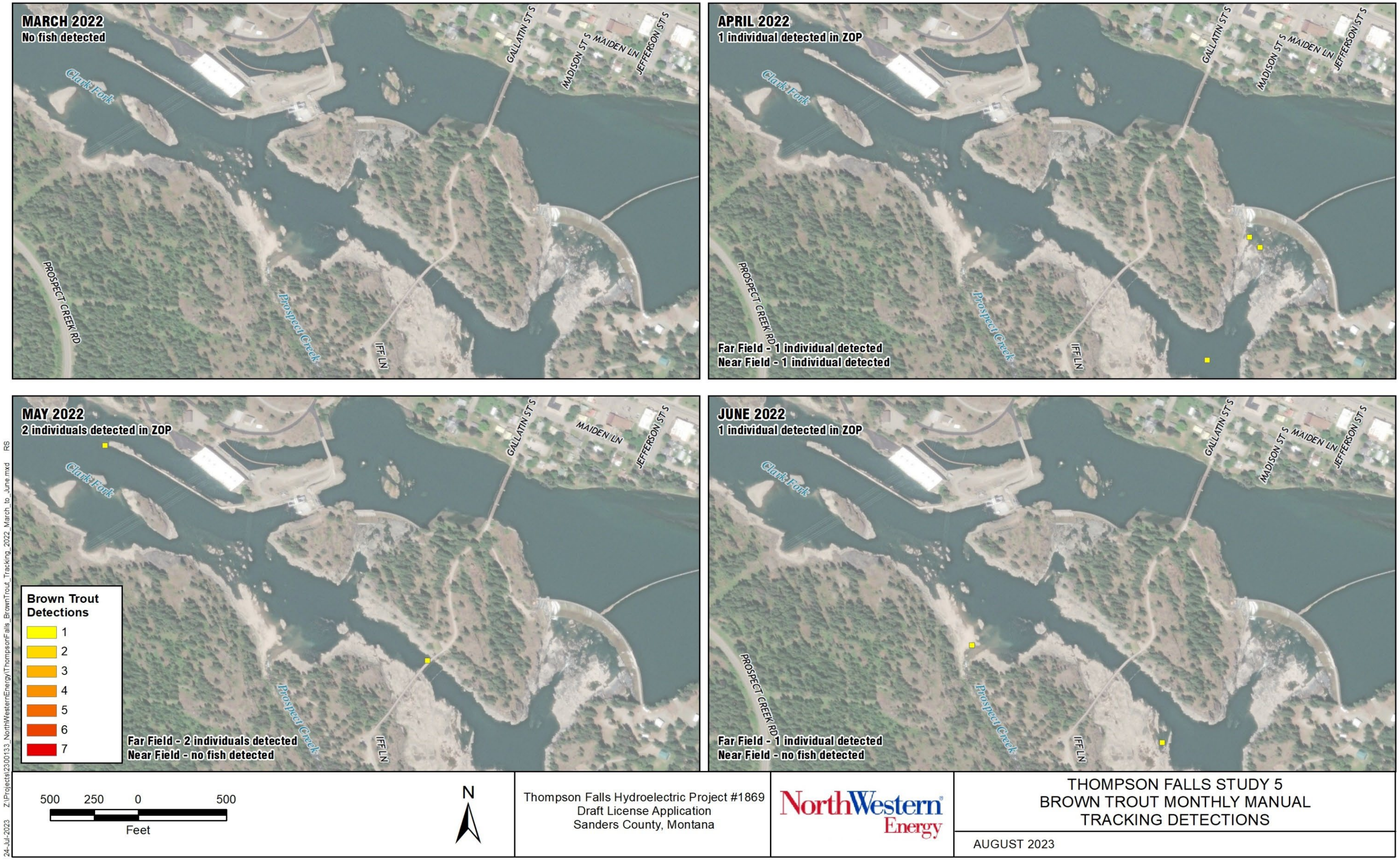
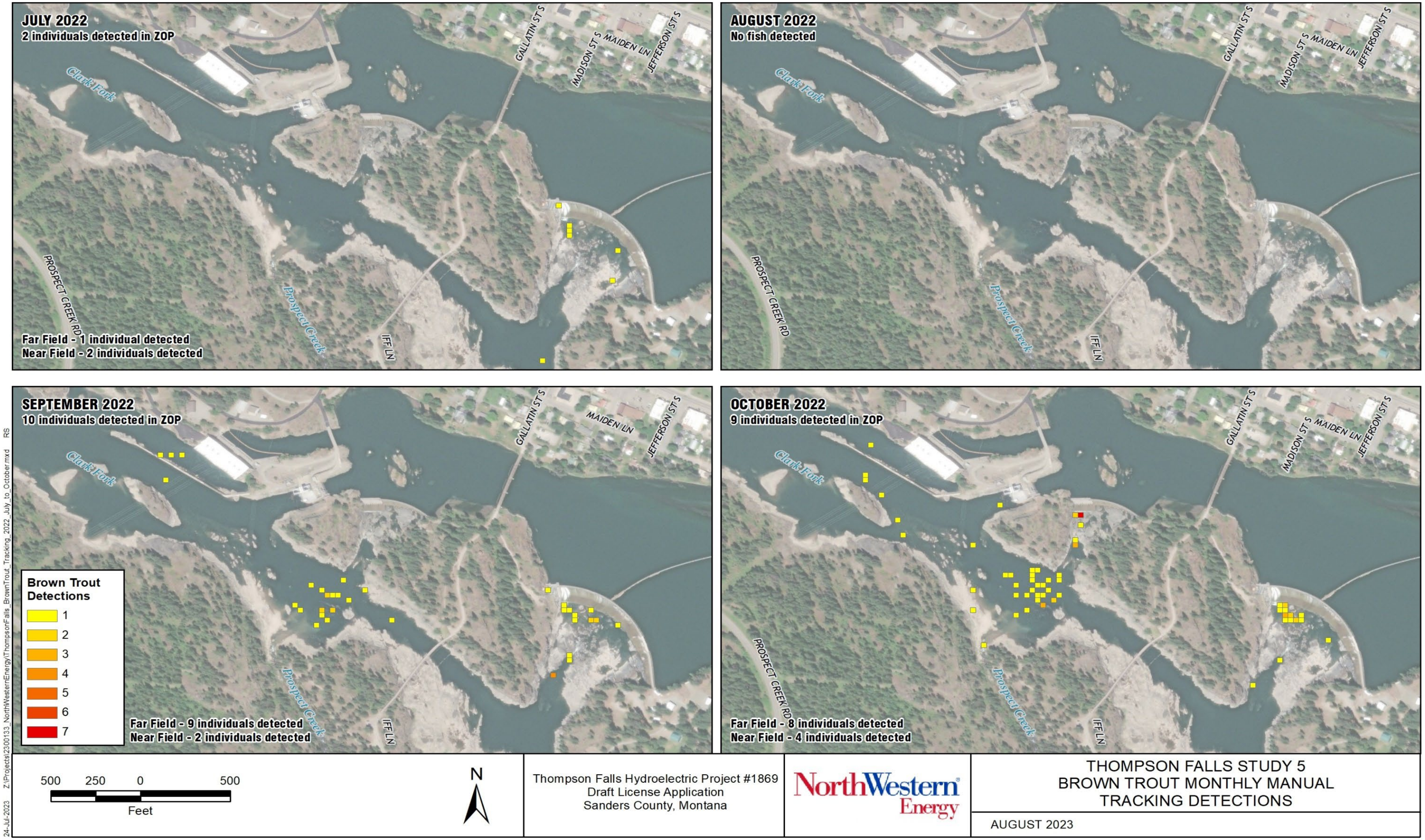


Figure 7-11: Monthly Manual Tracking of Brown Trout,July - October 2022. Number of Individual Fish Detected in the ZOP Each Month Provided.



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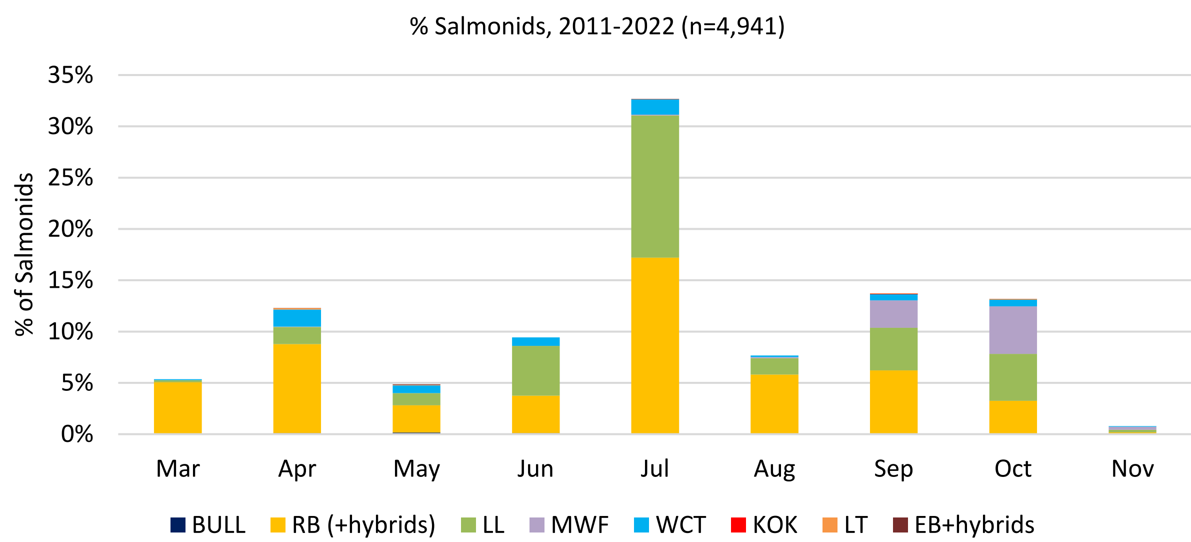
The timing of fish entering the fish passage facility indicate many fish are not migrating upstream to immediately spawn. Rainbow Trout are spring spawning fish, but they ascend the fish passage facility (**Figure 7-12)** in the spring, summer, and fall with minimal captures during the high flow periods of May and June and October-November (Northwestern 2022 ISR, AR, 2023 USR and AR). These dips in movement (May-June; October-November) may be partially a result of high water velocity in the spring, fish passage facility closures in the spring, as well as less favorable river conditions in the fall. The passage of Rainbow Trout does not appear to be solely driven by a desire to migrate to spawning locations.

Brown Trout are fall spawning fish, but they also have passed through the fish passage facility at all seasons, with the peak season of passage during the descending limb of the hydrograph in June/July (Figure 7-12).

Mountain Whitefish have also been collected in the fish passage facility as early as April, but passage of this species outside of the September through October time period is rare (Figure 7-12**)**. The largest number of Mountain Whitefish (73 individuals) recorded at the fish passage facility during a single fish passage facility check was the end of September 2014.

Figure 7-12: Percentage of salmonids, by month, recorded at the workstation after ascending the fish passage facility, 2011-2022.

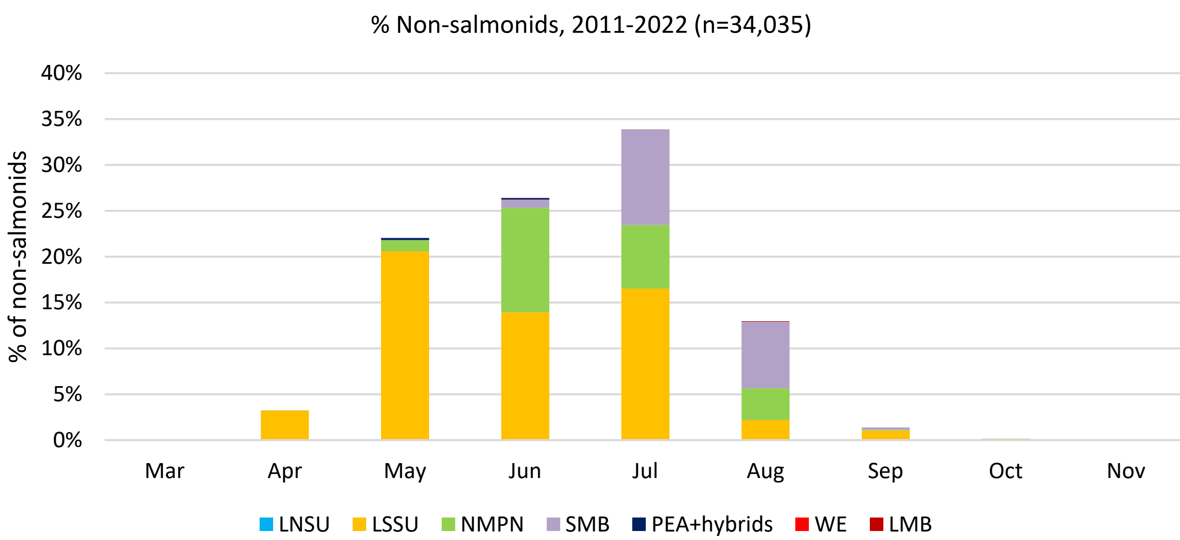


Several fish species displayed various patterns of returning to the fish passage facility, including annual, biennial, and triennial intervals. The timing of these fish returning to the fish passage facility on the exact date or within a week of the exact date 1, 2, and/or even 3 years later, supports the concept that fish movement is biological and a function of their circadian rhythm (Quinn 2005; Davie et al. 2009; O'Malley et al. 2010). In contrast, some fish have ascended the fish passage facility once and then remain upstream in the Thompson River for several years following their release upstream of the dam (e.g., unpublished data on Rainbow and Brown trout ascents in 2014 followed by Thompson River detections through 2023). The variability in movement patterns indicate inland fish utilization of the watershed is likely influenced by a multitude of factors related to the individual biological and physical needs for survival (Thurow 2016).

Tagged fish detections in the Thompson River add insight on fish behavior after passage. Some spring spawning fish migrate upstream in the summer/fall months and remain upstream of the dam through the winter and then spawn in the Thompson River in the spring. They may subsequently leave the Thompson River drainage, migrate downstream to Noxon Rapids Reservoir, then migrate back upstream to the fish passage facility, and repeat the process.

Non-salmonids are most common in warmer water months (May-August, depending on the year) and less common in the spring and fall months when water temperatures are cooler (**Figure 7-13**). Peak numbers for non-salmonids occur in July, after spring peak flows and prior to peak summer water temperatures. Smallmouth Bass have a higher tolerance for warmer temperatures and are more common during the peak summer temperatures (July-August).

Figure 7-13: Percentage of non-salmonids, by month, recorded at the workstation after ascending the fish passage facility, 2011-2022.



Salmonids in general, and Bull Trout in particular, have been found to move upstream, downstream, and into multiple tributaries in the Clark Fork River drainage. The timing of these movements is not strictly tied to spawning seasons. Bull Trout ascend the fish passage facility most frequently in the spring, but the timing is variable, and they have ascended the fish passage facility as late in the season as September. An example of complex Bull Trout movement is a Bull Trout radio tagged in 2010 was found in both Fishtrap Creek (during spawning season) and then later in the Vermilion River (after spawning season). Adult Bull Trout have been found in multiple tributaries, including tributaries that are not their natal stream, even when the natal stream is accessible. The FWS (2015) states that the ability to migrate is important to the persistence of Bull Trout as it allows them to seasonally or temporally occupy habitat that may be advantageous on an intermittent basis. It appears that seasonal and temporal movements are a part of the behavior of Bull Trout, and other species in the Project area.

The fishway was designed to operate up to 48,000 cfs before being closed during flows that exceeded this total river discharge. Through experimentation it was found that the facility could be operated beyond the design capacity of 48,000 cfs and is commonly operating until flows exceed 60,000 cfs. Although fish movement in the river is limited at this time, 61 fish representing six species (25 Largescale Sucker, 21 Rainbow Trout, 5 Westslope Cutthroat Trout, 4 Northern Pikeminnow, 3 Bull Trout, 3 Brown Trout) have ascended the fish passage facility during periods of flow in excess of 48,000 cfs [NorthWestern unpublished]).

7.1.3.3 Upstream Passage Effectiveness

In 2021 and 2022, NorthWestern evaluated upstream fish movement *via* radio telemetry through the Project's zone of influence[22] which is defined by the ZOP concept (FWS 2017). The ZOP concept defines discrete areas for analysis of the pathway fish use to move through the influence of the Project. These areas include far field, near field, entry, internal fish passage facility, exit, and upstream (**Figure 7-14)**. The ZOP concept provides a method to measure passage effectiveness and identify attributing causes and influences (Project and non-project related) to upstream passage effectiveness. The radio telemetry study focused on fish movement in a 0.75-mile section of the Clark Fork that is divided into the far field, near field, and fish passage facility entrance.

Results from 2021 are reported in detail in the ISR – Fish Behavior Study (**NorthWestern 2022a**) and results from the 2022 season are included in the USR – Fish Behavior Study 2021-2022 **(NorthWestern 2023a**). Hydraulic conditions in the far field, near field, and fish passage facility entrance were modeled, with results reported in the ISR – Hydraulic Conditions Study and USR-Hydraulic Conditions Study (NorthWestern 2022b and 2023b).

The fish behavior studies focused on evaluating Rainbow and Brown trout movement from the Thompson Falls original powerhouse upstream to the fish passage facility entrance at the Main Channel Dam. Rainbow and Brown trout are important game fish in the study area and serve as surrogate species to better understand upstream fish passage efficacy for Bull Trout (Scientific Panel 2020). The study evaluated what proportion of radio tagged fish enter the ZOP and find the fish passage facility entrance. The study measured the duration of time and pathway(s) of these movements during various flow conditions.

[22] Zone of Influence means an area within which there are positive or negative effects as a result of the Project.

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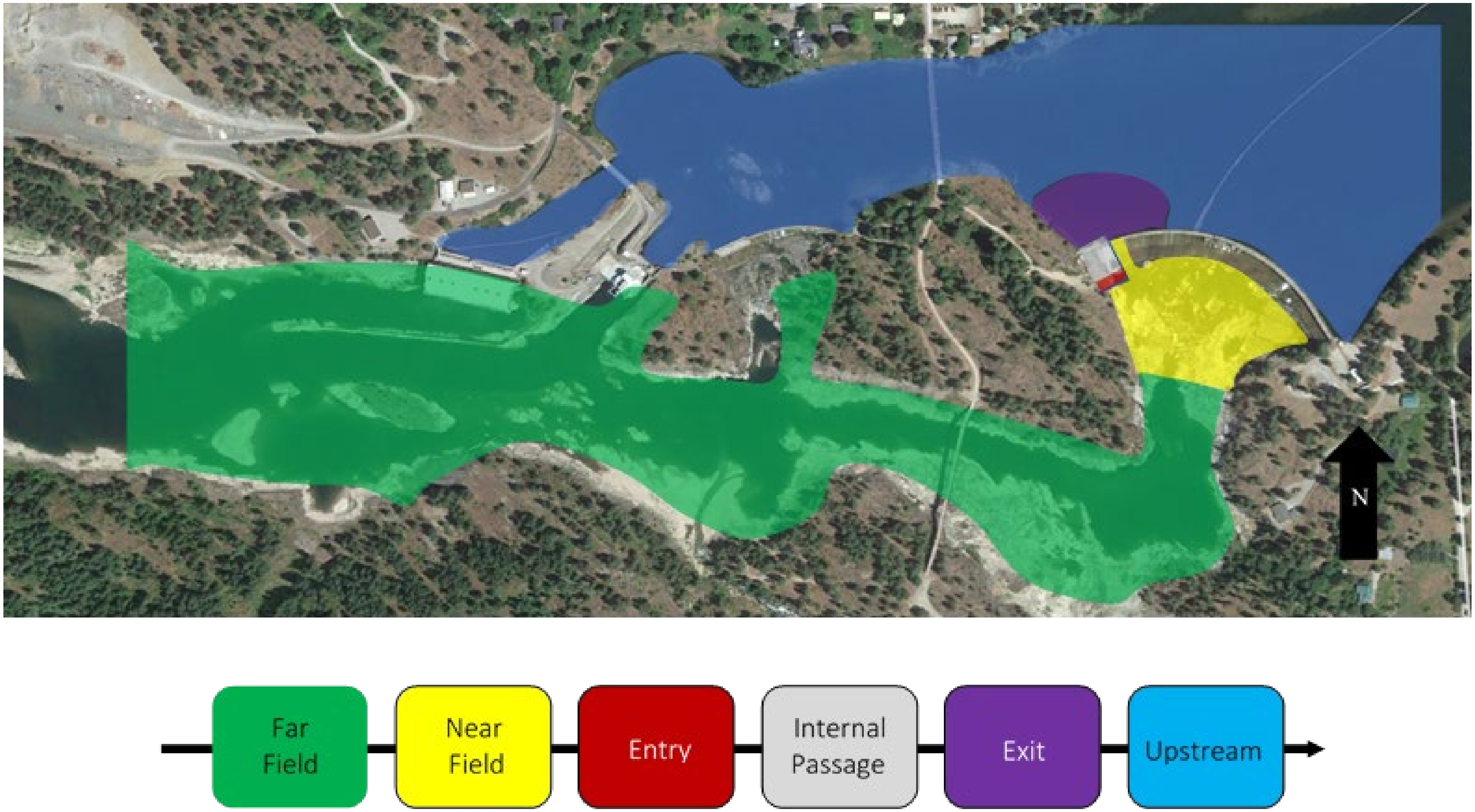
Figure 7-14: Study Areas as defined by the Zone of Passage concept.



Notes: Figure not to scale; Far Field = downstream of fish passage facility/dam where the Powerhouse and spill serve as primary attraction to migrating fish; Near Field = in proximity to fish passage facility where fish passage facility attraction flow may lure fish to entrance; Entry = Immediately downstream of entrance channel/gate where fish passage facility discharge dominates hydraulics/velocity field/fish behavior; Internal Passage = hydraulics, structure, and fish movement with the fish passage facility (i.e., entrance channel, pools, trap, exit channel); Exit = immediate upstream of the fish passage facility exit gate/exit channel where inflow into fish passage facility dominates hydraulics/velocity field/fish behavior; Upstream = beyond the influence of the fish passage facility into the reservoir/impoundment.
Source: Scientific Panel 2020

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A summary of the fish studied in 2021 and 2022, including the month and year of tagging, species, total number radio tagged, percentage/number of radio-tagged fish detected in the far field, near field, and fish passage facility entrance, is provided in **Table 7-8**.

Table 7-8: Summary of the Rainbow and Brown Trout Detected in 2021 and 2022.

Collection Time	Species	Total Tagged	% (#) in Far Field	% (#) in Near Field	% (#) Ladder Entrance	% (#) Ascend Ladder
June '21	RB	7	100 (7)	14 (1)	-	-
	LL	6	100 (6)	50 (3)	33 (2)	17 (1)
Sept/Oct '21	LL	3	100 (3)	33 (1)	33 (1)	33 (1)
2021 Total		**16**	**100 (16)**	**31 (5)**	**19 (3)**	**13 (2)**
March '22	RB	29	100 (29)	86 (25)	48 (14)	45 (13)
	LL	8	100 (8)	88 (7)	38 (3)	25 (2)
Sept '22	LL	17	94 (16)	35 (6)	24 (4)	12 (2)
2022 Total		**54**	**98 (53)**	**70 (38)**	**39 (21)**	**31 (17)**
Total Both Years		**70**	**98 (69)**	**62 (43)**	**35 (24)**	**27 (19)**

Notes: % = percentage; # = number of fish detected; LL = Brown Trout; RB = Rainbow Trout.

The results of the 2021 and 2022 telemetry study indicate fish are motivated to move upstream and readily, unimpeded, and quickly access the ZOP following release. Of the 70 tagged fish, 69 (98%) were later detected in the far field.

However, not all fish detected in the far field proceeded to the near field. Of the 69 fish that were detected in the far field, 43 (62%) made a foray to the near field, including 72 percent of the Rainbow Trout and 51 percent of the Brown Trout. The proportion of fish making the foray to the near field was much higher in 2022 (72%) than in 2021 (31%). The time of fish collection in 2021, during the late spring and after Rainbow Trout spawning, may have been a factor in the proportion of fish that moved upstream into the near field.

Collection of fish in 2021 occurred in early June during the ascending limb of the hydrograph while in 2022 collections occurred in March prior to snow melt and spring runoff. Only one June 2021-tagged Rainbow Trout was detected in the near field, while 25 (86%) of the March 2022-tagged Rainbow Trout were detected in the near field. Brown Trout collected in June 2021 and March 2022 and transported downstream had a higher percentage of fish (50% in 2021 and 88% in 2022) entering the near field than Brown Trout collected and transported downstream in the fall (33% in 2021 and 35% in 2022).

Of the 43 trout that were detected in the near field in both years of study, 24 (56%) were detected in the fish passage facility entrance, including 54 percent of the Rainbow Trout and 59 percent of the Brown Trout. Of the 24 detected at the fish passage facility entrance 19 (79%, 13 Rainbow and 6 Brown trout) ascended the facility to the top. Hypothetically, if all fish that entered the near field in 2022 (25 Rainbow and 13 Brown trout) continued to the fish passage facility entrance, attraction efficiency would have increased from 48 to 86 percent for Rainbow Trout and from 29 to 54 percent for Brown Trout.

In total, over the 2 years of study, 24 of the 70 radio tagged fish were detected at the fish passage facility entrance. Detections at the fish passage facility entrance were much higher in 2022 than in 2021, with 19 percent detected in 2021 and 39 percent detected in 2022.

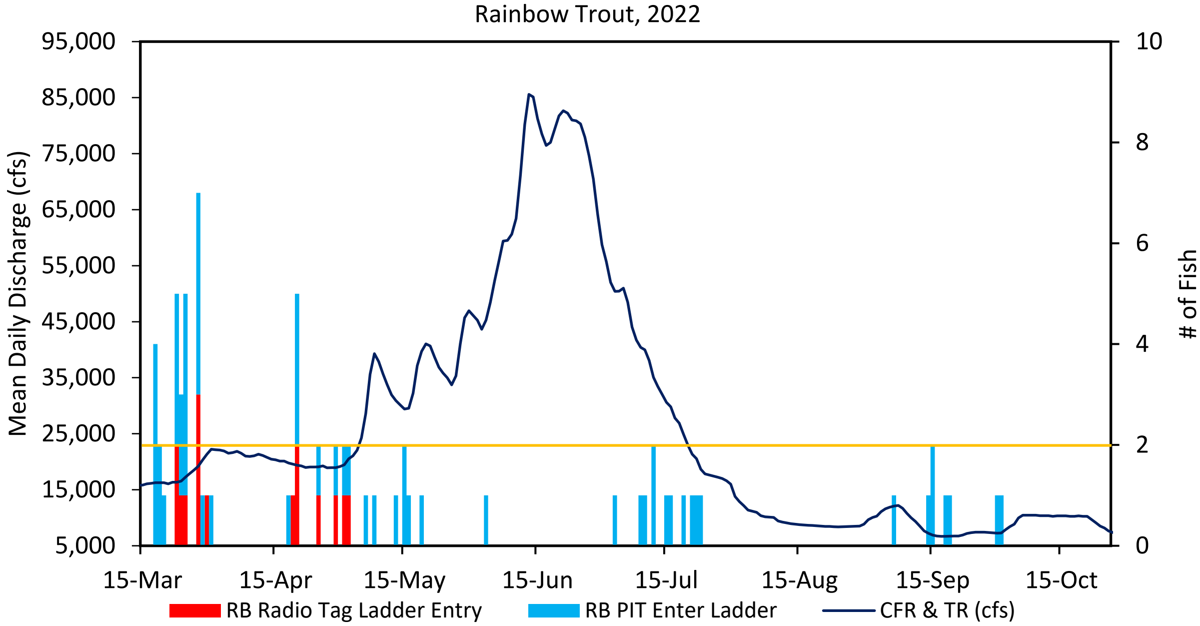
The data indicate that, during spill at the Main Channel Dam, the detection of fish in the ZOP was limited to a few individuals. Rainbow Trout were very active in the ZOP at the Main Channel Dam from March through May, prior to the start of spill during spring runoff.

During both years (2021 and 2022) most fish showed upstream movement from the release site to the near field area and did not appear to encounter obstacles that prevented movement into the ZOP. Radio tagged fish displayed the ability to travel to and within the ZOP in a matter of hours and days. Average travel time for Rainbow Trout to the near field was about 1 week in 2022 compared to 5 weeks in 2021, which may be a result of early spring collection of Rainbow Trout and greater motivation to move upstream to spawn. In both years, travel time from the near field to the fish passage facility entrance varied from hours to months. Brown Trout appeared to travel to the near field shortly after release downstream of the ZOP, and then leave and return, later in the fall. Rainbow Trout migration occurred shortly after release downstream of the ZOP, thus overall travel time for Rainbow Trout appeared quicker than Brown Trout.

The manual tracking data indicate most fish ultimately moved up the main section of the river channel and did not linger near the outlet areas at the Original Powerhouse and New Powerhouse. When fish entered the near field, the only pathway was up the center of the channel through the falls before moving to the right or left bank. Manual tracking predominantly detected fish from the center to the right bank near the location of the fish passage facility. When fish entered the near field, their presence was brief and fish spent substantially more time within the zone of the Main Dam Right (MDR) station versus the Main Dam Left (MDL) station before either returning downstream to the far field, entering the fish passage facility and then returning downstream to the far field, or entering and ascending the fish passage facility.

Entry to the fish passage facility by Rainbow Trout was limited to the spring (in 2022). Radio-tagged Rainbow Trout entered the fish passage facility in March and April, which coincided with pre-spill at the Main Channel Dam (**Figure 7-15**). The spring movement of radio-tagged Rainbow Trout to the fish passage facility entrance coincided with other Rainbow Trout PIT tagged fish also recorded entering the fish passage facility. However, there were additional Rainbow Trout detected entering the fish passage facility during the ascending limb of the hydrograph, as well as in the fall. During peak spring flow in June, no radio or PIT tagged Rainbow Trout were detected entering the fish passage facility. The fish passage facility was closed June 14 when spill exceeded 61,000 cfs and was then opened June 30 when spill was near 35,000 cfs.

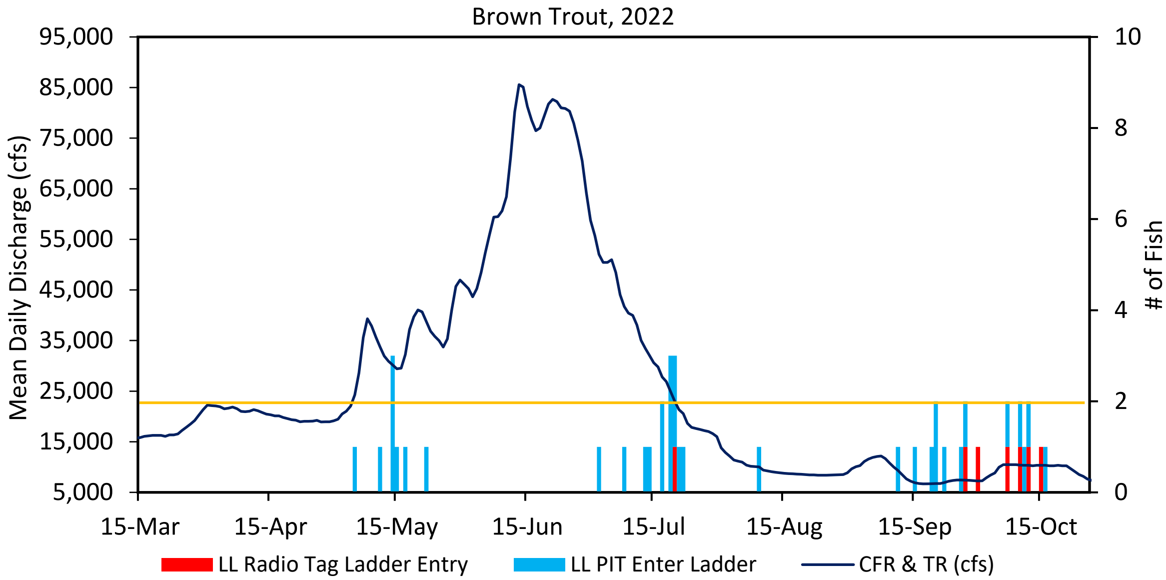
Figure 7-15: Summary of individual radio and PIT tagged Rainbow Trout detected entering the fish passage facility and mean daily streamflow.



Notes: CFR = Clark Fork River; TR = Thompson River; yellow line = 23,000 cfs; spill occurs when flows exceed line.
Source: CFR and TR 2022.

Radio-tagged Brown Trout entered the fish passage facility primarily during the fall months, September and October, with the exception of one Brown Trout entering the fish passage facility in July (in 2022). PIT-tagged Brown Trout recorded entering the fish passage facility were detected in May, July, once in August, and September and October. Brown Trout were detected entering the fish passage facility when spill occurred at the Main Channel Dam at the ascending and descending limb of the hygrograph, as well as during baseflows during the fall months (**Figure 7-16).** As with Rainbow Trout, Brown Trout were not detected during peak flows.

Figure 7-16: Summary of individual radio and PIT tagged Brown Trout detected entering the fish passage facility and mean daily streamflow.



Notes: CFR = Clark Fork River; TR = Thompson River; cfs = cubic feet per square feet; yellow line = 23,000 cfs; spill occurs when flows exceed line.
Source: CFR and TR 2022.

7.1.3.4 Hydraulic Conditions Downstream of the Main Channel Dam

The 2021 and 2022 telemetry data, and the Hydraulic Conditions Study (computational fluid dynamics [CFD]) modeling data, provide insight into fish passage conditions at a range of flows. The goals of the Hydraulic Conditions Study were to assess the velocity field downstream of the fish passage facility to understand if the flow field created by discharge from the fish passage facility provides a sufficient behavioral cue (attraction flow) to Bull Trout and other species, and whether velocities are low enough as to not fatigue fish attempting to approach the fish passage facility entrance.

A CFD model was developed of the existing Thompson Falls Main Channel Dam and river downstream of the dam using FLOW-3D HYDRO software (FLOW 3D) (version 22.1.0.16). The hydraulic modeling involved two phases. Phase 1 used two-dimensional simulations to provide depth averaged velocities at four flow scenarios: 200, 2,000, 25,000, and 37,000 cfs. The modeling scenarios were developed to determine the flow behavior and resulting downstream flow conditions over the range of operating conditions for the upstream fish passage facility. During Phase 2, the full model domain was analyzed using 3D modeling to better evaluate the vertical velocity distributions of flow downstream of the Main Channel Dam. Additional evaluations during Phase 2 of the study evaluated flows of 37,000 and 2,000 cfs. These flow rates bracket the range of possible flow conditions that are likely to occur during operation of the Upstream Fish Passage Facility. This section provides a brief summary of the results, details can be found in the ISR and USR (NorthWestern 2022b and 2023b).

Based on the results of CFD modeling, flows immediately downstream of the Thompson Falls Main Channel Dam are very complex, dynamic, and highly turbulent. Due to the curved shape of the Main Channel Dam, the flow jets through the panel and gate openings collide downstream of the structure causing significant mixing, turbulence, and energy dissipation. As flows pass downstream through the rocky falls area, velocities generally increase but are quickly dissipated by the main channel. The relatively sharp bend in the river alignment further dissipates velocities. As flows proceed farther downstream to the High Bridge, approximately 2,200 feet downstream of the Main Channel Dam, flows are relatively calm and uniform. Velocities increase again as the river narrows and depths decrease at the downstream boundary of the model domain approximately 500 feet downstream of the High Bridge (NorthWestern 2022b).

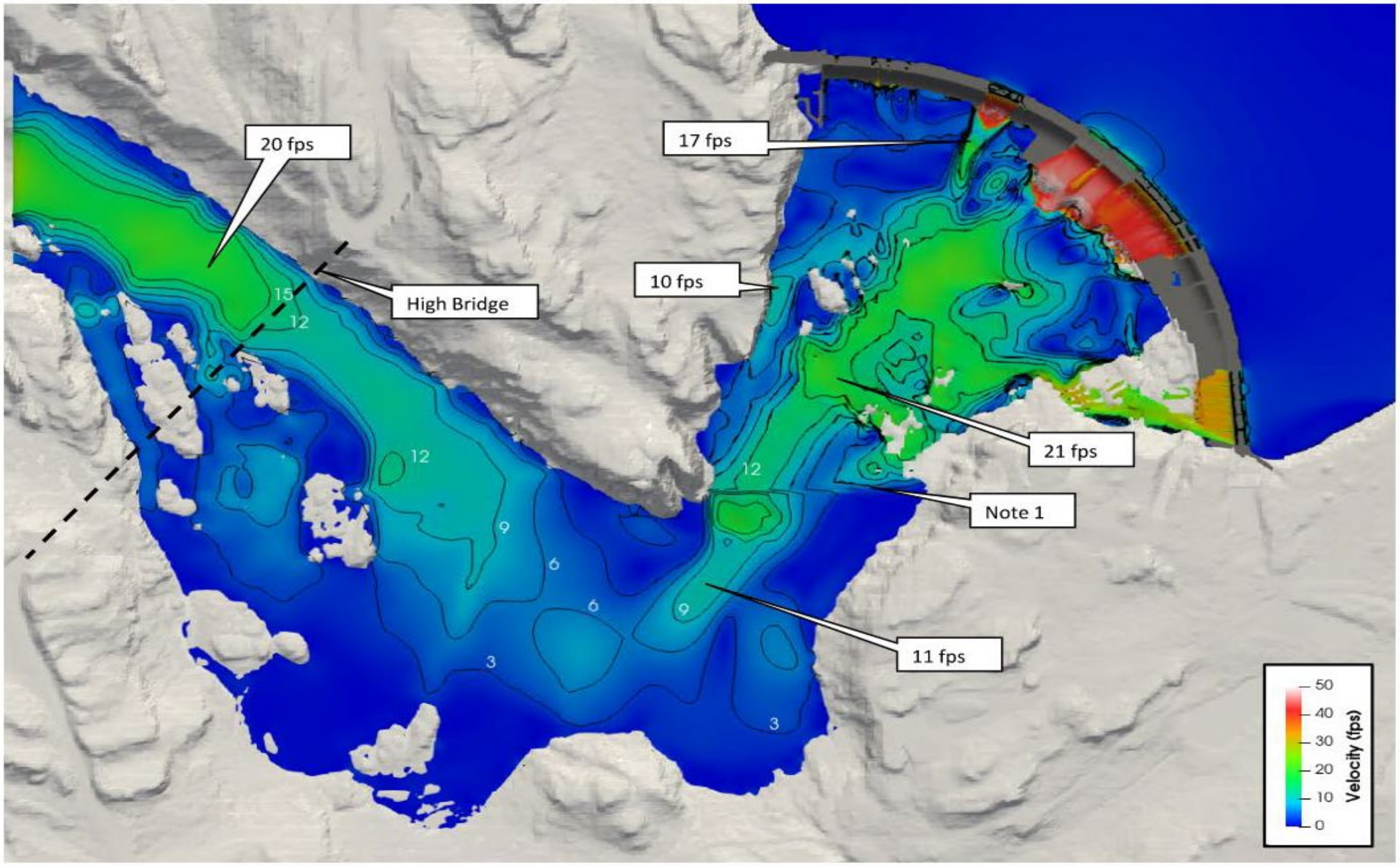
At 37,000 cfs, the highest velocities are on the downstream face of the Main Channel Dam, which are reduced considerably immediately downstream of the Main Channel Dam due to energy dissipation from the highly turbulent flows. A plan view of water velocities within the model domain are shown in **Figure 7-17**. The local upstream fish passage facility velocities are relatively low (less than 5 feet per second [fps]) due to the submergence of the upstream fish passage facility. Within the natural falls area, water velocities increase to a maximum of approximately 21 fps. Within the main river channel downstream of the natural falls, velocities decrease to approximately 11 fps as the channel widens and turns right. As the channel narrows again and flows pass under the High Bridge near the downstream end of the model, velocities increase to approximately 20 fps. The margins of the downstream river channel generally exhibit velocities of approximately 3 fps. However, along the left bank of the main channel there are a number of small side channels which locally increase the velocities. These generally reenter the main river channel near or just downstream of the High Bridge. Overall, the depth-averaged velocities from the upstream fish passage facility, through the channel downstream of High Bridge range from about 3 to 20 fps, with the higher velocities in the main channel path and lower velocities along the edges of the channel banks.

At 25,000 cfs, the highest velocities are on the downstream face of the Main Channel Dam, which are reduced considerably immediately downstream of the Main Channel Dam due to energy dissipation from the highly turbulent flows. A plan view of flow velocities within the model domain is shown in **Figure 7-18**. The local upstream fish passage facility velocities are relatively low (less than 5 fps) due to the submergence of the upstream fish passage facility. Some impacts from the HVJ can be seen within the resulting velocity field. Within the falls area, velocities increase to a maximum of approximately 27 fps. These velocities are slightly higher than those modeled at 37,000 cfs due to less submergence and a larger drop across the falls. Within the main river channel downstream of the falls, flow velocities decrease to approximately 13 fps as the channel widens and turns right. As the channel narrows again and flows pass under the High Bridge near the end of the model, velocities increase to approximately 19 fps. The margins of the downstream river channel generally exhibit velocities of approximately 1 to 5 fps. Overall, the depth-averaged velocities from the upstream fish passage facility, through the channel downstream of High Bridge range from about 2 to 27 fps, with the high velocities in the main channel path and lower velocities along the edges of the channel banks.

At 2,000 cfs, the highest velocities are immediately downstream of the open radial gate. However, these velocities are quickly reduced due to energy dissipation from the turbulent flow in the pool downstream of the Main Channel Dam structure. A plan view of flow velocities within the model domain is shown in **Figure 7-19**. The velocities from the open radial gate generally carry flow directly towards the falls. The pools to the left and right of this main flow path generally have limited flow and are relatively calm. In the vicinity of the Upstream Fish Passage Facility, the local velocities are about 3 to 12 fps, which is noticeably higher than the previous two simulations due to the lower submergence. Additionally, the impacts of the HVJ and Upstream Fish Passage Facility entrance flows are much more evident. Within the falls area, the flow velocities increase to a maximum of approximately 23 fps. Within the main river channel downstream of the falls, peak flow velocities decrease to about 3 to 5 fps as the channel widens and turns right. As the channel narrows again and flows pass under the High Bridge near the end of the model, velocities increase to slightly greater than 2 fps. The margins of the downstream river channel generally exhibit velocities less than 1 fps. Overall, the depth-averaged velocities from the upstream fish passage facility, through the channel downstream of High Bridge range from about 3 to 23 fps, with the higher velocities in the main channel path and lower velocities along the edges of the channel banks.

At 200 cfs, the velocities downstream of the Main Channel Dam generally are less than 2 fps. Velocities are higher immediately downstream of bay 1. However, these velocities are quickly dissipated within the pool in front of the upstream fish passage facility entrance. A plan view of flow velocities within the model domain is shown in **Figure 7-20**. The local upstream fish passage facility velocities range from 3 to 8 fps. Higher velocities are most evident where shallow flows pass from the HVJ and Upstream Fish Passage Facility entrance into the neighboring pool. Within the natural falls, flow velocities increase to a maximum of approximately 17 fps. As flows exit the falls and enter the main river channel, the velocities are quickly dissipated to 3 fps or less. As the river channel widens flows pass through the righthand bend, velocities are less than 2 fps. The remainder of the modeled river channel also exhibits flow velocities less than 1 to 2 fps across the full cross section of the channel. Overall, the depth-averaged velocities from the upstream fish passage facility, through the channel downstream of High Bridge range from about 3 to 17 fps, with the higher velocities isolated to the falls area and downstream of the upstream fish passage facility.

Figure 7-17: 37,000 cfs Plan View of Velocities



Notes:
1. 2D/3D mesh block boundary.
2. Contour interval of 3 fps shown from 0-15 fps.

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RUN 1: 37,000 CFS
PLAN VIEW OF VELOCITIES

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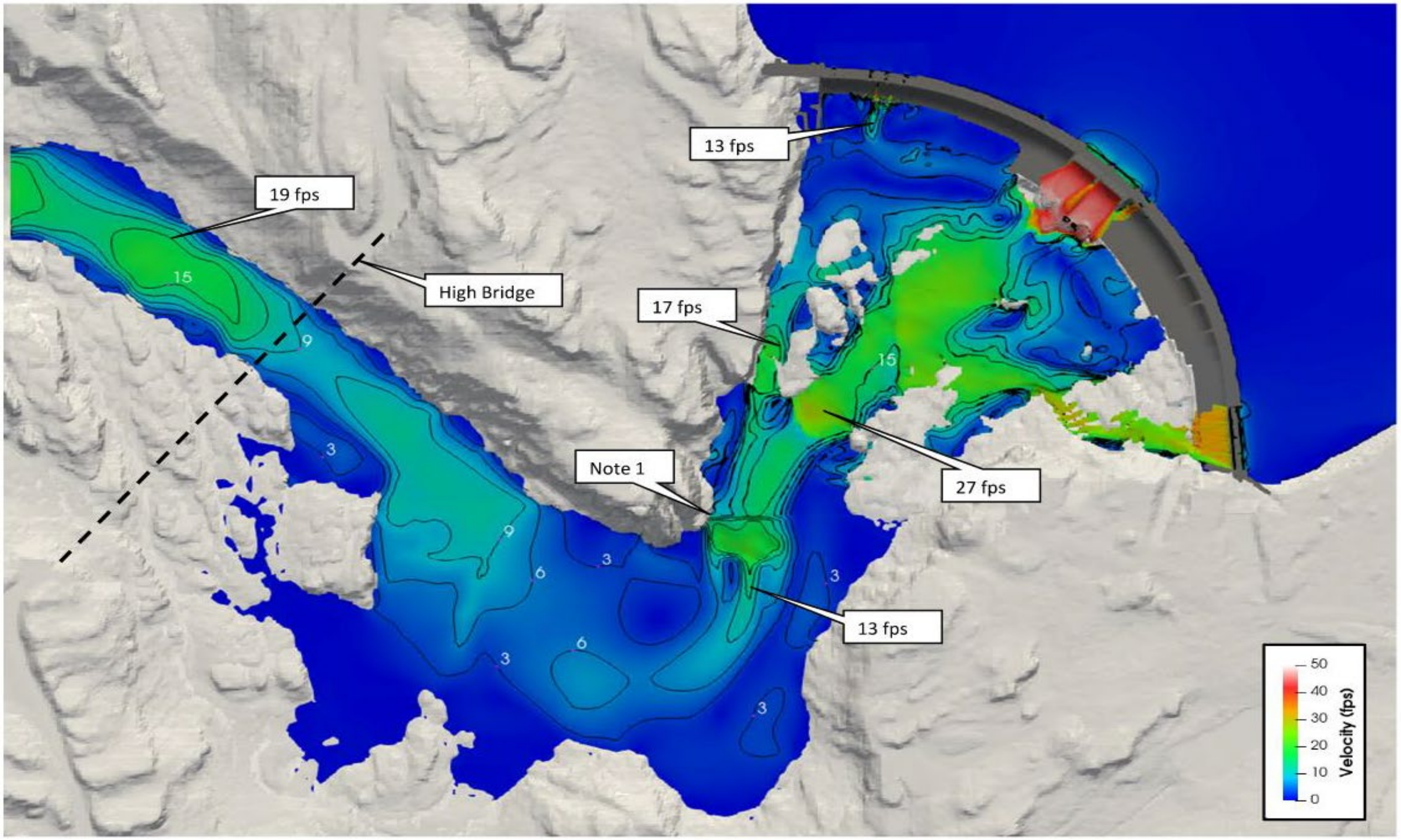
Figure 7-18: 25,000 cfs Plan View of Velocities



Notes:
1. 2D/3D mesh block boundary.
2. Contour interval of 3 fps shown from 0-15 fps.

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RUN 2: 25,000 CFS
PLAN VIEW OF VELOCITIES

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Figure 7-19: 2,000 cfs Plan View of Velocities

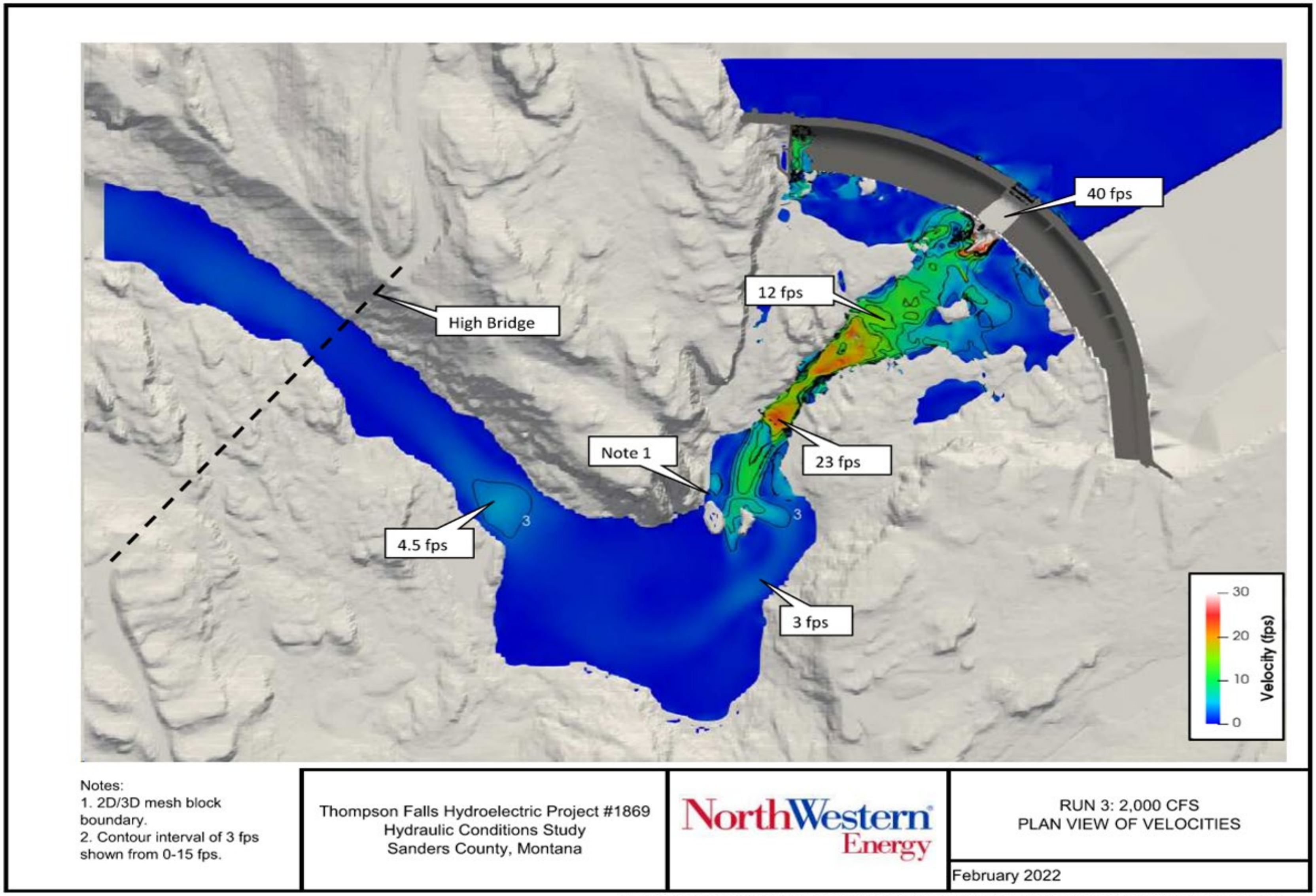
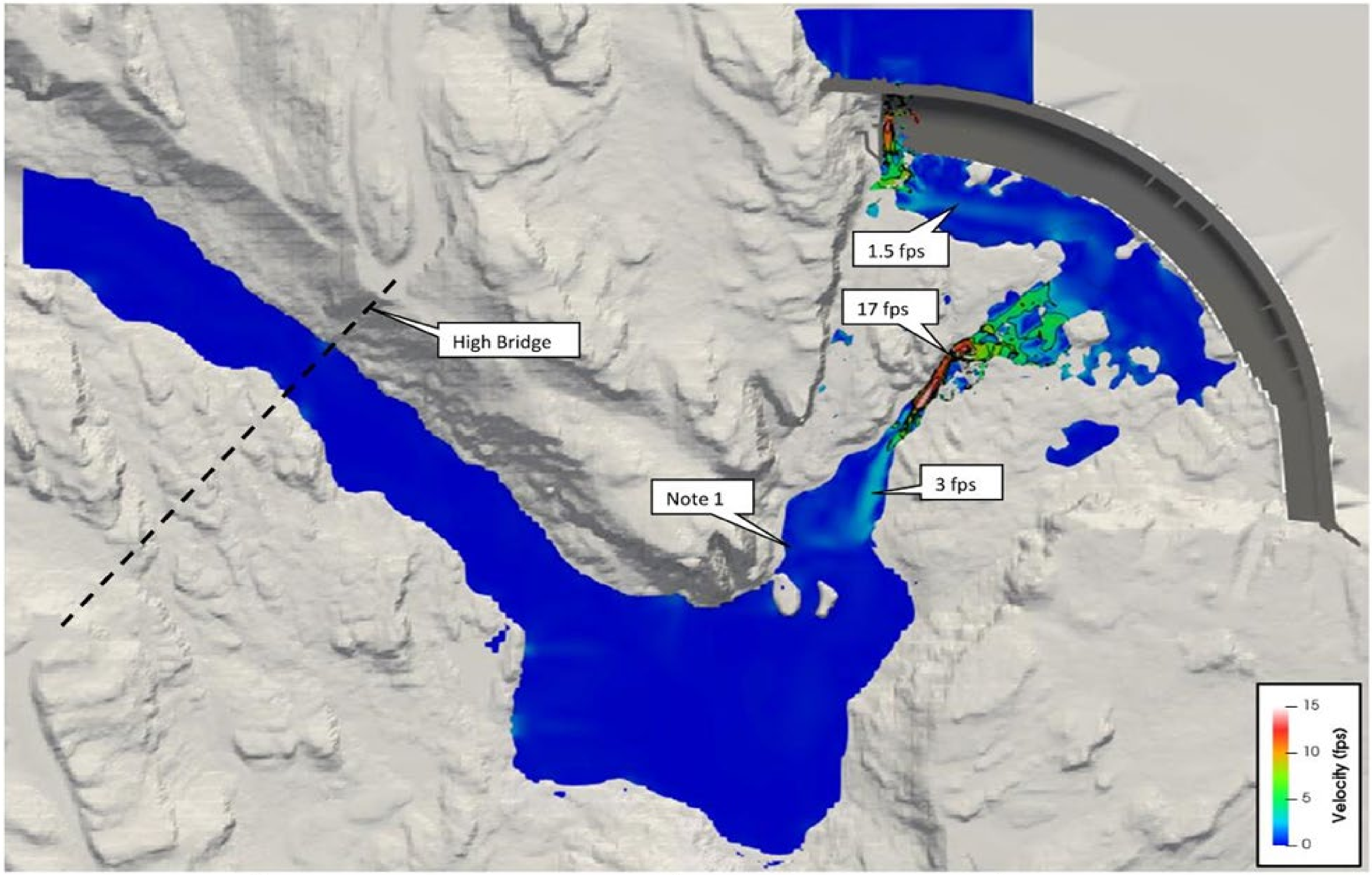


Figure 7-20: 200 cfs Plan View of Velocities



Notes:
1. 2D/3D mesh block boundary.
2. Contour interval of 3 fps shown from 0-15 fps.

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RUN 4: 200 CFS
PLAN VIEW OF VELOCITIES

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The natural falls, located approximately 600 feet downstream of the Main Channel Dam, has HVJ even at the lowest flow modeled (200 cfs) (**Table 7-9**). At the higher modeled flow ranges, a potential velocity barrier was also apparent further downstream near the High Bridge (Table 7-9). At 37, 000 cfs, the depth averaged velocity in the High Bridge area was 21 fps (Figure 7-14). At 25,000 cfs, the depth average velocity at the High Bridge was 19 fps (Figure 7-15). The the lower modeled flows, no velocity barrier was apparent at the High Bridge (Figure 7-16 and 7-17).

Table 7-9: Summary of Results of Thompson Falls Dam Phase 1 CFD Modeling

Run	Flow Rate (cfs)	Typical Flow Depth Below Dam* (feet)	Maximum Velocity Below Dam* (fps)	Typical Velocity Near Upstream Fish Passage Facility Entrance (fps)	Maximum Velocity Through Falls (fps)	Downstream Channel Margin Velocities (fps)	Maximum Velocity Near High Bridge (fps)
1	37,000	5-8	20	1-5	21	3	20
2	25,000	5-8	20	1-5	27	1-5	19
3	2,000	2-6	15	3-12	23	<1	2
4	200	1-5	10	3-8	14	<1	<1

Notes: * These columns refer to the area below the Main Channel Dam but above the falls; cfs = cubic feet per second; fps = feet per second

During Phase 2 of the study, the full model domain was analyzed using 3D modeling to evaluate the vertical velocity distributions of flow downstream of the Main Channel Dam. Additional evaluations during Phase 2 of the study evaluated flows of 37,000 and 2,000 cfs. These flow rates bracket the range of possible flow conditions that are likely to occur during operation of the upstream fish passage facility. The Phase 2 portion of the study identified three critical areas in the downstream reach on which to focus the modeling including the area near the fish passage facility entrance, the falls area and the High Bridge area. The results were evaluated based on three categories related to the swimming ability of the local fish species. Based on the 3D modeling results, the percent of the cross-sectional area for each velocity category was determined for each of three identified critical areas. The percent of the cross-sectional area for each velocity category at the fish passage facility entrance, falls, and High Bridge areas are summarized in **Table 7-10**.

Table 7-10. Results of Thompson Falls Dam Phase 2 CFD Modeling.

Location		Ladder Entrance		Falls Area		High Bridge	
Flow Rate (cfs)		37,000	2,000	37,000	2,000	37,000	2,000
Category Description	Velocity Range (fps)	Percent of Cross-Sectional Area (%)					
Maximum Prolonged Swim Speed	0-7.0	100	79	2	8	7	100
Intermediate Swim Speed Range	7.1-14.0	0	21	14	16	4	0
Exceeds Maximum Burst Speed	>14.0	0	0	84	76	89	0

Notes: cfs = cubic feet per second; fps = feet per second

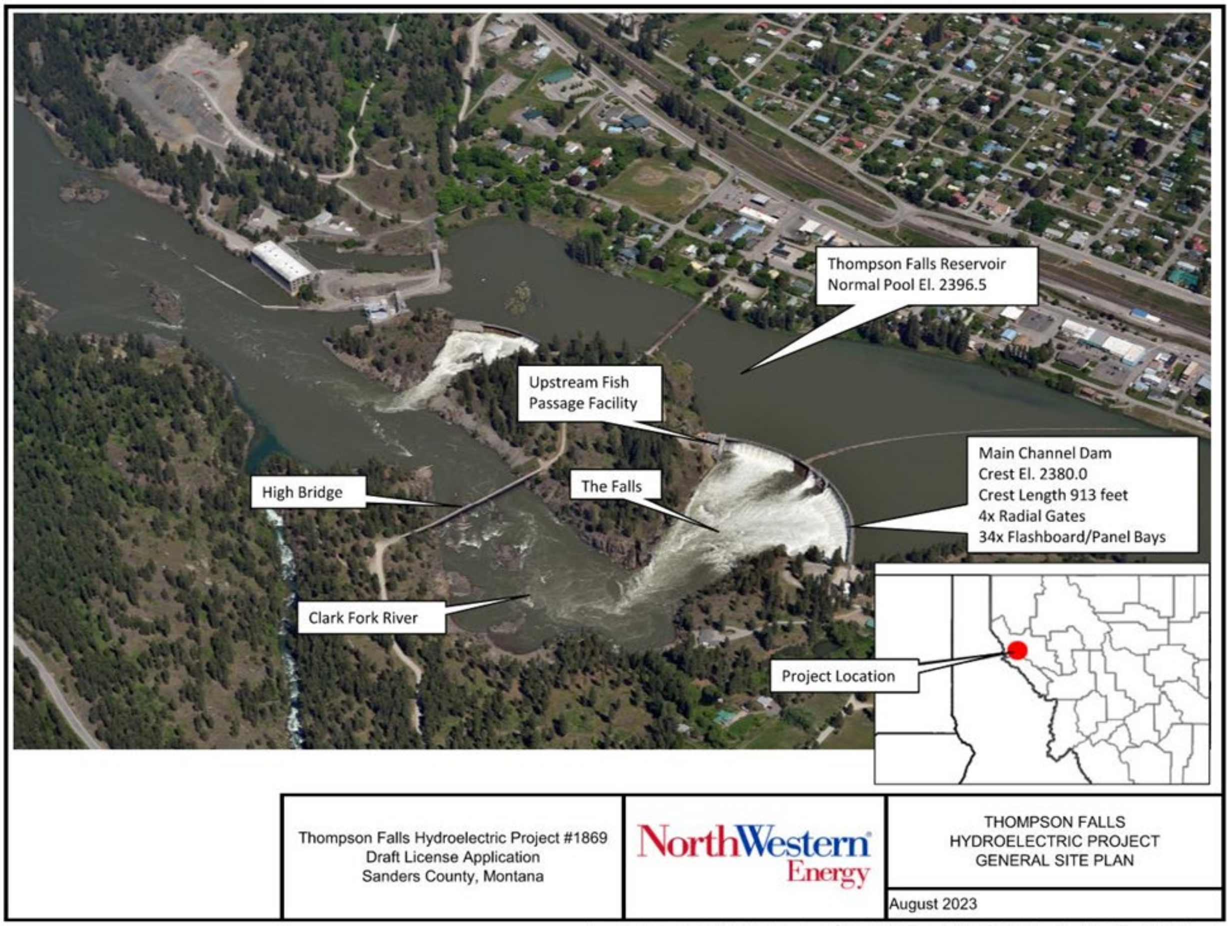
As shown in **Table 7-9**, for both flow rates evaluated, the fish passage facility entrance generally has large portions of the cross section that are below 7 fps, with negligible areas that exceed the maximum burst speed of 14 fps. These data indicate no impediments to fish passage in the area surrounding the upstream fish passage facility entrance.

Conversely, for both flow rates evaluated, the falls area has large portions of the cross section that exceed 14 fps, with limited areas that are below 7 fps.

At the High Bridge area, the results vary depending on the flow rate evaluated. At the higher flow, the majority of the cross-section velocity exceeds 14 fps with limited areas that are below 7 fps. At the lower flow rate, the High Bridge velocities are all under 7 fps.

During spill at the Main Channel Dam, both the telemetry and CFD modeling results indicate velocity obstacles may exist in the ZOP, specifically at the natural falls where the channel is constricted by boulders and rock (**Figure 7-21).** The CFD model indicates the falls would be a particularly challenging area for slower swimming non-salmonids to navigate. Another area with high velocities, at and above 25,000 cfs, is immediately downstream of the High Bridge where the channel constricts again. Both constricted areas (at the falls and High Bridge) are natural features of the Clark Fork River. During spill, the area accessible for various fish species to move upstream declines and is limited to the margins of the wetted channel and near the bottom of the channel depending on the roughness and available topography.

Figure 7-21: View of the Thompson Falls Project area and location of the falls in relation to the fish passage and High Bridge.



The CFD modeling indicates velocities near the fish passage facility entrance are within fish swimming abilities at all flow scenarios (*refer to* **Table 7-10** and **Table 7-11**). There are no apparent velocity barriers near the fish passage facility entrance that would discourage fish from finding or entering the fish passage facility. The location of the fish passage facility appears to be on the optimal side for fish based on the manual tracking data and proportion of detections recorded within the MDR zone versus the MDL zone. The left side (MDL) is generally more turbulent and violent at various spill regimes at the Main Channel Dam. CFD modeling also illustrates the higher velocities along the left bank during spill that are less accessible/suitable for several species based on their swimming abilities.

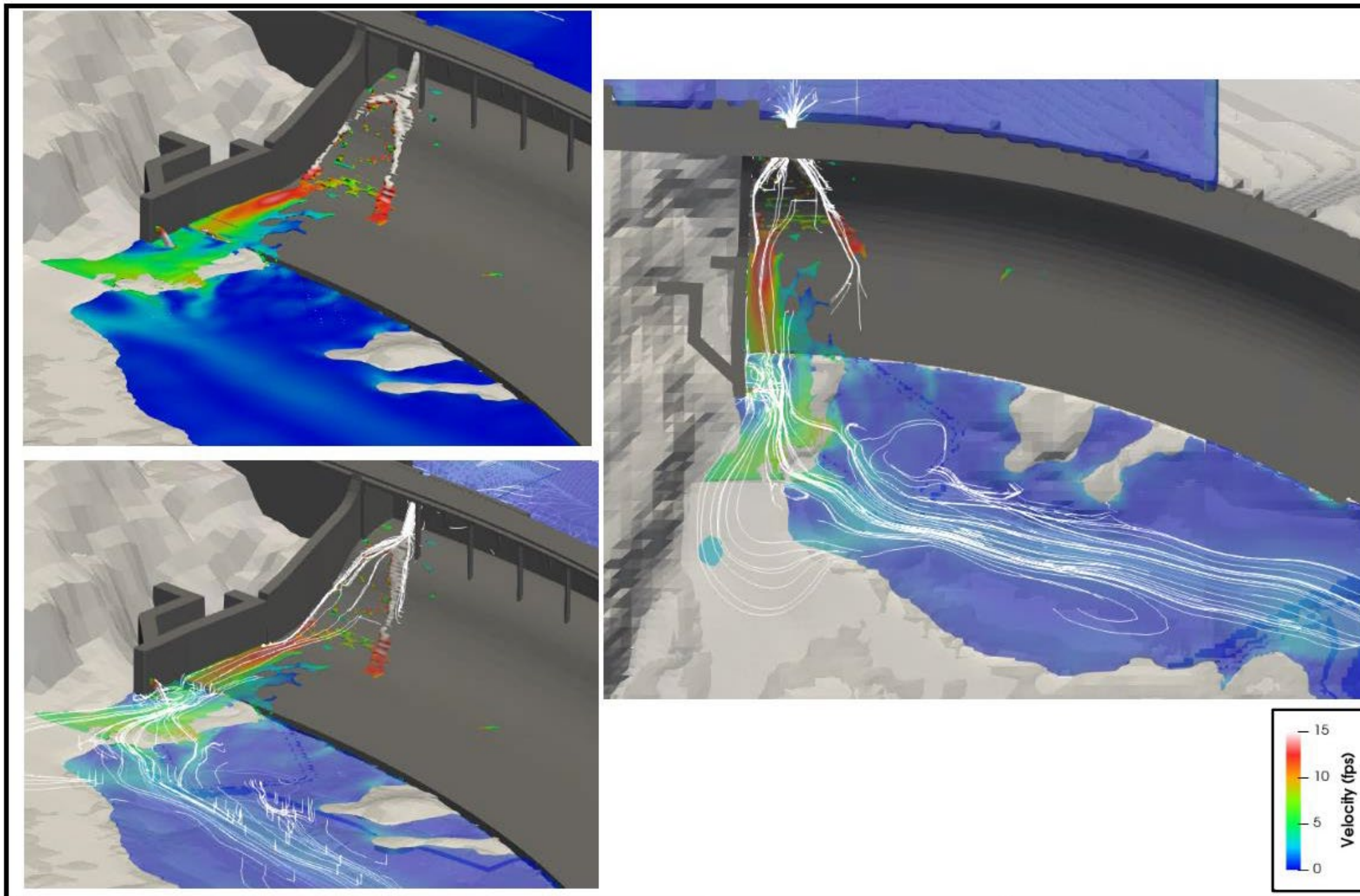
Table 7-11: Results of Thompson Falls Dam Phase 2 CFD Modeling

Location		Ladder Entrance		Falls Area		High Bridge	
Flow Rate (cfs)		37,000	2,000	37,000	2,000	37,000	2,000
Category Description	Velocity Range (fps)	Percent of Cross-Sectional Area (%)					
Maximum Prolonged Swim Speed	0-7.0	100	79	2	8	7	100
Intermediate Swim Speed Range	7.1-14.0	0	21	14	16	4	0
Exceeds Maximum Burst Speed	>14.0	0	0	84	76	89	0

Notes: % = percent; cfs = cubic feet per second; fps = foot per second

When looking at flow path streamlines it appears that at modeled flows of 200 cfs there remains a distinguishable level of attraction flow near the fish passage facility entrance that flows downstream and through the falls (**Figure 7-22**). As flows increase to 2,000 cfs the flow path streamlines remain distinguishable near the fish passage facility entrance although as it reaches the falls area it begins mixing with the flow paths from spill at the radial gates. As total spill increases and reaches 25,000 and 37,000 cfs, flow path streamlines from the fish passage facility entrance area are not as distinct and appear to be overwhelmed from flows at the radial gates and flow over the Main Channel Dam (**Figure 7-23**). These data indicate when large flows occur at the Main Channel Dam, attractant flow from the fish passage facility efficacy may diminish.

Figure 7-22: 200 cfs Upstream Fish Passage Facility entrance details.



Notes
1. Legend shown without transparency.

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RUN 4: 200 CFS
UPSTREAM FISH PASSAGE FACILITY
ENTRANCE DETAILS

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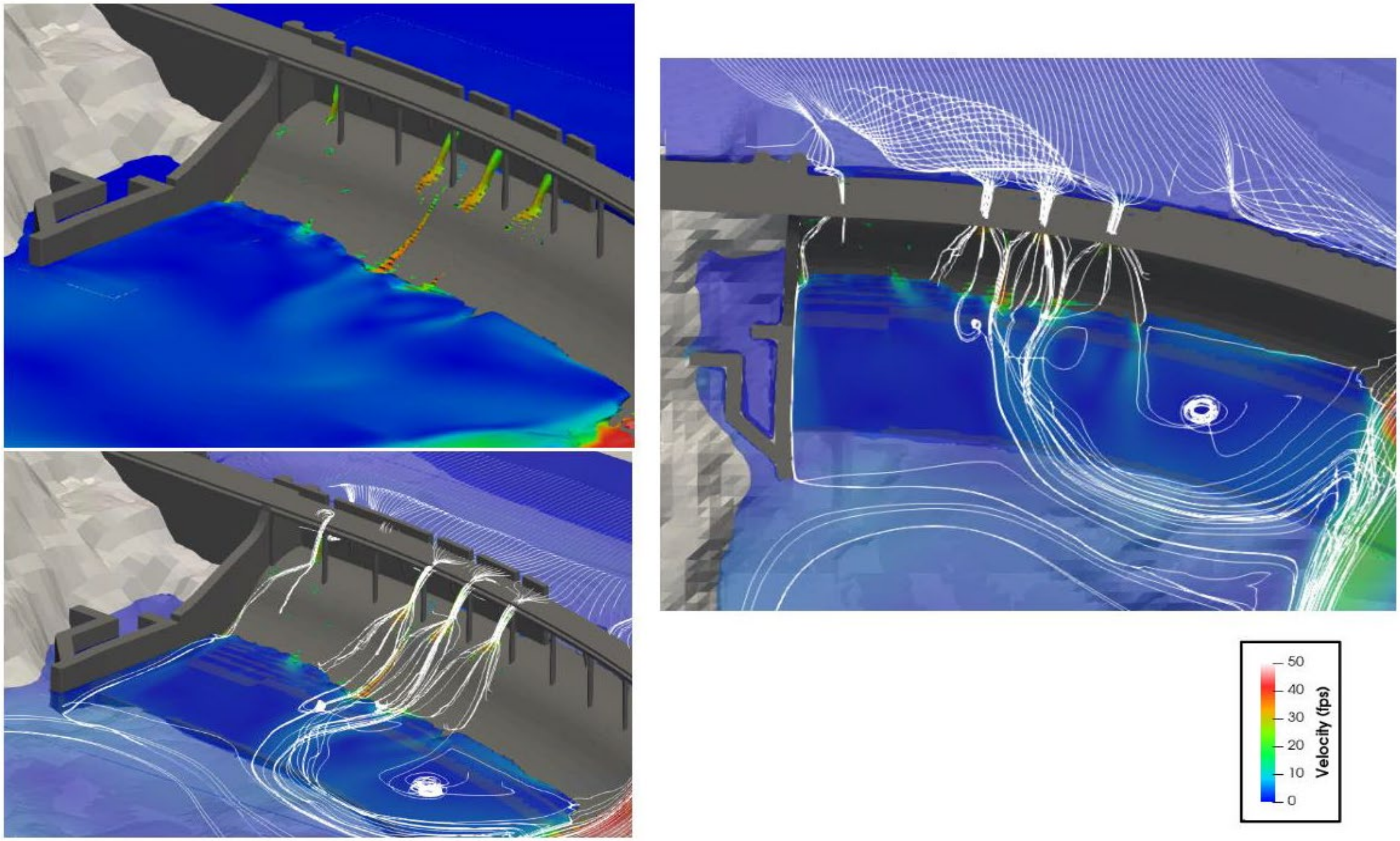
Figure 7-23: 37,000 cfs Upstream Fish Passage Facility entrance details.



Notes
1. Legend shown without transparency.

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NorthWestern Energy

RUN 1: 37,000 CFS
UPSTREAM FISH PASSAGE FACILITY
ENTRANCE DETAILS

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7.1.3.5 Internal Fish Passage Facility Efficiency

Based on the review of 65 articles from 1960 to 2011 that evaluated fish passage facilities, Noonan et al. (2012) found upstream passage efficiency for salmonids was close to 62 percent and non-salmonids was very poor (21%) in comparison. In addition, fish passage efficiency varied significantly among the various fishway types with the pool and weir, pool and slot, and natural fishways showing the highest efficiencies (Noonan et al. 2012).

Passage efficiency (internal) at Thompson Falls exceeds the values reported by Noonan et al. (2012) with approximately 70 to 75 percent of the salmonids and 23 to 27 percent of the non-salmonids (Largescale Sucker and Northern Pikeminnow) that enter the upstream fish passage facility ascend to the top (NorthWestern 2022c, 2023c). However, data on non-salmonids at the Thompson Falls fishway are limited as fewer of these species have been PIT-tagged. However, it is clear from the fish passage facility catch data that Largescale Sucker, Northern Pikeminnow, and Smallmouth Bass are capable of ascending the fish passage facility in large numbers.

Internal fish passage efficiency was best calculated in 2021 and 2022 after the installation of the PIT tag antennae in the entrance. Prior to 2021, all calculations required a PIT-tagged fish to enter the fish passage facility and move up to the lower pools 7/8. **Table 7-12** provides a summary of the 2021 and 2022 internal fish passage efficiency for salmonids and non-salmonids, as well as individual species.

The data collected in the fish passage facility from remote PIT tag arrays indicate there are more fish entering the fish passage facility and detected in the lower pools (7/8) than ascending to the top (holding pool) (NorthWestern 2022c, 2023c). Once salmonids reach the lower pool, it is estimated that around 91 percent of the salmonids and 71 percent of the non-salmonids continue to the top holding pool (**Table 7-12).** It is unclear what factors may be limiting fish that enter the fish passage facility from continuing to the lower pools and further up the fish passage facility to the top holding pool. It could be related to a lack of motivation to migrate upstream, or it could be related to hydraulic conditions in the fish passage facility.

Table 7-12: Number and percent of fish entering the fish passage facility recorded in the entrance, Pool 7/8, and top holding pool.

21/2022 PIT Tag Detections	# Fish @ Entrance	Fish in Pool 7/8 # (% of fish detected at entrance)	# Fish in Holding Pool (% of fish detected at entrance)	% of fish detected at Pool 7/8 reaching holding pool
Salmonids	166	131 (79%)	119 (72%)	91%
Non-salmonids	61	21 (34%)	15 (25%)	71%
Species				
BULL	4	3 (75%)	3 (75%)	75%
LL	66	46 (70%)	40 (61%)	87%
RB + hybrids	92	80 (87%)	74 (80%)	93%
WCT	3	2 (67%)	2 (67%)	67%
MWF	1	0	0	0%
NPMN	35	17 (49%)	13 (37%)	76%
LSSU	22	2 (9%)	2 (9%)	9%
LNSU	3	0	0	0

Once fish enter the fish passage facility, conditions within the facility are key to their successful ascent. Fish passage facility operations in orifice mode provide the largest opportunity for the most fish and fish species to ascend (NorthWestern 2019b). Based on the 2018 internal fish passage facility hydraulic study (NorthWestern 2018a), additional evaluation may identify added adjustments to further optimize fish passage facility hydraulics for upstream fish passage, specifically the lower pools between the entrance and pool 8. While the fish passage facility operates in orifice mode throughout the season (since 2019), the first eight pools are designed to be in notch mode.

7.1.3.6 Ascent Time in the Fish Passage Facility

Ascent information for PIT-tagged fish entering the fish passage facility and ascending the fish passage facility has been recorded since 2011. Prior to 2021, the ascent time was calculated based on the time between the last detection in the lower pools (7/8) and the holding pool. Since the PIT tag array was installed in the entrance of the fish passage facility in 2021, fish movement indicates travel duration between the entrance and lower pools can be within a few minutes. The time fish take to swim the distance between the entrance and lower pool PIT tag array is negligible. Therefore, ascent times are presented for all years.

Between 2011 and 2020, a total of 385 salmonids were recorded entering and ascending the ladder with a median salmonid ascent time of 2.2 hours in orifice mode and 1.3 hours in notch mode. In 2021 and 2022, the median ascent time for salmonids was 2.3 to 2.6 hours in orifice mode. Non-salmonid ascent times were longer, with a 2011 to 2020 median ascent time in orifice mode of 6.2 hours. Details of 575 ascent times for PIT-tagged fish that entered the fish passage facility 2011-2020, 2021 and 2022 are summarized in **Tables 7-13 and 7-14**.

Table 7-13: Summary of fish ascent times for fish moving through the fish passage facility while operating in orifice mode.

Orifice Mode / Fish Group	Year(s)	Number of Fish	Ascent Time (hours)			
			Min	Max	Median	Average
Salmonids	2011-2020	306	0.7	259	2.2	5.4
	2021	49	0.2	24.4	2.3	4.9
	2022	70	1	419.5	2.6	11.2
Non-Salmonids	2011-2020	53	1.3	31	6.2	7.8
	2021	9	2.3	6.6	3.3	3.7
	2022	6	1.4	13.4	3.2	4.5

Note: Data from 2011-2020 provides ascent times from lower pools to the holding pool, and data from 2021 and 2022 provide ascent times from last detection at the fish passage facility entrance to the holding pool.
Source: NorthWestern 2019a, 2019b, 2022c, 2023c

Notch mode results in higher velocities and reduction in areas of slack or calm water compared to orifice mode (NorthWestern 2018a). Therefore, faster ascent times do not necessarily translate into more fish or greater opportunity for upstream fish passage for all species. The faster ascent time may indicate limitations of access and potentially selection against some species to ascend the fish passage facility in notch *versus* orifice mode. In 2017 and 2018 testing was completed comparing notch with orifice mode where the passage facility was primarily operated in the notch configuration. This mode greatly reduced capture numbers of non-salmonid species and it was subsequently determined the gates should be operated in orifice mode.

Table 7-14: Summary of fish ascent times for fish moving through the fish passage facility while operating in notch mode.

Notch Mode / Fish Group	Year(s)	Number of Fish	Ascent Times (hours)			
			Min	Max	Median	Average
Salmonids	2011-2018	79	0.6	27.6	1.3	1.9
Non-Salmonids (Northern Pikeminnow)	2018	3	0.9	1.1	1.0	1.0

Notes: Data from 2011-2018 provides ascent times from lower pools to the holding pool. Fish passage facility operated full time in notch mode starting in 2019.

Based on the ascent time data, most salmonids ascend the ladder more quickly than non-salmonids. The maximum time any fish took to ascend the ladder was a Brown Trout that entered the fish passage facility September 22 and ascended 17 days later on October 10. The previous record was 10 days in June 2016 by a Brown Trout with a history of ascending the fish passage facility six times in 5 different years (2013, 2015, 2016, 2017, 2018). This Brown Trout had five ascent times recorded ranging from 58 minutes to 10 days and was detected in the lower pools in the ladder for extended periods prior to ascending in 2017 (21 days) and 2018 (4 days). It ascended the ladder in the spring and fall months, ascended more quickly in notch mode than orifice mode, and was detected in the Thompson River annually since 2015. The ascent time (0.97-10 days) did not appear to impede this Brown Trout's ability to continue migrating upstream and into the Thompson River after its release upstream of Thompson Falls Dam.

7.1.3.7 Upstream Fish Passage and Utilization of Upstream Habitat

Angler reports have provided insight into fish migration at a large scale, including the lower Flathead, middle Clark Fork, and Blackfoot rivers. Since 2017, salmonids recorded at the fish passage facility workstation receive a Floy tag that is visible to anglers, prior to being released upstream of the dam. FWP contact information is provided on the Floy tag.

Since 2017, anglers have reported catching 80 salmonids that previously ascended the fish passage facility (**Table 7-15**). The majority of the salmonids were captured upstream of Thompson Falls Dam with the greatest number of angler reports from the Thompson River. Other salmonids were captured downstream of Thompson Falls Dam, in the Noxon reach.

Table 7-15: Summary of Floy-tagged salmonids reported by anglers since 2017.* Angler reports include fish caught upstream and downstream of Thompson Falls Dam.

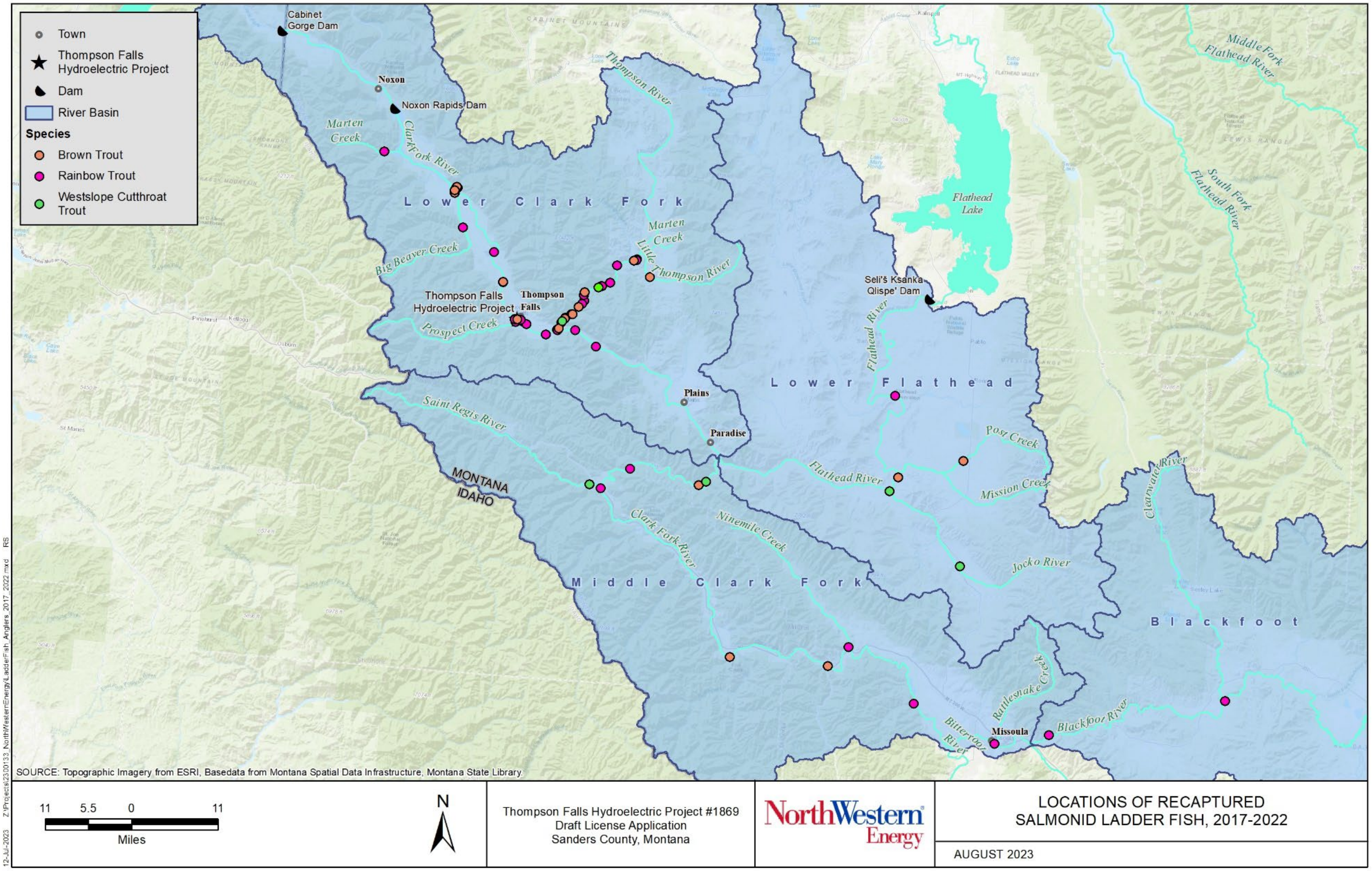
Species	2017	2018	2019	2020	2021	2022	Total
LL		1	3	6	5	7	22
RB	1		9	12	15	15	52
WCT		1	1	2	1	1	6
Total	**1**	**2**	**13**	**20**	**21**	**23**	**80**

Source: FWP unpublished

Angler report data continue to show the large geographical area fish are utilizing, both upstream and downstream of Thompson Falls Dam (**Figure 7-24**). In 2022, the longest distance report upstream was at the confluence of Nine Mile Creek with the Clark Fork River about 20 miles west of Missoula. Past reports include 190 miles upstream of the Project to the confluence of the Clearwater River and 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 and near the Project area, in the mainstem Clark Fork River and Thompson River drainages (**Figure 7-21**). Downstream, fish have been captured at the mouth of Prospect Creek extending downstream in Noxon Reservoir to Vermilion Bay and White Pine Creek, as well as below Cabinet Gorge Dam.

Figure 7-24: Angler Reports of Recaptured Salmonid Ladder Fish, 2017-2022.



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7.1.4 Downstream Fish Passage

7.1.4.1 Downstream Survival

When water is spilling over or through the dams at the Thompson Falls Project, fish can migrate downstream *via* the spillways, outlet works, or through the turbines. During non-spill periods, the primary means of downstream passage is through the turbines. In 2007, the previous Licensee (PPL Montana) prepared a *Literature Review of Downstream Fish Passage Issues at Thompson Falls Hydroelectric Project* (GEI 2007b) (2007 Literature Review) which included specific consideration of federally-listed Bull Trout and Westslope Cutthroat Trout, a sensitive species and Montana Species of Special Concern.

The 2007 Literature Review estimated that survival estimates at the Project are 94 percent through the new powerhouse (Kaplan turbine), 85 percent through the original powerhouse (Francis turbines), and 98 percent through the spillway. Combined survival estimates for trout measuring greater than 100 mm was estimated to likely be 91 to 94 percent.

The BO (FWS 2008) issued by the FWS October 28, 2008, concurred with the survival estimate in the 2007 Literature Review.

In 2022, NorthWestern prepared an Updated Literature Review (NorthWestern 2022d) to provide updates, as available, to estimates of downstream passage survival of various size classes of fish, with respect to current Project configuration and operations. The 2022 Updated Literature Review supported the 2007 findings. The recent 2022 literature review found more recent work confirming the differences in survival between Kaplan and Francis-type turbines. Kaplan units are significantly safer for fish than Francis type units (Vikstrom et al. 2020; Algera et al. 2020). The range of survival through Kaplan turbines for juvenile Atlantic Salmon and Brown Trout is within the estimate previously reported with survival between 100 to 99 percent and Francis juvenile survival 88 to 91 percent (Vikstrom et al. 2020).

The literature reviews (2007 and 2022) concluded that combined survival estimates for passage through the Francis turbines, the Kaplan turbine and the spillway for trout measuring greater than 100 mm is likely 91 to 94 percent. Little research specific to the species at Thompson Falls has been completed since 2006. Thus, no additional literature was identified during the 2022 review that would measurably change the 2007 estimates of downstream survival at the Project.

The Licensee has documented downstream fish movement through the Project since the construction and operation of the Thompson Falls Upstream Fish Passage facility (fish passage facility) commenced in 2011. Salmonids, and some non-salmonids, which are passed upstream are tagged with a PIT tag. Subsequent recaptures of tagged fish have demonstrated that adult salmonids can survive downstream passage at the Project. From 2011 to 2018, PIT-tag data collected at the fish passage facility indicate a minimum of 10 percent of the PIT-tagged fish released upstream of the dam (264 out of 2,644 tagged-fish) returned and ascended the fish passage facility a second, third, fourth, or sixth time. These 264 fish include one Bull Trout, 164 Rainbow

Trout, 73 Brown Trout, 12 Westslope Cutthroat Trout, six Rainbow x Westslope Cutthroat hybrids, four Mountain Whitefish, three Northern Pikeminnow, and one Largescale Sucker (NorthWestern 2019b). Additionally, about 6.5 percent of the 1,107 Floy-tagged Smallmouth Bass ascended the fish passage facility two or more times; two fish ascended three times; one fish ascended four times; and one fish ascended five times (NorthWestern 2018b).

On an annual basis, an average of 8 percent (between 3 and 13.5%) of the salmonids PIT-tagged each year, return to the fish passage facility the following year. For example, in 2019, there were 543 PIT-tagged fish (341 salmonids; 202 non-salmonids) released upstream of the fish passage facility and 8 percent of the salmonids (18 Rainbow Trout; 9 Brown Trout; 1 Mountain Whitefish) and 6 percent of the non-salmonids (10 Northern Pikeminnow; 2 Largescale Sucker) returned to the fish passage facility in 2020 (NorthWestern unpublished data).

PIT tagged adult and juvenile Bull Trout have also been detected in tributaries both upstream and downstream of the Project (NorthWestern 2019a; 2019b), indicating that the fish survived downstream passage through the Project.

Determining whether a fish moved downstream over the spillway or through the turbines depends on streamflow conditions. The combined capacity of the seven generating units at the Project is approximately 23,000 cfs. When river inflows exceed this capacity, spill is initiated at the Main Channel Dam spillway. Therefore, when streamflows are less than 23,000 cfs, it is assumed that all downstream fish passage is through turbines. When streamflows are above 23,000 cfs, fish can pass downstream through the turbines or over the spillway. Data indicate Rainbow and Brown trout, as well Largescale Sucker have survived migrating downstream through the turbines. Additional detection data collected from 10 years of fish passage facility operations indicate Bull Trout, Rainbow Trout, Westslope Cutthroat Trout, Rainbow hybrids, Brown Trout, Northern Pikeminnow, Largescale Sucker, and Smallmouth Bass have all successfully migrated downstream of Thompson Falls Dam, either through the turbines or over the spillway.

The available data demonstrate that fish are successfully passing both upstream and downstream of the Project, and that some fish make the loop multiple times over the years.

7.1.4.2 Fallback

Fallback is generally defined as a fish that successfully completes upstream passage of a fishway at a dam facility but later returns downstream of the dam (Rischel and Bjornn 2003; Naughton et al. 2006, McLaughlin et al. 2013; Silva et al. 2018). The time between successful passage and detection downstream of the facility is also an important component of fallback analysis, but there is no set standard for evaluating fallback.

The concerns with fallback include fish becoming disoriented when exiting the fishway and moving in the wrong direction and no longer motivated to swim upstream as a result of the fishway experience or fish are no longer physically capable of continuing the upstream migration due to the demands of the fishway (McLaughlin et al. 2013). Even if a fish returns to the fishway and reascends, there are concerns of unwanted delay and corresponding consequences such as reduction in fitness, increase susceptibility to injury/mortality, decrease in reproductive success (McLaughlin et al. 2013). Another concern in the Columbia River system regarding anadromous fish is the potential for bias estimates of fish passage and escapement calculations which could also impact estimates of adult salmon run sizes, which have management (ecological and economic) implications for the fish stocks (Boggs et al. 2004). Fallback is also commonly associated as an adverse impact post-tagging (Frank et al. 2009).

Between 2011 and 2022, approximately 3,495 salmonids (between 175-525 salmonids annually) were uniquely tagged at the fish passage facility and released upstream (**Table 7-16**). Fish were detected below Thompson Falls Dam via the PIT tag array in the fish passage facility, other tag arrays in downstream tributaries (e.g., Prospect Creek, Graves Creek), or other sampling efforts (e.g., Noxon Rapids Reservoir gillnetting and electrofishing). Most years there were a few salmonids detected downstream of Thompson Falls Dam within 30 days after ascending the fish passage facility and release upstream.

Table 7-16: Summary of the salmonids detected downstream of Thompson Falls Dam within 30 days of initial release upstream of the dam, 2011-2022.

Fish Species	Annual Salmonid Fallback within 30 days of release upstream of Thompson Falls Dam											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BULL	-	-	-	-	-	-	-	-	-	-	-	-
RB	8	-	-	1	1	3	-	1	1	1	2	1
RBxWCT	-	-	-	-	-	1	-	-	-	-	1	-
WCT	2	-	-	-	-	1	1	-	-	-	1	-
LL	-	-	-	2	1	4	-	-	-	1	1	4
Total	**10**	**-**	**-**	**3**	**2**	**9**	**1**	**1**	**1**	**2**	**5**	**5**
% of Tagged Salmonids	**4.6**	**-**	**-**	**1.2**	**0.4**	**1.7**	**0.4**	**0.6**	**0.9**	**0.7**	**2.5**	**2.7**

7.1.5 Freshwater Mollusks

There are two aquatic species of concern, the Western Pearlshell Mussel *Margaratifera falcata* (listed as Montana SOC and USFS sensitive species), and the Shortface Lanx (*Fisherola nuttalli*), a Montana SOC with known historic range in the Project area. These species are discussed below, including a brief life history background, known distribution of the species in the Project area, threats and limiting factors for each species.

7.1.5.1 Western Pearlshell Mussel

The Western Pearlshell is a freshwater mussel identified as a SOC in Montana in 2008 and a USFS sensitive species in 2010. The freshwater mussels rely on a suitable host fish which is critical to their dispersal and survival (Jackson 1925; Roscoe and Redelings 1964; Young and Williams

1984b). Bauer (1994) concluded that the only suitable host for the glochidia, (larval stage), of Margaritifera *spp*. is the subfamily Salmoninae, restricting these freshwater mussels to trout streams. Specific host fish are often not known; however, studies have shown Brown, Brook, Rainbow, and Cutthroat trout are suitable hosts for Western Pearlshell glochidia (Murphy 1942; Toy 1998; Young and Williams 1984b). In Montana, the native Westslope Cutthroat Trout was historically the host fish (MNHP and FWP 2023d; Stagliano 2019). Reproductive success requires the presence of a suitable host fish when glochidia are released into the water column, although specific reproductive triggers and timing for Western Pearlshell is not well understood (Allard et al. 2015). Western Pearlshell are vulnerable to changes in host species distribution, presence, timing of migration and reproduction (Allard et al. 2015). The distribution of the freshwater mussel is often more geographically limited than the distribution of salmonid fish (Hovingh 2004).

The most suitable habitat for the Western Pearlshell is lotic systems that are oligotrophic with cooler temperatures, low turbidity, low levels of calcium carbonate, and high levels of DO (Bauer 1987, Bauer 1992, Jackson 1925, Roscoe and Redelings 1964, Toy 1998, Young and Williams 1984a). Habitat preferences are toward streams with clean and cold water with relatively stable substrates (Stagliano 2010, MNHP 2018, MNHP 2023). Substrate composition is usually composed of sand, gravel, and cobbles that are “open” graded enough to allow for physical movement and water percolation. In steeper streams, larger boulders may provide small suitable sites immediately downstream of them. In larger streams, the streambank provides for flow disruption and energy dissipation which can result in the formation and maintenance of desired substrates.

The Western Pearlshell is sensitive to water quality issues such as sedimentation and eutrophication. The distribution of this species has also been threatened by impoundments and diversions (MNHP and FWP 2019). Water quality issues and fragmentation of habitat as a result of water diversions or dam structures can adversely impact their host fish which the freshwater mussel relies on for distribution and survival. This freshwater mussel is susceptible to adverse impacts to their environment due to its sedimentary lifestyle after the larval stage and is generally intolerant of pollutants.

Historically, Western Pearlshell was present throughout the Clark Fork River drainage (Stagliano et al. 2007). Populations of the Western Pearlshell in larger rivers such as the Clark Fork River are believed to be extirpated or are at such low densities that long-term viability is unlikely as a result of habitat fragmentation of the mainstem (Stagliano et al. 2007). MNHP database (2023) indicated a single Western Pearlshell was collected in the Thompson Falls Reservoir just upstream of the Dry Chanel Dam along the shallows of the Island Park Shoreline (*refer to* **Figure 8-2**). The sample event occurred in July 2018 by FWP AIS survey crew (personal communication, S. Freeman, FWP, April 2023). Photos were taken (**Photo 7-1**) of the specimen. Although the specimen was found completely intact, it is unknown if the individual was still alive. The crew completing the survey in 2018 used kick nets, rock picking, and raking to examine plants.

The 2018 collection was the first documentation of a Western Pearlshell in Thompson Falls Reservoir. It is unclear if the shell was transported by another species (e.g., mink or river otter), if it washed downstream from the closest documented population in the Thompson River or is representative of a localized population resulting from glochidia detaching from a host fish in the reservoir. The Thompson Falls Reservoir does not provide optimal habitat to support a viable and reproducing population of mussels. The host fish, Westslope Cutthroat (or other salmonid species) utilize the reservoir as a migratory corridor and the abundance of host fish in the reservoir is low based on fish sampling surveys (e.g., fall gillnet and spring electrofishing). The habitat for mussels in a lacustrine environment is marginal. The habitat for larvae to establish in the substrate immediately upstream of the dam and powerhouses is also minimal. Water depth, seasonal temperatures, and substrate are also not optimal for this species.

Photograph 7-1: Western pearlshell mussel individual sampled in Thompson Falls Reservoir, July 2018.

Stagliano revisited stream reaches in the Clark Fork River where 20-year-old or older records of the Western Pearlshell were known and found no populations (Stagliano et al. 2007). In 2014 Stagliano (2015) documented a few isolated populations in the Thompson River drainage. In 2022, Stagliano (in press) collected and analyzed environmental deoxyribonucleic acid (eDNA) and snorkeling surveys in the Thompson River with eDNA results detecting Western Pearshell Mussel in the lower Thompson River (mainstem) and observations of live shells upstream of the confluence with the West Fork Thompson River (personal communication, D. Stagliano, February 3, 2023).

7.1.5.2 Shortface Lanx

The Shortface Lanx is a native freshwater snail categorized as a Montana SOC. This snail was historically present throughout the Columbia River Basin (Nietzel and Frest 1989), but known occurrences are limited to parts of the Salmon and Snake rivers, Okanagan River drainage in British Columbia, and Deschutes River in Oregon (MNHP and FWP 2020). The species was presumed extirpated in Montana (Stagliano et al. 2007), likely due to historically suitable habitat been lost due to impoundments (MNHP and FWP 2020). Reports of the species in the Lower Clark Fork River basin have been isolated and few (MNHP and FWP 2020; MNHP 2023).

The Shortface Lanx is commonly referred to as a “limpet” although it is not a “true limpet”. This common name “limpet” is applied to this species based on the limpet-like appearance (having a simple shell which is conical in shape rather than being spirally coiled), which distinguishes it from all other freshwater snails living in the Columbia River drainage of Canada and the U.S. These snails are generally triangular-shaped and measure about 12 mm in length, 10 mm in width, and 6 mm in height (MNHP and FWP 2020).

The Shortface Lanx prefers cool, cold, clean waters that are well-oxygenated and consist of permanent flow and cobble-boulder substrate (Nietzel and Frest 1989). Stream habitat type includes large perennial rivers ranging from 98 to 300 feet wide. This species primarily feeds on algae and diatoms by scraping rock surfaces. It is not present in areas with a high abundance of macrophytes or epiphytic algae, in areas with a bedrock substrate, or in areas of heavy disturbance (Frest 1999). Distribution and movement are either from a slow snail-like crawl or stream current. These species are not active in the winter.

Shortface Lanx is a hermaphrodite (both sexes in same individual) and lays transparent, suboval gelatinous egg masses containing between 1 to 12 eggs. The life span of the species is about 1 year with adult mortality increasing rapidly after egg laying and when temperatures rise above 62.6°F (COSEWIC 2016).

Specific threats to populations of Shortface Lanx have been identified as loss of habitat through impoundments, degraded water quality and siltation of cobbles, as well as nutrient enrichment (Nietzel and Frest 1989; Frest and Johannes 1995).

MNHP records show only three observations of the Shortface Lanx in Montana over the last 50 years (MNHP 2023). McGuire (2002) identified the snail in August 2000 and 2001 in the Lower Clark Fork River, upstream of Thompson Fall Reservoir at Station 27 with an average relative abundance of eight snails per Hess sample. This section of river is not influenced by the reservoir and is outside the Project vicinity. In July 2019, Stagliano (Montana Biological Survey/Stag Benthos 2019) identified one specimen of the snail from five samples identified at site CF3 located immediately downstream of Thompson Falls Dam and the FERC Project boundary (*refer to* **Figure 8-2**). No individuals were located in the upstream site, CF1. The current distribution or abundance of this species in the Lower Clark Fork River is not known.

7.1.6 Aquatic Invasive Species

Aquatic invasive species (AIS) can be in the form of aquatic plants, animals, and pathogens. AIS impact water bodies and wetalands, whose presence can cause severe damage to local ecosystems, industry and tourism. AIS can also be categorized as non-native species. Non-native species are defined as deliberately or accidentally introduced to areas outside of their native geographic range, which are able to reproduce and maintain sustainable populations in the areas (Montana Field Guide 2023).

NorthWestern identified American bullfrog tadpoles (*Lithobates catesbeianus*) in the lower Thompson Falls Reservoir (large midchannel island area) during a sampling event in September 2021 (**Photograph 7-3**). This is the first known finding of this species in Thompson Falls Reservoir. Bullfrogs are non-native and invasive in the western U.S. where they have caused issues for other native amphibians through competition and chytrid fungus.

Another aquatic invasive and non-native species, Virile Crayfish *(Faxonius virilis)* was identified during the sample event in September 2021. This omnivorous species is native to eastern Montana but has been invading westward for the last 30 years. The Virile Crayfish was documented in the Thompson Chain of Lakes (Thompson River drainage) and was likely started with an illegal introduction via "bucket biology" (Montana Field Guide 2023).

No populations of zebra (*Dreissena polymorpha*) or Quagga mussels (*Dreissena bugensis*) are known to currently exist in Montana. Known distribution of invasive aquatic mollusks in Montana as of 2020 (FWP 2020) are shown in **Figure 7-25**. Aquatic invasive plants are discussed in **Exhibit E - Section 8 – Wildlife and Botanical Resources.**

Photograph 7-3: American Bullfrog Located During September 2021 Sampling Event

Source: (NorthWestern 2022e Operations Study).

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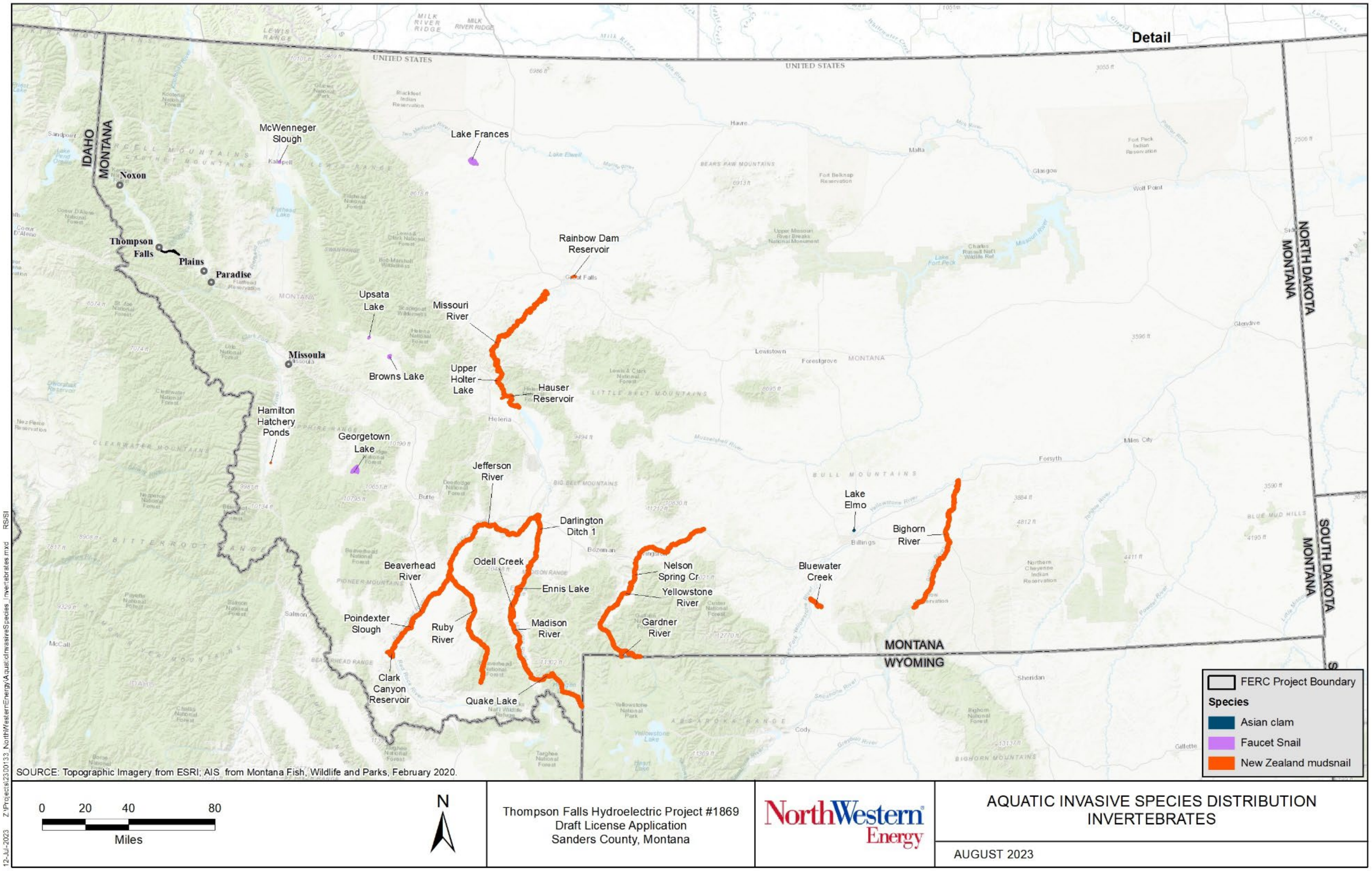
Figure 7-25: Aquatic invasive invertebrates.



Source: FWP 2020

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7.2 Environmental Measures

7.2.1 Existing Environmental Measures

NorthWestern is implementing these ongoing environmental measures for the benefit of fisheries in the Project area:

- Operate and maintain the upstream fish passage facility from mid-March through mid-October per FERC order issued on February 12, 2009.
- Upstream fish passage monitoring and reporting per FERC order issued on February 12, 2009.
- Fisheries population monitoring and reporting (filed with FERC) within the reservoir and portions of the river.
- Downstream fish passage mitigation per FERC order issued on February 12, 2009.
- Develop and implement operational procedures to reduce TDG production during periods of spill per FERC order issued on February 12, 2009. Procedures are described in the TDG Control Plan, 2010.
- Maintain minimum instream flows downstream of the Project of 6,000 cfs or inflow, whichever is less per License Article 411.

7.2.2 Proposed Environmental Measures

NorthWestern is proposing to implement the PM&E measures described below:

- Operate and maintain the upstream fish passage facility from mid-March through mid-October.
- Evaluate and assess opportunities to enhance the effectiveness of the existing upstream fish passage facility.
- Continue to engage with TAC partners on PM&E.
- Operate to maintain reservoir elevations within the top 2.5 feet of the reservoir (between 2396.5 and 2394 feet), under normal operations.
- NorthWestern is in discussions with other Relicensing Participants concerning other potential environmental PM&E measures.
- Continue to maintain a minimum flow of 6,000 cfs or inflows, whichever is less, in the Clark Fork River downstream of the Project. If inflow is at or less than 6,000 cfs, then NorthWestern may go below the minimum in order to maintain reservoir elevation.
- Monitor TDG levels during high flow periods in the Clark Fork River and update the TDG Control Plan as necessary.

7.3 Environmental Effects

7.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes. The following sections discuss the environmental effects on fisheries and aquatic resources as a result of current operations that is anticipated to continue under the no action alternative.

7.3.1.1 Upstream Fish Passage

Under the no action alternative, operation of the upstream fish passage facility would continue. A variety of species would continue to be captured during the seasonal March through October timeframe and capture efficiencies would remain the same. Floy and PIT tagging of salmonids captured in the fishway would proceed.

Project operations would, on occasion, result in reservoir drawdown up to 4 feet below full pool. As reported in the ISR, Operations Study when the reservoir elevation was 2.3 feet down (2,394.2 feet) the fish passage facility began to have operating issues. The HVJ slowed down considerably and there was reduced water being fed to this feature. The fish sampling loop was inoperable due to the lack of water to fill the fish lift and anesthetizing tank. Pumps were shut off as they were drained, and the entire fish passage facility lacked sufficient flow and water to effectively capture fish. These impacts would reduce the amount of time the upstream fish passage facility would be operable during the season and therefore decrease total numbers of fish passed upstream at the facility.

7.3.1.2 Downstream Fish Passage

Downstream fish passage survival would continue as it has historically. Previous literature review efforts in 2007 (*Literature Review of Downstream Fish Passage Issues at Thompson Falls*

Hydroelectric Project [GEI 2007b]) and the 2022 Updated Literature Review Study Report indicate relatively high survival estimates at the Project with 94 percent through the new powerhouse (Kaplan turbine), 85 percent through the original powerhouse (Francis turbines), and 98 percent through the spillway. Combined survival estimates for trout measuring greater than 100 mm was estimated to likely be 91 to 94 percent. PIT tagging and floy tagging efforts have also documented downstream survival of adults through or over the facility (NorthWestern 2019b).

Downstream fish passage mitigation dollars ($100,000 annually) to improve Bull Trout survival would continue to be allocated focused on tributaries. Actions such as habitat restoration, streamside property acquisitions or easements would be sought after by NorthWestern Energy and agency and non profit partners. Although these actions are focused for Bull Trout improvements, other species such as Westslope Cutthroat Trout, which coexist in these same tributaries would also see benefits from these activities.

7.3.1.3 Reservoir Management

The no action alternative would periodically utilize the top 4 feet of water in the Thompson Falls Reservoir. During 2019, the reservoir was drafted 4 feet and widespread stranding was observed at this reservoir elevation. At the larger drawdowns, the quantity of dewatered habitats and fish stranding was large in scope and scale. The large flat areas where juvenile fish rearing typically occurs were adversely impacted by dewatering at these low water levels and rapid rate of withdrawal. Areas in the lower Thompson Falls Reservoir and those near the islands upstream of Thompson River had the most stranded fish.

Increasing the frequency of using the full 4 feet of elevation in the no action alternative would have impacts to juvenile populations of non-native sportfish within Thompson Falls Reservoir. These affects would vary depending on the frequency and rate of elevation change, along with the time of year. A full 4-foot change during the spring or early summer could have a larger effect on species like Smallmouth and Largemouth bass if it occurred when they were spawning. Drying up redds, fry, and juvenile fish could have large negative effects on fish year classes within the reservoir. A 4-foot change in elevation during the early fall or late summer would primarily negatively impact juvenile or adult fish, while sparing egg mortality in redds.

As indicated in the Operations Study ISR (NorthWestern 2022e), access for salmonids into and out of Cherry Creek and Thompson River remains at all reservoir elevations. There are no flow or depth barriers to fish movement from the no action alternative.

7.3.1.4 Total Dissolved Gas and Gas Bubble Trauma

The no action alternative would have no effect on TDG levels or associated GBT in fish located downstream of the facility. The current TDG control plan and gate sequencing would remain in operation. Previous investigations have found little GBT symptoms at any discharges in adult fish. Furthermore, fish captured at the upstream fish passage facility have not exhibited signs or symptoms of GBT during the 13 years of operation.

7.3.1.5 Minimum Flows

A downstream minimum flow of the lesser or 6,000 cfs or inflow will be maintained downstream during normal operations. There are no known impacts to aquatic resources identified as related to minimum flows. The bypass channel provides a wetted channel sufficient for upstream fish passage. The upstream fish passage facility continues to operate seasonally (March–October). Prospect Creek confluence remains connected to the mainstem Clark Fork River and is accessible to fish.

7.3.1.6 AIS

Under the no action alternative NorthWestern operations and maintenance will not impact AIS status in the area.

7.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations.

The following sections discuss the status fisheries and aquatic resources as a result of proposed operations that is anticipated to continue under the action alternative.

7.3.2.1 Upstream Passage

Under the proposed action alternative, operation of the upstream fish passage facility would continue. A variety of species would continue to be captured during the seasonal March-October timeframe. Reservoir elevations more than 2.3 feet below full pool showed impacts to operation of the fish passage facility. To address this and potential other issues, under the proposed alternative Northwestern proposes to evaluate and assess opportunities to enhance the effectiveness of the existing upstream fish passage facility.

7.3.2.2 Downstream Passage

There are no proposed operational changes that would impact downstream fish passage survival. Previous literature review efforts in 2007 (*Literature Review of Downstream Fish Passage Issues at Thompson Falls Hydroelectric Project* [GEI 2007b]) and the 2022 Updated Literature Review Study Report indicate relatively high survival estimates at the Project with 94 percent through the new powerhouse (Kaplan turbine), 85 percent through the original powerhouse (Francis turbines), and 98 percent through the spillway. Combined survival estimates for trout measuring greater than 100 mm was estimated to likely be 91 to 94 percent. PIT tagging and floy tagging efforts have also documented downstream survival of adults through or over the facility (NorthWestern 2019b).

7.3.2.3 Reservoir Management

The proposed Project operations would impact the water level fluctuation in the Thompson Falls Reservoir up to 2.5 feet The 2021 and 2022 Operations Study found some dewatering of shallow areas of the reservoir and side channels, including fish stranding when water levels are greater than 1.5 feet below fool pool (NorthWestern 2022e, 2023d). Fish stranding was evaluated along 12 transects designated in a variety of locations, representing different shoreline aquatic habitat. The 2021 Operations Study evaluated water level fluctuations up to 2.5 feet below full pool and found fish stranding (**Table 7-17).** The 2022 Operations Study evaluated water fluctuations on August 24 and 31 with reservoir elevations at 2395.8 and 2395.7 feet, respectively. Transects were partially submerged and no fish stranding was observed. These data indicate stranding may occasionally occur as a result of reservoir fluctuations. However, the vast majority of the stranded fish observed were Black Bullhead. No salmonids were observed being stranded during either study.

Table 7-17: Total count of stranded fish for each survey event during Thompson Falls Reservoir Operations Study in 2021

Operations Phase #	Date	Reservoir Elevation (ft)	BBH	LMB	SMB	YP	NPM	PUMP	Total
1	7/28/2021	2396	-	-	-	-	-	-	**0**
	7/30/2021	2394.5	1	2	0	0	0	1	**4**
2	8/17/2021	2395.5	19	9	-	-	1	-	**29**
	8/19/2021	2395.0	3	1	-	-	-	-	**4**
3	9/8/2021	2394	89	9	2	4	1	-	**105**
		TOTAL	**112**	**21**	**2**	**4**	**2**	**1**	**142**

Notes: BBH = Black Bullhead, LMB = Largemouth Bass, SMB = Smallmouth Bass,
YP = Yellow Perch, NPM = Northern Pikeminnow, PUMP = Pumpkinseed Sunfish

7.3.2.4 Minimum Flows

The proposed Project operations will have no impact on instream flows and subsequently no impact to fishery resources.

7.3.2.5 AIS

The proposed Project alternative is not anticipated to impact AIS. .

7.3.2.6 TDG Effects on Fish

The proposed action would have no impact on TDG levels and GBT on fish downstream of the dams or powerhouse. TDG levels are not anticipated to change based on operations from the proposed action.

7.3.2.7 Project Boundary Effects

Proposed modifications to the Project boundary incorporate the lands and water that are needed for Project purposes. The proposed Project boundary modification will have no impact on Fisheries or aquatic habitat.

7.4 Unavoidable Adverse Impacts

Based on the results of the Fish Behavior Study (NorthWestern 2023) upstream fish passage is limited to fish that locate and ascend the fish passage facility. Similarly, continued operations will result in minimal fish passage mortality from passage through turbines and over the dam during spill. Fish stranding would occur but would be slightly worse under the no action alternative due to the 4-foot drawdown. Stranding of salmonids is not anticipated to occur under either alternative.

These unavoidable adverse impacts are mitigated through implementation of PM&E's.

8. Wildlife and Botanical Resources

This Section describes wildlife and botanical resources in the vicinity of the Project and considers potential effects of the Project. Threatened and endangered (T&E) species, as well as candidate species, are addressed in **Exhibit E - Section 10 – Threatened and Endangered Species**, of this Exhibit E

8.1 Affected Environment

This section provides a description of the wildlife and botanical resources within the Project boundary with the understanding that wildlife resources may move in and out of the Project boundary. Therefore, areas adjacent to or near the Project boundary (described as the Project vicinity) are included in the description of wildlife and botanical resources to provide an overall context of the larger geographic area used by wide-ranging wildlife species. Botanical resources are grouped according to vegetative communities or habitat types with some individual species analysis. Habitat types help determine actual and potential occurrence of wildlife species.

8.1.1 Wildlife Resources

A summary of known species in the Project vicinity, including big-game, small furbearers, other mammals, waterfowl, raptors, and other bird species, is provided in **Table 8-1.** Special status listed by the state of Montana or USFS sensitive are identified by an asterisk (*). Federally listed or candidate species are identified with ** and are described in more detail in **Exhibit E - Section 10 – Threatened and Endangered Species**.

Table 8-1. Summary of wildlife species known to occur in the Project vicinity.

Common Name	Scientific Name	Bird/ Mammal
Beaver	*Castor canadensis*	Mammal
Bighorn sheep*	*Ovis canadensis*	Mammal
Black bear	*Ursus americanus*	Mammal
Bobcat	*Lynx rufus*	Mammal
Elk	*Cervus canadensis*	Mammal
Fringed myotis*	*Myotis thysanodes*	Mammal
Grizzly bear**	*Ursus arctos horribilis*	Mammal
Mink	*Mustela vison*	Mammal
Moose	*Alces alces*	Mammal
Mountain lion	*Puma concolor*	Mammal
Mule deer	*Odocoileus hemionus*	Mammal
Muskrat	*Ondatra zibethicus*	Mammal
North American wolverine	*Gulo gulo*	Mammal

Common Name	Scientific Name	Bird/ Mammal
Gray wolf	*Canis lupus*	Mammal
River otter	*Lontra canadensis*	Mammal
White-tailed deer	*Odocoileus virginianus*	Mammal
American avocet	*Recurvirostra americana*	Bird
American coot	*Fulica americana*	Bird
American crow	*Corvus brachyrhynchos*	Bird
American dipper	*Cinclus mexicanus*	Bird
American goldfinch	*Spinus tristis*	Bird
American kestrel	*Falco sparverius*	Bird
American pipit	*Anthus rubsescens*	Bird
American redstart	*Setophaga ruticilla*	Bird
American robin	*Turdus migratorius*	Bird
American tree sparrow	*Spizella arborea*	Bird
American white pelican*	*Pelecanus erythrorhynchos*	Bird
American wigeon	*Mareca americana*	Bird
Anna's hummingbird	*Anas americana*	Bird
Bald eagle*	*Haliaeetus leucocephalus*	Bird
Bank swallow	*Riparia riparia*	Bird
Barn swallow	*Hirundo rustica*	Bird
Barrow's goldeneye	*Bucephala islandica*	Bird
Belted kingfisher	*Megaceryle alcyon*	Bird
Black-billed magpie	*Pica hudsonia*	Bird
Black-chinned hummingbird	*Archilochus alexandri*	Bird
Black-capped chickadee	*Poecile atricapillus*	Bird
Black-headed grosbeak	*Pheucticus melanocephalus*	Bird
Black-throated green warbler	*Setophaga virens*	Bird
Blackpoll warbler	*Setophaga striata*	Bird
Black Swift*	*Cypseloides niger*	Bird
Blue jay	*Cyanocitta cristata*	Bird
Blue-winged teal	*Anas discors*	Bird
Bohemian waxwing	*Bombycilla garrulus*	Bird
Bonaparte's gull	*Chroicocephalus philadelphia*	Bird
Brewer's blackbird	*Euphagus cyanocephalus*	Bird
Brewer's sparrow*	*Spizella breweri*	Bird
Brown creeper*	*Certhia americana*	Bird
Brown-headed cowbird	*Molothrus ater*	Bird
Bullock's oriole	*Icterus bullockii*	Bird

Common Name	Scientific Name	Bird/ Mammal
Burrowing owl*	*Athene cunicularia*	Bird
California gull	*Larus californicus*	Bird
California scrub-jay	*Aphelocoma californica*	Bird
Calliope hummingbird	*Selasphorus calliope*	Bird
Canada goose	*Branta canadensis*	Bird
Canvasback	*Aythya valishineria*	Bird
Canyon wren	*Catherpes mexicanus*	Bird
Caspian tern*	*Hydropogne caspia*	Bird
Cassin’s finch*	*Haemorhous cassinii*	Bird
Cassin’s vireo	*Vireo cassinii*	Bird
Cedar waxwing	*Bombycilla cedrorum*	Bird
Chestnut-backed chickadee	*Poecile rufescens*	Brid
Chipping sparrow	*Spizella passerina*	Bird
Cinnamon teal	*Anas cyanoptera*	Bird
Clark’s grebe*	*Aechmophorus clarkii*	Bird
Clark’s nutcracker*	*Nucifraga columbiana*	Bird
Clay-colored sparrow	*Spizella pallida*	Bird
Common goldeneye	*Bucephala clangula*	Bird
Common grackle	*Quiscalus quiscula*	Bird
Common loon*	*Gavia immer*	Bird
Common merganser	*Mergus merganser*	Bird
Common nighthawk	*Chordeiles minor*	Bird
Common raven	*Corvus corax*	Bird
Common redpoll	*Acanthis flammea*	Bird
Common yellowthroat	*Geothlypis trichas*	Bird
Cooper’s hawk	*Accipiter cooperii*	Bird
Cordilleran flycatcher	*Empidonax occidentalis*	Bird
Dark-eyed junco	*Junco hyemalis*	Bird
Downy woodpecker	*Dryobates pubescens*	Bird
Dusky flycatcher	*Empidonax oberholseri*	Bird
Eastern kingbird	*Tyrannus tyrannus*	Bird
Eurasion collard-dove	*Streptopelia decaocto*	Bird
Eurasian wigeon	*Anas Penelope*	Bird
European starling	*Sturnus vulgaris*	Bird
Evening grosbeak*	*Coccothraustes vespertinus*	Bird
Flammulated owl*	*Psiloscops flammeolus*	Bird
Forster’s tern*	*Sterna forsteri*	Bird

Common Name	Scientific Name	Bird/ Mammal
Gadwall	*Anas strepera*	Bird
Golden eagle*	*Aquila chrysaetos*	Bird
Golden-crowned kinglet	*Regulus satrapa*	Bird
Gray catbird	*Dumetella carolinensis*	Bird
Gray jay	*Perisoreus canadensis*	Bird
Gray-crowned rosy-finch*	*Leucosticte tephrocotis*	Bird
Great blue heron*	*Ardea herodias*	Bird
Great horned owl	*Bubo virginanus*	Bird
Greater scaup	*Aythya marila*	Bird
Greater yellowlegs	*Tringa melanoleuca*	Bird
Green-winged teal	*Anas crecca*	Bird
Hairy Woodpecker	*Dryobates villosus*	Bird
Hammond’s flycatcher	*Empidonax hammondii*	Bird
Harlequin duck*	*Histrionicus histrionicus*	Bird
Harris’s sparrow	*Zonotrichia querula*	Bird
Hermit thrush	*Catharus guttatus*	Bird
Herring gull	*Larus argentatus*	Bird
Hooded merganser	*Lophodytes cucullatus*	Bird
Horned grebe	*Podiceps auratus*	Bird
Horned lark	*Eremophila alpestris*	Bird
House finch	*Haemorhous mexicanus*	Bird
House sparrow	*Passer domesticus*	Bird
House wren	*Troglodytes aedon*	Bird
Killdeer	*Charadrius vociferus*	Bird
Lazuli bunting	*Passerina amoena*	Bird
Least flycatcher	*Empidonax minimus*	Bird
Lesser scaup	*Aythya affinia*	Bird
Lewis’s woodpecker*	*Melanerpes lewis*	Bird
Lincoln’s sparrow	*Melospiza lincolnii*	Bird
Long-billed dowitcher	*Limnodromus scolopaceus*	Bird
MacGillivray’s warbler	*Geothlypis tolmiei*	Bird
Mallard	*Anas platyrhynchos*	Bird
Marsh wren	*Cistothorus palustris*	Bird
Merlin	*Falco columbarius*	Bird
Mountain bluebird	*Poecile gambeli*	Bird
Mountain chickadee	*Poecile gambeli*	Bird
Mourning dove	*Zenaida macroura*	Bird

Common Name	Scientific Name	Bird/ Mammal
Nashville warbler	*Oreothlypis ruficapilla*	Bird
Northern flicker	*Colaptes auratus*	Bird
Northern pintail	*Anas acuta*	Bird
Northern saw-whet owl	*Aegolius acadicus*	Bird
Northern rough-winged swallow	*Stelgidopteryx serripennis*	Bird
Northern shoveler	*Anas clypeata*	Bird
Northern shrike	*Lanius excubitor*	Bird
Northern waterthrush	*Parkesia noveboracensis*	Bird
Olive-sided flycatcher	*Contopus cooperi*	Bird
Orange-crowned warbler	*Oreothlypis celata*	Bird
Osprey	*Pandion haliaetus*	Bird
Pacific loon	*Gavia pacifica*	Bird
Pacific wren	*Troglodytes pacificus*	Bird
Pectoral sandpiper	*Calidris melanotos*	Bird
American peregrine falcon*	Falco peregrinus anatum	Bird
Pied-billed grebe	*Podilymbus podiceps*	Bird
Pileated woodpecker*	*Dryocopus pileatus*	Bird
Pine siskin	*Spinus pinus*	Bird
Purple finch	*Haemorhous purpureus*	Bird
Pygmy nuthatch	*Sitta pygmaea*	Bird
Red crossbill	*Loxia curvirostra*	Bird
Red-breasted merganser	*Mergus serrator*	Bird
Red-breasted nuthatch	*Sitta canadensis*	Bird
Red-eyed vireo	*Vireo olivaceus*	Bird
Red-naped sapsucker	*Sphyrapicus nuchalis*	Bird
Red-necked grebe	*Podiceps grisegena*	Bird
Red-shafted flicker	*Colaptes auratus cafer*	Bird
Red-tailed hawk	*Buteo jamaicensis*	Bird
Red-winged blackbird	*Agelaius phoeniceus*	Bird
Redhead	*Aythya americana*	Bird
Ring-billed gull	*Larus delawarensis*	Bird
Ringed-neck duck	*Aythya collaris*	Bird
Rough-legged hawk	*Buteo lagopus*	Bird
Rock pigeon	*Columba livia*	Bird
Ruby-crowned kinglet	*Regulus calendula*	Bird
Ruddy duck	*Oxyura jamaicensis*	Bird
Ruffed grouse	*Bonasa umbellus*	Bird

Common Name	Scientific Name	Bird/ Mammal
Rufous hummingbird	*Selasphorus rufus*	Bird
Sabine's gull	*Xema sabini*	Bird
Savannah sparrow	*Passerculus sandichensis*	Bird
Semipalmated plover	*Charadrius semipalmatus*	Bird
Sharp-shinned hawk	*Accipiter striatus*	Bird
Snow goose	*Chen caerulescens*	Bird
Solitary sandpiper	*Tringa solitaria*	Bird
Song sparrow	*Melospiza melodia*	Bird
Spotted sandpiper	*Actitis macularius*	Bird
Spotted towhee	*Pipilo maculatus*	Bird
Steller's jay	*Cyanocitta stelleri*	Bird
Surf scoter	*Melanitta perspicillata*	Bird
Swainson's thrush	*Catharus ustulatus*	Bird
Swamp sparrow	*Melospiza georgiana*	Bird
Tennessee warbler	*Oerothlypis peregrina*	Bird
Townsend's solitaire	*Myadestes townsendi*	Bird
Townsend's warbler	*Setophaga townsendi*	Bird
Tree swallow	*Tachycineta bicolor*	Bird
Trumpeter swan*	*Cygnus buccinator*	Bird
Tundra swan	*Cygnus columbianus*	Bird
Turkey vulture	*Cathartes aura*	Bird
Varied thrush*	*Ixoreus naevius*	Bird
Vaux's swift	*Chaetura vauxi*	Bird
Vesper sparrow	*Pooecetes gramineus*	Bird
Violet-green swallow	*Tachycineta thalassina*	Bird
Warbling vireo	*Vireo gilvus*	Bird
Western bluebird	*Bialia mexicana*	Bird
Western grebe	*Aechmophorus occidentalis*	Bird
Western meadowlark	*Sturnella neglecta*	Bird
Western sandpiper	*Calidris mauri*	Bird
Western tanager	*Piranga ludoviciana*	Bird
Western wood-pewee	*Contopus sordidulus*	Bird
White-breasted nuthatch	*Sitta carolinensis*	Bird
White-crowned sparrow	*Zonotrichia leucophrys*	Bird
White-throated sparrow	*Zonotrichia albicollis*	Bird
White-throated swift	*Aeronautes saxatalis*	Bird
White-winged crossbill	*Loxia leucoptera*	Bird

Common Name	Scientific Name	Bird/ Mammal
Wild turkey	*Meleagris gallopavo*	Bird
Willow flycatcher	*Empidonax traillii*	Bird
Wilson's phalarope	*Phalaropus tricolor*	Bird
Wilson's snipe	*Gallinago delicata*	Bird
Wilson's warbler	*Cardellina pusilla*	Bird
Wood duck	*Aix sponsa*	Bird
Yellow warbler	*Setophaga petechia*	Bird
Yellow-breasted chat	*Icteria virens*	Bird
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	Bird
Yellow-rumped warbler	*Setophaga coronata*	Bird

Notes: *= sensitive species, SOC, and SSS; **= federally listed, proposed and candidate species are addressed in Exhibit E - Section 10 – Threatened and Endangered Species.
Sources: MPC, 1982; 1982a; Wood and Olsen 1984; D. Wrobleski, USFS, Wildlife Biologist, personal communication, April 5, 2018; B. Sterling, FWP, personal communication, April 5, 2018; MNHP 2018, 2023; Avian Knowledge Network 2019, 2023

The bottomlands (low-lying lands along the Clark Fork River) provide important winter-feeding habitat for wildlife, especially during harsh winters for deer and other ungulates. Douglas-fir and larch stands with their needles and the understory shrub community represented by mountain berry, service berry, and lichen provide foraging opportunities for wildlife. Many big-game species utilize areas in the Project vicinity either seasonally or year-round.

The assemblage of islands in Thompson Falls Reservoir, located immediately upstream of the confluence with the Thompson River, provide habitat for elk, black bear, whitetail deer, bald eagle, other bird species as well as resident and migratory waterfowl. It is estimated that about 40 to 50 elk also use the islands for calving each spring (B. Sterling, FWP, personal communication, April 5, 2018).

Bighorn sheep are known to be present in the vicinity of the Project, and are discussed in more detail in **Exhibit E - Section 8.1.1.1 – USFS Region 1 Sensitive Species**. Other wildlife species that may transit the Project vicinity, include moose, grizzly bear, and North American wolverine (wolverine). Grizzly bear and wolverine are discussed in more detail in **Exhibit E - Section 10 – Threatened and Endangered Species**.

The river corridor between the towns of Thompson Falls and Plains provides optimal nesting habitat for peregrine falcon and bald eagles. Peregrine falcon nesting sites were located about 1 every 5 miles in cliffs along the Clark Fork River where they can dive for prey such as ducks and other small birds (D. Wrobleski, USFS, Wildlife Biologist, personal communication, April 5, 2018). Bald eagle nests were located about one every 5 miles, including one located along the Thompson Falls Reservoir and one in the islands just upstream of the confluence with the

Thompson River (D. Wrobleski, USFS, Wildlife Biologist, personal communication, April 5, 2018).

8.1.1.1 USFS Region 1 Sensitive Species

The Project is within USFS Region 1 – Northern Region. Region 1 encompasses all of Montana, North Dakota, northern Idaho, and parts of northwest South Dakota. The USFS Region 1 list of sensitive species for the LNF and KNF (**Figure 8-1**), was last updated in 2011.

LNF covers over 2 million acres with about 103.78 acres of federal lands within the FERC Project boundary. KNF borders LNF and is located downstream of the Project. KNF covers about 2.2 million acres of the northwestern section of Montana bordering Canada. There are no KNF lands in the Project boundary. Although all of the Project is outside of KNF and most of the Project is outside of the LNF, there is potential for some of these Region 1 sensitive species to the Project.

There are 21 USFS Region 1 sensitive species, including three amphibians, six birds, two fishes, one invertebrate, and nine mammals known or suspected to occur in the LNF and/or KNF (**Table 8-2**). The majority of the USFS sensitive species (18 of 21) are also recognized as Montana SOC or Montana Special Status Species (SSS) with the exception of American peregrine falcon (removed from the Montana SOC list in 2022), gray wolf, and bighorn sheep.

There are 18 USFS R1 sensitive species known to occur in both the LNF and KNF (Table 8-2). The presence designation (known or suspected) for two species, northern leopard frog and fringed-myotis, vary between the two forests (Table 8-2). The northern leopard frog is known to occur in KNF and suspected to occur in LNF. The fringed myotis is known to occur in KNF and has no designation for LNF. There are 10 species in Table 8-2 with an observation record with MNHP (2018, 2023). Where a species is designated with the "potential" to occur in Table 8-2, this indicates habitat exists in the Project vicinity, but no observation was identified through the 2018 or 2023 MNHP query. Species "unlikely" to be present indicate suitable habitat does not exist in the area for breeding, nesting, or denning purposes.

One USFS sensitive species in the vicinity of the Project that is closely monitored by FWP is bighorn sheep. FWP estimates the population of the Thompson Falls bighorn sheep herd is approximately 75 to 80 individuals (B. Sterling, FWP, personal communication, April 5, 2018). Bighorn sheep tend to congregate east and northeast of the Project boundary between October/November and April/May (MPC 1982; B. Sterling, FWP, personal communication, April 5, 2018).

Figure 8-1. The Project location with respect to the Lolo and Kootenai National Forests.

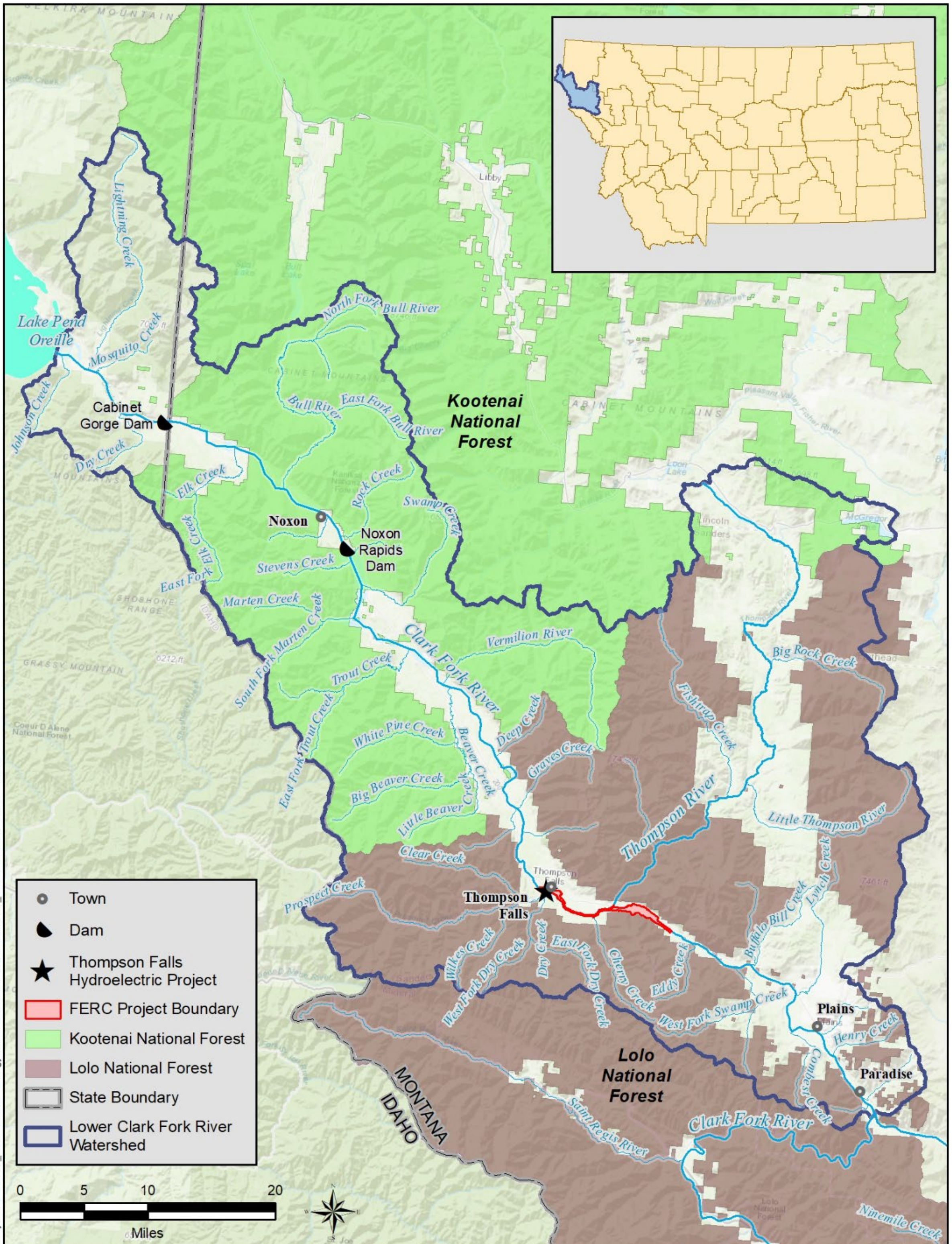

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Table 8-2: Summary of USFS R1 sensitive species (2011) for aquatics, birds, mammals, and amphibians with known (K) or suspected (S) presence in LNF and/or KNF.

Taxon	Common Name	Scientific Name	Known (K) or Suspect (S) Presence in LNF/KNF	Habitat Type/ Requirement(s)	Additional Special Species Status	Likelihood of Occurrence in vicinity of Project
Amphibian	Northern leopard frog	*Rana pipiens*	K in KNF; S in LNF	Perennial wetlands and larger water bodies	MT SOC	Potential
Amphibian	Western toad	*Bufo boreas*	K	Wetlands and upland habitats	MT SOC	Observed
Amphibian	Coeur d'Alene salamander	*Plethodon idahoensis*	K	Streams, seeps, and springs	MT SOC	Potential
Bird	American peregrine falcon	*Falco peregrinus anatum*	K	Cliffs near water bodies	Removed from MT SOC in 2022	Observed
Bird	Bald eagle	*Haliaeetus leucoephalus*	K	Riparian forest	MT SSS	Observed
Bird	Black-backed woodpecker	*Picoides arcticus*	K	Forest affected by wildfire	MT SOC	Observed
Bird	Common Loon	*Gavia immer*	K	Fish-bearing lakes	MT SOC	Observed
Bird	Flammulated owl	*Otus flammeolus*	K	Forest	MT SOC	Observed
Bird	Harlequin Duck	*Histrionicus histrionicus*	K	Low gradient streams with little or no in-stream disturbance	MT SOC	Observed – no suitable breeding habitat is within the Project boundary
Fish	Columbia River Redband Trout	*Oncorhynchus mykiss gairdneri*	K in KNF	Cool, clean, low-gradient streams	MT SOC	Unlikely – no observations and no spawning or rearing habitat within the Project boundary
Fish	Westslope Cutthroat Trout	*Oncorhynchus clarki lewisi*	K	Water bodies	MT SOC	Observed
Invertebrate	Western Pearlshell	*Margaritifera falcata*	K	Streams	MT SOC	Observed 1 shell in 2018 – suitable habitat (and presence of host fish) to support life history requirements, not present within Project boundary

Taxon	Common Name	Scientific Name	Known (K) or Suspect (S) Presence in LNF/KNF	Habitat Type/ Requirement(s)	Additional Special Species Status	Likelihood of Occurrence in vicinity of Project
Mammal	Bighorn sheep	*Ovis canadensis*	K	Open habitat and cliffs		Observed
Mammal	Fisher	*Martes pennant*	K	Mixed conifer forests	MT SOC	Unlikely
Mammal	Fringed-myotis	*Myotis thysanodes*	K in KNF	Desert shrublands, sagebrush-grassland, and woodland habitats (ponderosa pine, oak and pine, Douglas-Fir); caves, mines, rock crevices	MT SOC	Observed
Mammal	Gray wolf	*Canis lupus*	K in KNF	Generalists		Potential
Mammal	Long-eared myotis	*Myotis evotis*	K	Cluttered forest habits, including Douglas-fir and spruce-fir forests; hollow trees, under rocks on ground, under loose bark	MT SOC	Potential
Mammal	Long-legged myotis	*Myotis volans*	K	Forested mountain regions, river bottoms, high elevations; caves and mines	MT SOC	Potential
Mammal	North American wolverine	*Gulo gulo luscus*	K	Higher elevations with snow cover	MT SOC	Potential
Mammal	Northern bog lemming	*Synaptomys borealis*	K	Wet meadows, sphagnum bogs, and swamps	MT SOC	Potential
Mammal	Townsend's big-eared bat	*Corynorhinus townsendii*	K	Caves in forested habitats (Douglas-fir and lodgepole pine forests, ponderosa pine woodlands, cottonwood bottomland, Utah juniper-sagebrush scrub)	MT SOC	Potential

Note 1: habitat type requirements described, additional Montana special species designations noted (MT SSS or SOC), and likelihood of occurrence in the vicinity of the Project. (*Adapted from Sources:* USFS 2011; MNHP 2018, 2023; Montana Field Guide 2023, NorthWestern File Data).

Note 2: Observations and occurrence of a species are not necessarily indicative of the presence of suitable habitat or breeding/nesting/denning areas. Rather, an observation reflects the fact that the species has been seen, even if it was simply passing through the area.

8.1.1.2 Montana Special Status Species and Species of Concern

Montana maintains a list of SOC, and a separate list of SSS. Species listed as SSS are not Montana SOC, but need to be recognized in environmental review, permitting, or planning processes because they either have global conservation status ranks that include a G1 or G2 or have some legal protections in place. The MNHP database was queried for SSS and SOC occurring within the FERC Project boundary and its vicinity (January 24, 2023).

The MNHP database results indicate 46 species with documented occurrence or observations in the Project vicinity, which extends beyond the FERC Project boundary. **Table 8-3** provides a summary of the species groups (amphibians, birds, bryophytes, fish, invertebrates, mammals, reptiles, and vascular plants), common and scientific name, habitat and distribution, and species status. Species status includes Montana state designation as SOC or SSS; federal protection by FWS under Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act of 1940 (BGEPA), Birds of Conservation Concern Regions 10, 11 and 17 (BCC110, BCC 11 or BCC 17), or designation under the ESA; and USFS sensitive species and known (K) or suspected (S) occurrence in KNF or LNF. The MNHP (2023) geographic information system (commonly known as GIS) files for Montana SSS and SOC occurrence/observations did not include all species listed in Table 8-3.

Observations and occurrence of a species are not necessarily indicative of the presence of suitable habitat or breeding/nesting/denning areas. Rather, an observation reflects the fact that the species has been seen, even if it was simply passing through the area.

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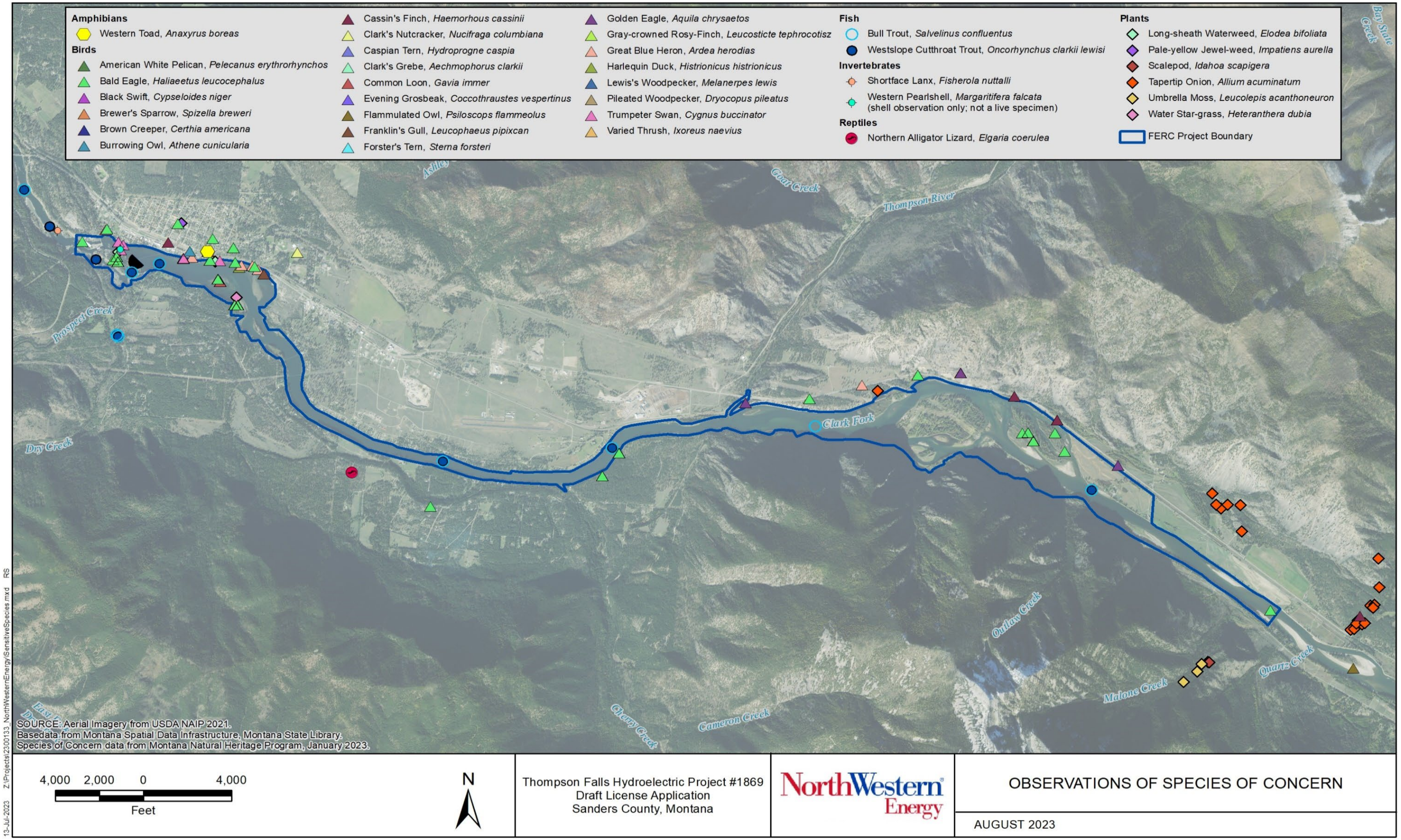
Table 8-3: Summary of the species groups, common and scientific name, habitat and distribution, and species status.

Species Group	Common Name	Scientific Name	Habitat Type	Distribution	MT	FWS	USFS	KNF	LNF
Amphibians	Western Toad	*Anaxyrus boreas*	Wetlands, floodplain pools	Resident Year Round	SOC		SENSITIVE	K	K
Birds	American White Pelican	*Pelecanus erythrorhynchos*	Lakes, ponds, reservoirs	Migratory Summer Breeder	SOC	MBTA			
Birds	Bald Eagle	*Haliaeetus leucocephalus*	Riparian forest	Resident Year Round	SSS	BGEPA; MBTA	SENSITIVE	K	K
Birds	Black Swift	*Cypseloides niger*	Waterfalls	Migratory Summer Breeder	SOC	MBTA; BCC10			
Birds	Brewer's Sparrow	*Spizella breweri*	Sagebrush	Migratory Summer Breeder	SOC	MBTA			
Birds	Brown Creeper	*Certhia americana*	Moist conifer forests	Resident Year Round	SOC	MBTA			
Birds	Burrowing Owl	*Athene cunicularia*	Grasslands	Migratory Summer Breeder	SOC	MBTA; BCC17	SENSITIVE		
Birds	Caspian Tern	*Hydroprogne caspia*	Large rivers, lakes	Migratory Summer Breeder	SOC	MBTA			
Birds	Cassin's Finch	*Haemorhous cassinii*	Drier conifer forest	Resident Year Round	SOC	MBTA; BCC10			
Birds	Clark's Grebe	*Aechmophorus clarkii*	Lakes, ponds, reservoirs	Migratory Summer Breeder	SOC	MBTA; BCC10; BCC11			
Birds	Clark's Nutcracker	*Nucifraga columbiana*	Conifer forest	Resident Year Round	SOC	MBTA			
Birds	Common Loon	*Gavia immer*	Mountain lakes w/ emergent veg	Migratory Summer Breeder	SOC	MBTA	SENSITIVE	K	K
Birds	Evening Grosbeak	*Coccothraustes vespertinus*	Conifer forest	Resident Year Round	SOC	MBTA; BCC10			
Birds	Flammulated Owl	*Psiloscops flammeolus*	Dry conifer forest	Migratory Summer Breeder	SOC	MBTA; BCC10	SENSITIVE	K	K
Birds	Forster's Tern	*Sterna forsteri*	Wetlands	Migratory Summer Breeder	SOC	MBTA			
Birds	Franklin's Gull	*Leucophaeus pipixcan*	Wetlands	Migratory Summer Breeder	SOC	MBTA; BCC10; BCC11; BCC17			
Birds	Golden Eagle	*Aquila chrysaetos*	Grasslands	Resident Year Round	SOC	BGEPA; MBTA			
Birds	Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*	Alpine	Resident Year Round	SOC	MBTA			
Birds	Great Blue Heron	*Ardea herodias*	Riparian forest	Resident Year Round	SOC	MBTA			
Birds	Harlequin Duck	*Histrionicus histrionicus*	Mountain streams	Migratory Summer Breeder	SOC	MBTA	SENSITIVE	K	K
Birds	Lewis's Woodpecker	*Melanerpes lewis*	Riparian forest	Migratory Summer Breeder	SOC	MBTA; BCC10; BCC17			
Birds	Northern Goshawk	*Accipiter gentilis*	Mixed conifer forests	Resident Year Round	SOC	MBTA			
Birds	Pileated Woodpecker	*Dryocopus pileatus*	Moist conifer forests	Resident Year Round	SOC	MBTA			
Birds	Trumpeter Swan	*Cygnus buccinator*	Lakes, ponds, reservoirs	Resident Year Round	SOC	MBTA	SENSITIVE		
Birds	Varied Thrush	*Ixoreus naevius*	Moist conifer forests	Migratory Summer Breeder	SOC	MBTA			
Bryophytes	Umbrella Moss	*Leucolepis acanthoneuron*	Talus slopes / rock outcrops	Present	SOC				
Fish	Westslope Cutthroat Trout	*Oncorhynchus clarkii lewisi*	Mountain streams, rivers, lakes	Resident Year Round	SOC		SENSITIVE	K	K
Fish	Bull Trout	*Salvelinus confluentus*	Mountain streams, rivers, lakes	Resident Year Round	SOC	Threatened; Critical Habitat			
Invertebrates	Humped Coin	*Polygyrella polygyrella*	Moist conifer forests	Resident Year Round	SOC				
Invertebrates	Shortface Lanx	*Fisherola nuttalli*	Large mountain rivers	Resident Year Round	SOC				
Invertebrates	Western Pearlshell	*Margaritifera falcata*	Mountain streams, rivers	Resident Year Round	SOC		SENSITIVE	K	K
Mammals	Fisher	*Pekania pennanti*	Mixed conifer forests	Resident Year Round	SOC		SENSITIVE	K	K
Mammals	Fringed Myotis	*Myotis thysanodes*	Riparian and dry mixed conifer forest	Resident Year Round	SOC				
Mammals	Hoary Bat	*Lasiurus cinereus*	Riparian and forest	Migratory Summer Breeder	SOC				
Mammals	Long-eared Myotis	*Myotis evotis*	Forest	Resident Year Round	SOC				
Mammals	Long-legged Myotis	*Myotis volans*	Conifer forest	Resident Year Round	SOC				
Mammals	Townsend's Big-eared Bat	*Corynorhinus townsendii*	Caves in forested habitats	Resident Year Round	SOC		SENSITIVE	K	K
Mammals	Western Pygmy Shrew	*Sorex eximius*	Open conifer forest, grasslands, and shrublands, often near water	Resident Year Round	SOC				

Species Group	Common Name	Scientific Name	Habitat Type	Distribution	MT	FWS	USFS	KNF	LNF
Mammals	Grizzly Bear	*Ursus arctos*	Conifer forest	Resident Year Round	SOC	Threatened			
Mammals	Wolverine	*Gulo gulo*	Boreal forest and Alpine habitats	Resident Year Round	SOC		Sensitive	K	K
Reptiles	Northern Alligator Lizard	*Elgaria coerulea*	Talus slopes / rock outcrops	Resident Year Round	SOC				
Vascular Plants	Long-sheath Waterweed	*Elodea bifoliata*	Wetland/riparian (shallow water)	Present	SOC				
Vascular Plants	Pale-yellow Jewel-weed	*Impatiens aurella*	riparian	Present	SOC				
Vascular Plants	Scalepod	*Idahoa scapigera*	Vernally moist, rock ledges	Present	SOC		SENSITIVE		S
Vascular Plants	Tapertip Onion	*Allium acuminatum*	Dry forest-grassland	Present	SOC		SENSITIVE		K
Vascular Plants	Water Star-grass	*Heteranthera dubia*	Aquatic	Present	SOC		SENSITIVE		

Notes: Species status includes Montana state designation as SOC or SSS; federal protection by FWS under Migratory Bird Treaty Act (MBTA), BGEPA 1940, Birds of Conservation Concern Regions 10, 11 and 17 (BCC110, BCC 11 or BCC 17), or designation under the ESA; and USFS sensitive species and known (K) or suspected (S) occurrence in KNF or LNF (MNHP 2023).

Figure 8-2. Species occurrence or observations of Montana SOC and SSS species in the Project boundary and vicinity.



Source: data provided by MNHP 2023

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8.1.2 Botanical Resources

8.1.2.1 Habitat and Native Plant Assemblages

The general habitat types in the Project boundary include aquatic, gravel bars, grasslands/hay meadows, human developed areas, riparian tree-shrubs/shrub steppe, and mixed deciduous/conifer forest (Wood and Olsen 1984; MNHP 2018, 2023). Aquatic habitat includes all open water areas associated with rivers, streams, ponds, sloughs, and marshes (including emergent vegetation zones along the edge of open water). Gravel bars are typically represented by less stable areas associated with islands and streambanks that are generally covered during high streamflow and are sparsely vegetated. Grasslands are dominated by sedges and rushes and influenced by the presence of an elevated water table. Agricultural hay bottoms and grain fields are included in this habitat type. Occasionally trees and/or shrubs are present in grasslands but they represent a small portion of the total coverage.

Where land development is absent, the benches and slopes above the Clark Fork River are dominated by forests of Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), western larch (*Larix occidentalis*), and ponderosa pine (*Pinus ponderosa*). Broadleaf trees and shrubs are confined to the river's edge. Riparian tree-shrub/shrub steppe is associated with the riverine systems and is primarily black cottonwood (*Populus trichocarpa*) with deciduous shrub understory such as serviceberry (*Amelachier*), Rocky Mountain maple (*Acer glabrum*), and snowberry (*Symphoricarpos*). The mixed deciduous/conifer forest occupies the floodplain between the riparian vegetation and dense conifer forests and represents a mosaic of conifer trees (Douglas-fir, Ponderosa pine, lodgepole pine) and deciduous trees (cottonwood and birch) and shrubs (Wood and Olsen 1984).

The two areas within the Project boundary where wildlife is most likely to be present include Island Park located between the Main Channel Dam and Dry Channel Dam and the group of islands in the Clark Fork River located upstream of the confluence with the Thompson River. Both areas provide a mix of conifer dominated forests and woodlands, grasslands, wet meadow/herbaceous marshes, and floodplain/riparian areas **Figure 8-3**.

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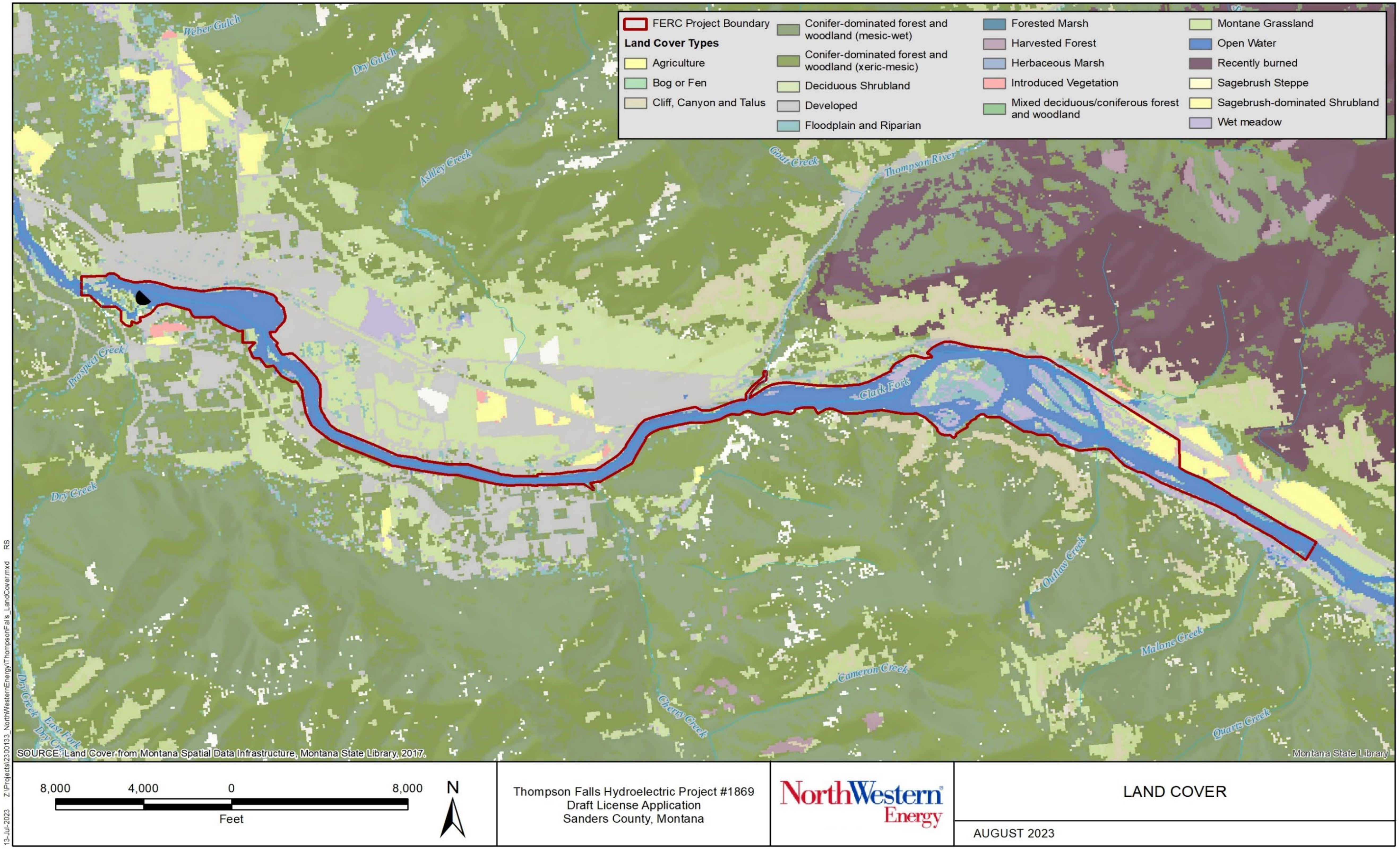
Figure 8-3. Thompson Falls Project and land cover types in Project boundary and Vicinity.



Source: MNHP 2017

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8.1.2.2 USFS R1 Sensitive Plant Species

The list of USFS R1 sensitive species known or suspected to occur in the LNF includes 35 species of plants (USFS 2011). KNF was not included in this review because none of the land in the Project boundary is located in the KNF. Of the 35 plant species identified, 13 species are known to occur in Sanders County (Montana Field Guide 2018, 2023) and eight species were considered to have potential to occur in the Project boundary based on habitat requirements. A summary of the USFS sensitive plant species known or suspected to occur in the LNF, their habitat requirements, and likelihood of occurrence in the Project boundary is provided in **Table 8-4**. One of the sensitive plant species, tapertip onion, is also identified as a Montana SOC. Tapertip onion require dry, open forests and grassland habitat (MNHP and FWP 2023c).

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Table 8-4: USFS, Region 1 sensitive plant species (2011) with known (K) or suspected (S) presence in Lolo National Forest and Sanders County.

Common Name	Scientific Name	Presence in LNF Known (K) or Suspect (S)	Known Occurrence in Sanders County	Habitat Type and Known Locations	Likelihood of Occurrence in the vicinity of the Project
Sapphire rockcress	*Arabis fecunda (syn. Boechera fecunda)*	S		Endemic to state. Present in southwest MT in Ravalli, Beaverhead, and Silver Bow counties.	Unlikely
Peculiar moonwort	*Botrychium paradoxum*	S		Mesic meadows and bunchgrass communities in western MT.	Unlikely
Giant helleborine	***Epipactis gigantea***	**K**	**X**	**Streambanks, lake margins, fens with springs, and seeps, often near thermal waters. Western and southwestern MT.**	**Potential**
Britton's Dry Rock Moss	***Grimmia brittoniae***	**K**	**X**	**Vertical faces of shaded, calcareous cliffs (1,640-2,300 feet above mean sea level). Endemic to northwestern MT and border with Idaho. Known presence in Flathead, Lincoln and Sanders counties.**	**Potential**
Howell's gumweed	*Grindelia howellii*	K		Roadsides and other similarly disturbed habitat. Regionally endemic Missoula and Powell counties in MT and Benewah County, Idaho.	Unlikely
Missoula phlox	*Phlox kelseyi*	S		Endemic to west-central MT. Range is Missoula to the Little Belt Mountains and the southern end of the Rocky Mountain Front south of Granite County.	Unlikely
Whitebark pine	*Pinus albicaulis*	K	X	Subalpine and krummholtz habitats in most mountain ranges in MT.	Unlikely
Idaho barren strawberry	*Waldsteinia idahoensis*	K		Endemic to north-central Idaho with one occurrence in MT. Open coniferous forest in the montane zone. One known site in MT in Missoula County.	Unlikely
Musk-root	*Adoxa moschatellina*	K		Sparsely distributed in Southwest MT in unimpacted areas by human disturbance or invasive weeds.	Unlikely

Common Name	Scientific Name	Presence in LNF Known (K) or Suspect (S)	Known Occurrence in Sanders County	Habitat Type and Known Locations	Likelihood of Occurrence in the vicinity of the Project
Tapertip Onion	***Allium acuminatum***	**K**	**X**	**Scattered sites in western MT, but rare. Known to occur in Ravalli and Sanders counties.**	**Potential**
Round-leaved Orchis	*Amerorchis rotundifolia*	S		Rocky Mountain Front, Bob Marshall Wilderness Complex, Swan Valley and northwest corner of MT. Spruce forest around seeps or along streams.	Unlikely
Sandweed	*Athysanus pusillus*	S		Limited to Bitterroot Mountains in MT. Vernal moist, shallow soil of steep slopes and cliffs in the lower montane zone.	Unlikely
Beck Water-marigold	*Bidens beckii*	K		Still or slow-moving water of lakes, rivers and sloughs in valleys, 0-10 feet. Western valleys of MT.	Unlikely
Watershield	*Brasenia schreberi*	K	X	Shallow waters in the valleys of northwest corner of MT.	Unlikely
Creeping Sedge	*Carex chordorrhiza*	S		Rare in MT. Fens and wet meadows in the northwest corner of MT.	Unlikely
Glaucus beaked sedge	*Carex rostrate*	K		Rare in MT. Wet, organic soils of fens in the montane zone, including floating peat mats.	Unlikely
Diamond clarkia	***Clarkia rhomboidea***	**K**	**X**	**Rare in MT, known in northwest corner of MT along lower Clark Fork River drainage and known in Sanders and Lincoln counties. Dry, open forest slopes with gravelly soils in the montane zone.**	**Potential**
Sand Springbeauty	***Claytonia arenicola***	**K**	**X**	**Rare in MT, one localized area in western MT in Sanders County. Mossy, forested, north-facing talus slopes in the lower montane zone.**	**Potential**
Cluster's Lady's-slipper	***Cypripedium fasciculatum***	**K**	**X**	**Northwest portion of MT in warm, dry mid-seral montane forest in the Douglas fir/ninebark and grand fir/ninebark habitat types.**	**Potential**

Common Name	Scientific Name	Presence in LNF Known (K) or Suspect (S)	Known Occurrence in Sanders County	Habitat Type and Known Locations	Likelihood of Occurrence in the vicinity of the Project
Small Yellow Lady's-slipper	*Cypripedium parviflorum*	K	X	Western half of MT. Fens, damp mossy woods, seepage areas, and moist forest-meadow ecotones in the valley to lower montane zones. Calcareous derived soils.	Unlikely
Sparrow's-egg Lady's slipper	*Cypripedium passerinum*	S		Mossy, moist, or seepy places in coniferous forests often on calcareous substrates. Occurrences are either in designated wilderness areas or Glacier National Park.	Unlikely
English sundew	*Drosera anglica*	K	X	Sphagnum moss in wet, organic soils of fens in the montane zone.	Unlikely
Crested Shieldfern	*Drypteris cristata*	K		Moist to wet, organic soils at the forest margins of fens and swamps in the montane zone. Known to occur in Flathead, Lake, Missoula, Ravalli and Beaverhead counties.	Unlikely
Western Joepey-weed	*Eupatorium occidentale*	S		Western part of MT in Mineral and Ravalli counties. Rocky outcrops and slopes in the montane and lower subalpine zones.	Unlikely
Hiker's gentian	*Gentianopsis simplex*	S		Rare in MT. Fens, meadows, and seeps usually in areas of crystalline parent material in montane and subalpine zones.	Unlikely
Western pearl-flower	***Heterocodon rariflorum***	**K**	**X**	**Northwest MT in vernally moist grassland slopes, mossy, ledges, and riparian swales in valley, foothills and montane zones.**	**Potential**
Scalepod	*Idahoa scapigera*	S		Rare and peripheral in MT. Known to be present in Bitterroot Mountains. Vernal moist, open soil on rock ledges in the lower montane zone.	Unlikely
Meesia Moss	*Meesia triquetra*	S		Wet soil and peat in fens and bogs, soil in wet woods. Known in Flathead County.	Unlikely

Common Name	Scientific Name	Presence in LNF Known (K) or Suspect (S)	Known Occurrence in Sanders County	Habitat Type and Known Locations	Likelihood of Occurrence in the vicinity of the Project
Oregon bluebells	*Mertensia bella*	K		Wet, seepy, open or partially shaded slopes in the montane and subalpine zones. Rare in MT and only known in parts of LNF in Missoula County.	Unlikely
North Idaho monkeyflower	***Mimulus clivicola***	**K**	**X**	**Known to occur in Sanders County in vernally moist soil of partially wooded slopes in the montane zone.**	**Potential**
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	S		Shallow water of lakes, ponds, and sloughs in the valley, foothill, and montane zones. Known in northwest MT.	Unlikely
Pod Grass	*Scheuchzeria palustris*	K		Wet, organic soil of fens in the valley and montane zones, usually with Sphagnum moss. Known west of continental divide in MT.	Unlikely
Water Bulrush	*Schoenoplectus subterminalis*	K		Open water and boggy margins of ponds, lakes, and sloughs at 0.1-3 m depth in the valley, foothill, and montane zones. Known in western MT.	Unlikely
Red Clover	***Trifolium eriocephalum***	**S**	**X**	**Native to Europe and introduced for forage and hay in N. America. Meadows, fields, lawns, roadsides, riverbanks, plains, valleys, montane zone.**	**Potential**
Hollyleaf Clover	*Trifolium gymnocarpon*	K		Open woods and slopes, usually in dry soil of sagebrush steppe to ponderosa pine forest in the foothills to lower montane zone. Known within the West Fork Bitterroot River drainage, Rock Creek drainage.	Unlikely

Notes: Species with potential to occur in proximity of the Project are in bold.
Sources: USFS 2011; Montana Field Guide 2018, 2023

8.1.2.3 Noxious Weeds

Nonnative plant species, specifically invasive or noxious weeds, can threaten the survival of native species and reduce the ecological integrity for aquatic and terrestrial systems, and thus adversely impact wildlife habitat. Invasive plant species such as noxious weeds are defined as, "any exotic plant species established or that may be introduced in the state that may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities…" (Montana Code Annotated § 7-22-2101)

NorthWestern refers to the Montana Department of Agriculture (agr.mt.gov/Noxious-Weeds) for the latest state and county noxious weed list (MDA 2019) and guidance for prioritizing and targeting management efforts, if present in the area. Annually NorthWestern applies herbicides to control weeds on its property, including recreational trails, trailheads, and parking lots.

Table 8-5 summarizes the Montana noxious weed list plus three species specific to Sanders County (MDA 2019). Aquatic invasive plants such as Eurasian watermilfoil, curlyleaf pondweed, flowering rush, and yellow flag iris included on the Montana State noxious weed list are discussed in **Exhibit E - Section 9 – Wetland, Riparian, and Littoral Habitats**.

Table 8-5. Montana noxious weed list and Sanders County noxious weed list.

Classification	Common Name	Scientific Name
Priority 1A (non-established new invaders)	Yellow starthistle	*Centaurea solstitialis*
	Dyer's woad	*Isatis tinctoria*
	Common reed	*Phragmites australis ssp. australis*
	Medusahead	*Taeniatherum caput-medusae*
Priority 1B (established new invaders)	Knotweed complex	*Polygonum cuspidatum, P. sachalinense, P. × bohemicum, Fallopia japonica, F. sachalinensis, F. × bohemica, Reynoutria japonica, R. sachalinensis, and R.× bohemica*
	Purple loosestrife	*Lythrum salicaria*
	Rush skeletonweed	*Chondrilla juncea*
	Scotch broom	*Cytisus scoparius*
	Blueweed	*Echium vulgare*
Priority 2A (widespread weed infestations)	Tansy ragwort	*Senecio jacobaea, Jacobaea vulgaris*
	Meadow hawkweed complex	*Hieracium caespitosum, H. praealturm, H. floridundum, and Pilosella caespitosa*
	Orange hawkweed	*Hieracium aurantiacum, Pilosella aurantiaca*
	Tall buttercup	*Ranunculus acris*
	Perennial pepperweed	*Lepidium latifolium*
	Yellow flag iris	*Iris pseudacorus*
	Eurasian watermilfoil	*Myriophyllum spicatum, Myriophyllum spicatum x Myriophyllum sibiricum*
	Flowering rush	*Butomus umbellatus*
	Common buckthorn	*Rhamnus cathartica L.*
	Ventenata	*Ventenata dubia*
Priority 2B (widespread weed infestations)	Canada thistle	*Cirsium arvense*
	Field bindweed	*Convolvulus arvensis*
	Leafy spurge	*Euphorbia esula*
	Whitetop	*Cardaria draba, Lepidium draba*

Classification	Common Name	Scientific Name
	Russian knapweed Spotted knapweed Diffuse knapweed Dalmatian toadflax St. Johnswort Sulfur cinquefoil Common tansy Oxeye daisy Houndstongue Yellow toadflax Saltcedar Curlyleaf pondweed Hoary alyssum	*Acroptilon repens, Rhaponticum repens* *Centaurea stoebe, C.maculosa* *Centaurea diffusa* *Linaria dalmatica* *Hypericum perforatum* *Potentilla recta* *Tanacetum vulgare* *Leucanthemum vulgare* *Cynoglossum officinale* *Linaria vulgaris* *Tamarix spp.* *Potamogeton crispus* *Berteroa incana*
Priority 3 (regulated plants)	Cheatgrass Hydrilla Russian olive Brazilian waterweed Parrot feather watermilfoil	*Bromus tectorum* *Hydrilla verticillata* *Elaeagnus angustifolia* *Egeria densa* *Myriophyllum aquaticum or M. brasiliense*
Sanders County	Baby's Breath Common Mullein	*Gypsophila paniculate* *Verbascum thasus*

Source: MDA 2019

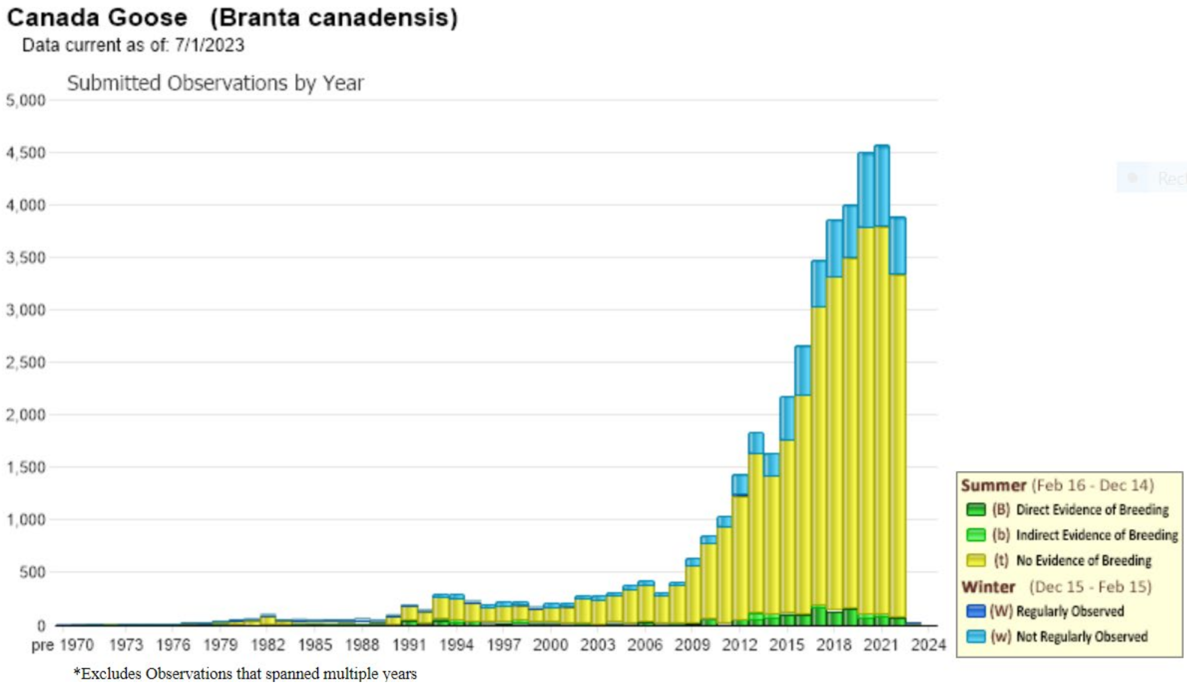
8.2 Environmental Measures

8.2.1 Existing Environmental Measures

8.2.1.1 Completed Environmental Measures

In 1983 USFWS and FWP recommended that the Licensee implement a Canada goose brood rearing enhancement plan, the Licensee implemented the plan by developing the Canada goose brood rearing habitat. New brood-rearing habitat was developed and on average 76 percent of goslings fledged successfully from 1983 to 1986 (O'Neil 1988). The Canada goose population in Montana has increased over the last 20 years, and they are currently abundant in the Project area, as is reflected by the increase in total observations each year in **Figure 8-2**.

Figure 8-4. Total Canada goose observations submitted to the Montana Natural Heritage Program Database, by year.



Source: MNHP and FWP 2023f.

Currently, NorthWestern implements control measures on its lands for noxious weeds in high use disturbed areas where weeds are more likely to occur (e.g., trailheads, parking lots, buildings) annually.

8.2.1.2 Ongoing Environmental Measures

Under the existing license the following environmental measures are ongoing.

- Implement annual noxious weed control measures in high-use areas on NorthWestern's lands.

8.2.2 Proposed Environmental Measures

NorthWestern is proposing to implement the PM&E measures described below:

- Implement annual noxious weed control measures in high-use areas on NorthWestern's lands.

8.3 Environmental Effects

This section discusses the potential effects of proposed Project operations on wildlife and botanical resources. The analysis of potential effects is limited to those effects associated with the proposed change in operations, and Project boundary as no new construction or development is proposed under the new license.

8.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures,** including noxious weed control would continue. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations. The terrestrial habitats would continue to function just as they do today.

The presence of disturbed land, vehicle traffic, and pedestrian traffic entering and exiting the Project provides a vector for introducing noxious weeds. Noxious weeds can impact wildlife by crowding out indigenous grasses and forbs that wildlife eat, reducing the amount of available forage. NorthWestern under the no action alternative would continue to engage in annual control measures for noxious weeds on NorthWestern-owned property.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's ability to manage lands and waters that are needed for Project purposes, under FERC's oversight.

8.3.2 Applicant's Proposed Alternative

NorthWestern does not propose additional construction or development of the Project, so there will be no construction-related impacts to wildlife resources under the Applicant's Proposed Alternative.

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations. Wildlife habitat at the Project is not expected to change as a result of reservoir fluctuation in the applicant's proposed alternative. Therefore, NorthWestern's proposed operational changes are not expected to affect wildlife species or habitat in the Project boundary.

NorthWestern's proposed alternative includes changes to the Project boundary which will modify the acreage of habitat types in the Project boundary (**Table 8-6**). The most notable change is the elimination of acres of agricultural land within the Project boundary. The proposed Project boundary encompasses fewer acres than the current Project boundary, so the acreage of other habitat types is also reduced. However no detrimental impacts to wildlife or botanical resources are anticipated as a result of the change in Project boundary.

Table 8-6. Acres of habitat types in current and proposed Project boundary

Cover Type	Acres in current Project boundary	Acres in proposed Project boundary
Agriculture	38	0
Conifer-dominated forest and woodland (mesic-wet)	31	16
Conifer-dominated forest and woodland (xeric-mesic)	37	23
Deciduous Shrubland	2	2
Developed	64	23
Floodplain and Riparian	190	151
Herbaceous Marsh	9	7
Insect-Killed Forest	8	8
Introduced Vegetation	2	0
Montane Grassland	136	81
Wet meadow	194	128

The Proposed Action alternative does not result in an increased risk of introduction of noxious weeds over the no action alternative. NorthWestern proposes to continue to engage in annual control measures for noxious weeds on NorthWestern-owned property.

There is no known direct or indirect effect identified from continuing to operate the Project under the Proposed Action alternative to wildlife and botanical resources. The terrestrial habitats would continue to function and provide existing benefits to wildlife and botanical resources.

8.4 Unavoidable Adverse Impacts

There is no unavoidable adverse impact identified for wildlife and botanical resources based on the no alternative or proposed alternative actions.

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9. Wetland, Riparian, and Littoral Habitats

This Section provides a description of the wetland, riparian, and littoral habitats within the Project boundary and analyzes potential effects of continued operations of the Project as proposed by NorthWestern on these resources.

9.1 Affected Environment

Aquatic and terrestrial animal species may use various habitats, including wetland, riparian, and littoral habitat(s) available within the Project vicinity. These species are identified and discussed in **Exhibit E - Section 7 – Fisheries and Aquatic Resources**, **Section 8 – Wildlife and Botanical Resources**, and **Section 10 – Threatened, Endangered, Proposed, and Candidate Species**.

Riparian and wetland data were initially obtained from the Montana Spatial Data Infrastructure (MSDI 2020). A subsequent wetland delineation was also conducted. Wetland and riparian habitats within the Project boundary, as mapped in the MSDI, are limited and primarily occur at the upstream end of Thompson Falls Reservoir (**Figure 9-1**). This mapping includes wetlands supported by groundwater as well as wetlands with a direct connection to surface water. There is riverine riparian habitat along the shoreline and there are dispersed wetland areas and shallow channels around the islands near the confluence of the Thompson River (MSDI 2020). Some aquatic plant communities are native, while some species are invasive (Madsen and Cheshier 2009; Hansen Environmental 2016).

A summary of the illustrated wetland, and riparian habitat types shown in Figure 9-1 is provided in **Table 9-1** with the respective acreage within the current Project boundary.

Table 9-1: Wetland, riparian, and waterway habitat types identified in the current Project boundary.

Wetland and Riparian Habitat Type	Area in FERC boundary (acres)
Freshwater Emergent Wetland	131
Waterways (Lake/Riverine/Pond)	1372
Freshwater Forested/Shrub Wetland	171
Forested/Shrub Riparian	45
Total	**1,719**

Source: MSDI 2020

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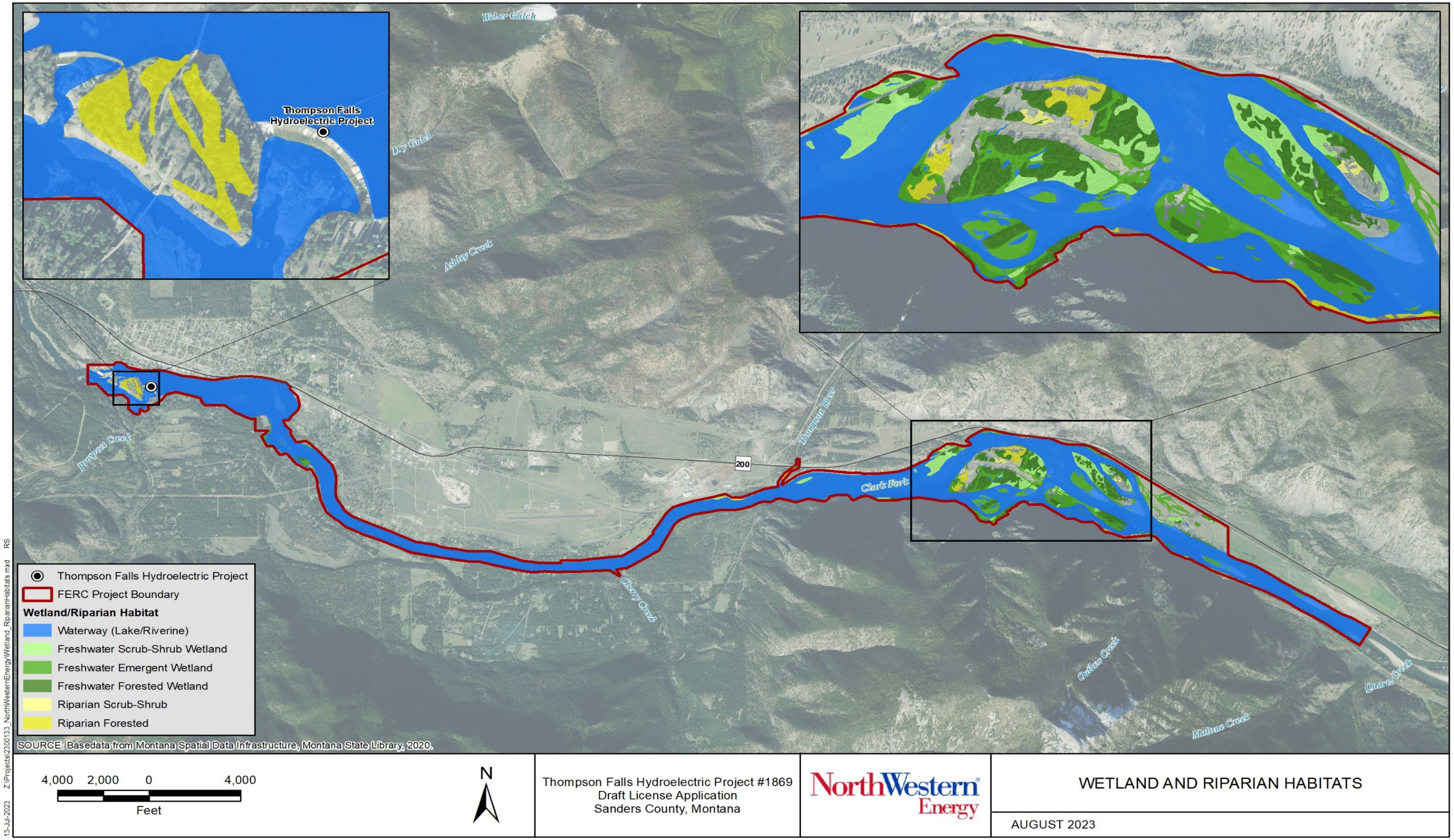
Figure 9-1: Montana wetland and riparian habitats within the current Project boundary.



Source: MSDI 2020

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9.1.1 Wetland Habitats

In 2023, a delineation and evaluation of wetlands with a direct hydrologic connection to the Project was completed (POWER Engineers 2023) (**Appendix B – Wetland Assessment Report**). Fourteen wetland areas were delineated along the water's edge of the reservoir. A total of 11.33 acres of palustrine emergent wetland habitat, of which 10.98 acres are within the current Project boundary, were delineated (**Figure 9-2)**.

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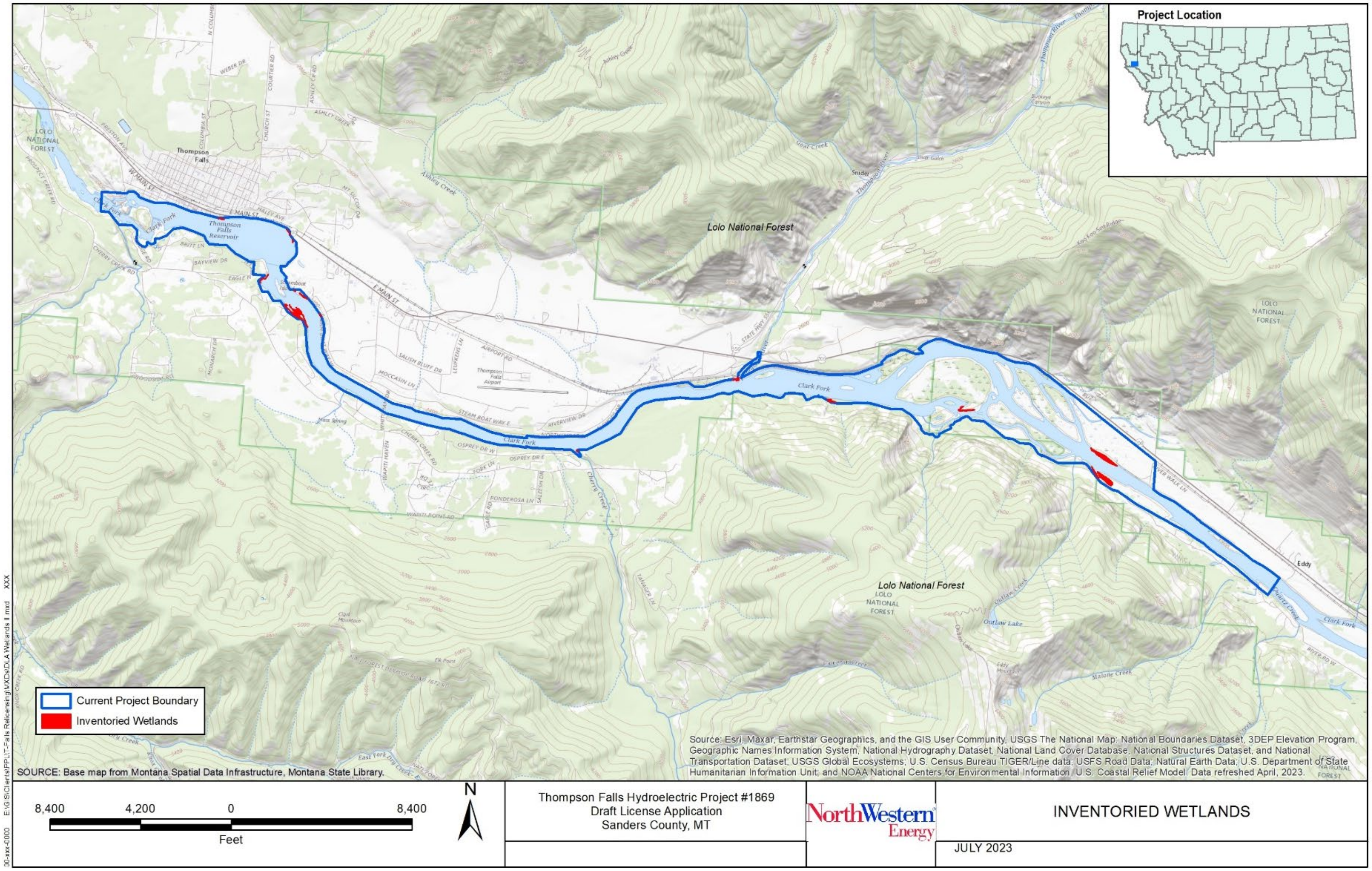
Figure 9-2: Inventoried wetlands within current Project boundary



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In general, the inventoried wetland areas represent a narrow, vegetated fringe along the Ordinary High-Water Mark (OHWM) of the Thompson Falls Reservoir and are commonly found along the lower terraces and islands within the Project area. These wetland areas generally share common characteristics (**Table 9-2**) and have been grouped for the purpose of discussion based on the source for wetland hydrology. The two general categories for the 14 wetland areas include Group 1, with wetland hydrology solely provided by water elevations within the reservoir and Group 2, which derive some level of hydrology for tributaries of the Clark Fork River. These two groups are discussed below.

Table 9-2. Inventoried Wetlands

WETLAND/ WATERWAY ID	WETLAND TYPE[1]	WETLAND TYPE (HGM)[2]	SIZE (ACRES)	LOCATION (LAT/LONG)
Wetland 1 (WL-1)	PEM1A	Lacustrine	2.67	47.567594
				-115.170191
Wetland 2 (WL-2)	PEM1A	Lacustrine/Riverine	0.30	47.568338
				-115.172296
Wetland 3 (WL-3)	PEM1A	Lacustrine	3.41	47.570334
				-115.170783
Wetland 4 (WL-4)	PEM1A	Lacustrine	0.61	47.575110
				-115.197502
Wetland 5 (WL-5)	PEM1A	Lacustrine/Riverine	0.21	47.575009
				-115.222833
Wetland 6 (WL-6)	PEM1A	Lacustrine	0.59	47.576939
				-115.240836
Wetland 7 (WL-7)	PEM1A	Lacustrine/Riverine	0.05	47.566325
				-115.269681
Wetland 8 (WL-8)	PEM1A	Lacustrine	0.04	47.581088
				-115.319736
Wetland 9a/b (WL-9a/b)	PEM1A	Lacustrine	2.74	47.581326
				-115.324284
Wetland 10 (WL-10)	PEM1A	Lacustrine	0.26	47.583343
				-115.323203
Wetland 11 (WL-11)	PEM1A	Lacustrine	0.03	47.583935
				-115.324840
Wetland 12 (WL-12)	PEM1A	Lacustrine	0.20	47.585195
				-115.330850
Wetland 13a/b (WL-13a/b)	PEM1A	Lacustrine	0.10	47.590272
				-115.325960
Wetland 14 (WL-4)	PEM1A	Lacustrine	0.12	47.592389
				-115.339686
			Total	**11.33**

Notes: HGM = Hydrogeomorphic; PEM1A = Palustrine, Emergent, Persistent, Temporarily Flooded
Sources: [1]Cowardin et al. 1979; [2]Brinson 1993

9.1.1.1 Wetland Group 1 (WL-1, 3, 4, 6, 8-14)

Wetland Group 1 (WG-1) includes all wetland habitat that appears to be directly supported by water elevations impounded by the Thompson Falls Dam and consists of 11 wetland areas that total 10.78 acres of palustrine emergent wetland habitat. These wetland habitats typically occupy low benches and narrow fringes along the water's edge. The wetland hydrology indicators observed within WG-1 included surface water, high water table, saturation, sediment deposits, geomorphic position, and a positive facultative (FAC)-neutral test. Hydrophytic vegetation observed within WG-1 primarily included reed canary grass (*Phalaris arundinacea*, facultative wetland (FACW)) with lesser amounts of Baltic rush (*Juncus balticus*, FACW), broad-leaf cattail (*Typha latifolia*, obligate wetland (OBL)), pale-yellow iris (*Iris pseudacorus*, OBL), Northwest Territory sedge (*Carex utriculata*, OBL), common spike rush (*Eleocharis palustris*, OBL), and hard-stem club-rush (*Schoenoplectus acutus*, OBL).

The hydrophytic vegetation indicators included a positive rapid test for hydrophytic vegetation, a positive dominance test, and prevalence index within the range indicating the presence of hydrophytic vegetation. Adjacent uplands were generally characterized by Rocky Mountain bee plant (*Cleome serrulate*, UPL), Canada goldenrod (*Solidago canadensis*, facultative upland (FACU)), slender wild rye (*Elymus trachycaulus*, FAC), blue wild rye (*Elymus glaucus*, FACU), smooth brome (*Bromus inermis*, UPL), common tansy (*Tanacetum vulgare*, FACU), Kentucky bluegrass (*Poa pratensis*, FAC), western meadow-rue (*Thalictrum occidentale*, FACU), great mullein (*Verbascum thapsus*, FACU), orchard grass (*Dactylis glomerata*, FACU), common yarrow (*Achillea millefolium*, FACU), and common dandelion (*Taraxacum officinale*, FACU). The hydric soil indicators observed within WG-1 included sandy redox and depleted matrix and commonly exhibited distinct redoximorphic concentrations starting within 8 inches of the soil surface. All wetland areas within WG-1 were preliminarily determined to be jurisdictional based on an observed hydrologic connection the Project.

9.1.1.2 Wetland Group 2 (WL-2, 5, and 7)

Wetland Group 2 (WG-2) includes wetland habitat identified along the water's edge of the reservoir that receive supplemental wetland hydrology from surface water draining from adjacent slopes. WG-2 includes three areas of palustrine emergent habitat (approximately 0.55 acre). Surface water observed draining from the steep mountain slopes through WL-2 was presumably determined to be Outlaw Creek, based on National Hydrography Dataset interpretation. Wetland hydrology for WL-5 appeared to be sustained by both impounded surface water and intermittent stream flow contributed from surface runoff of the mountainside above. WL-7 was identified as a very small wetland depression at the mouth of Cherry Creek. The wetland hydrology indicators for WG-2 included surface water, saturation, drainage patterns, geomorphic position, and a positive FAC-neutral test. Dominant hydrophytic vegetation observed within WL-2 included pale-yellow iris and reed canary grass. The hydrophytic vegetation indicators included a positive rapid test for hydrophytic vegetation, a positive dominance test, and prevalence index within the range indicating the presence of hydrophytic vegetation. Adjacent uplands were generally characterized by blue wild rye, common tansy, western meadow-rue, and smooth brome. The hydric soil indicators observed within WL-2 included sandy redox and depleted matrix. All wetlands within WG-2 were preliminarily determined to be jurisdictional based on an observed hydrologic connection to the Project.

9.1.1.3 Functional Assessment

The two wetland groups were assessed on separate Montana Wetland Assessment Method (MWAM) forms (Berglund and McEldowney 2008) and include Assessment Areas (AA)-1 (WG-1) and AA-2 (WG-2). Completed forms are provided in Appendix A and a summary of wetland functions and value ratings is provided in **Table 9-3**. According to the functional assessments, both AAs were classified as Category III wetlands. According to the Montana Wetland Assessment Method, Category III wetlands are more common and generally less diverse than Category I and II wetlands. Category III wetlands can provide many functions and values but are not rated as high as Category I and II wetlands in the assessment. To be rated a Category III wetland, the AA must not qualify as a Category I, II, or IV site (Berglund and McEldowney 2008). Descriptions of each AA evaluation are provided below.

Table 9-3. MWAM Functional Assessment Summary

Function and Value Parameters from the 2008 MDT Wetland Assessment Method[1]	Assessment Area 1		Assessment Area 2	
	WL-1, 3, 4, 6, 8-14		WL-2, 5, 7	
	Rating	Points	Rating	Points
Listed/Proposed T&E Species Habitat	Low	0	Low	0
MNHP State Species of Concern Habitat	Low	0	Low	0
General Wildlife Habitat	Moderate	0.7	Moderate	0.7
General Fish/Aquatic Habitat	N/A	--	N/A	--
Flood Attenuation	Moderate	0.5	High	0.8
Short and Long Term Surface Water Storage	High	0.9	Moderate	0.4
Sediment/Nutrient/Toxicant Removal	High	1	High	1
Sediment/Shoreline Stabilization	High	1.0	High	1.0
Production Export/Food Chain Support	Moderate	0.5	Moderate	0.7
Groundwater Discharge/Recharge	Moderate	0.7	High	1.0
Uniqueness	Low	0.3	Low	0.3
Recreation/Education Potential	Moderate	0.1	Moderate	0.1
Actual Points/Possible Points	5.7/10.0		6.0/10.0	
% of Possible Score Achieved	57%		60%	
Overall Category	III		III	
Total Acreage of Assessed Wetlands	10.78		0.55	
Function Unit Total (actual points x estimate AA acreage)	61.5		3.3	
Total Projected Function Units on this Project	**64.8**			

Note: [1]See completed Montana Department of Transportation (MDT) functional assessment forms in **Appendix B – Wetland Assessment Report** for detailed ratings.

9.1.1.3.1 Functional Assessment of AA-1 (WG-1)

AA1 consists of the 11 wetland areas in WG-1 totaling 10.78 acres. According to the MWAM, AA-1 is a Category III wetland. AA-1 received low ratings for listed/proposed T&E species, MNHP state SOC habitat, and uniqueness.. AA-1 received moderate ratings for general wildlife habitat, flood attenuation, production export/food chain support, groundwater discharge/recharge, and recreation/education potential and high ratings for short- and long-term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. AA-1 received 5.7 out of 10 possible points (57%) and a total of 61.5 functional units.

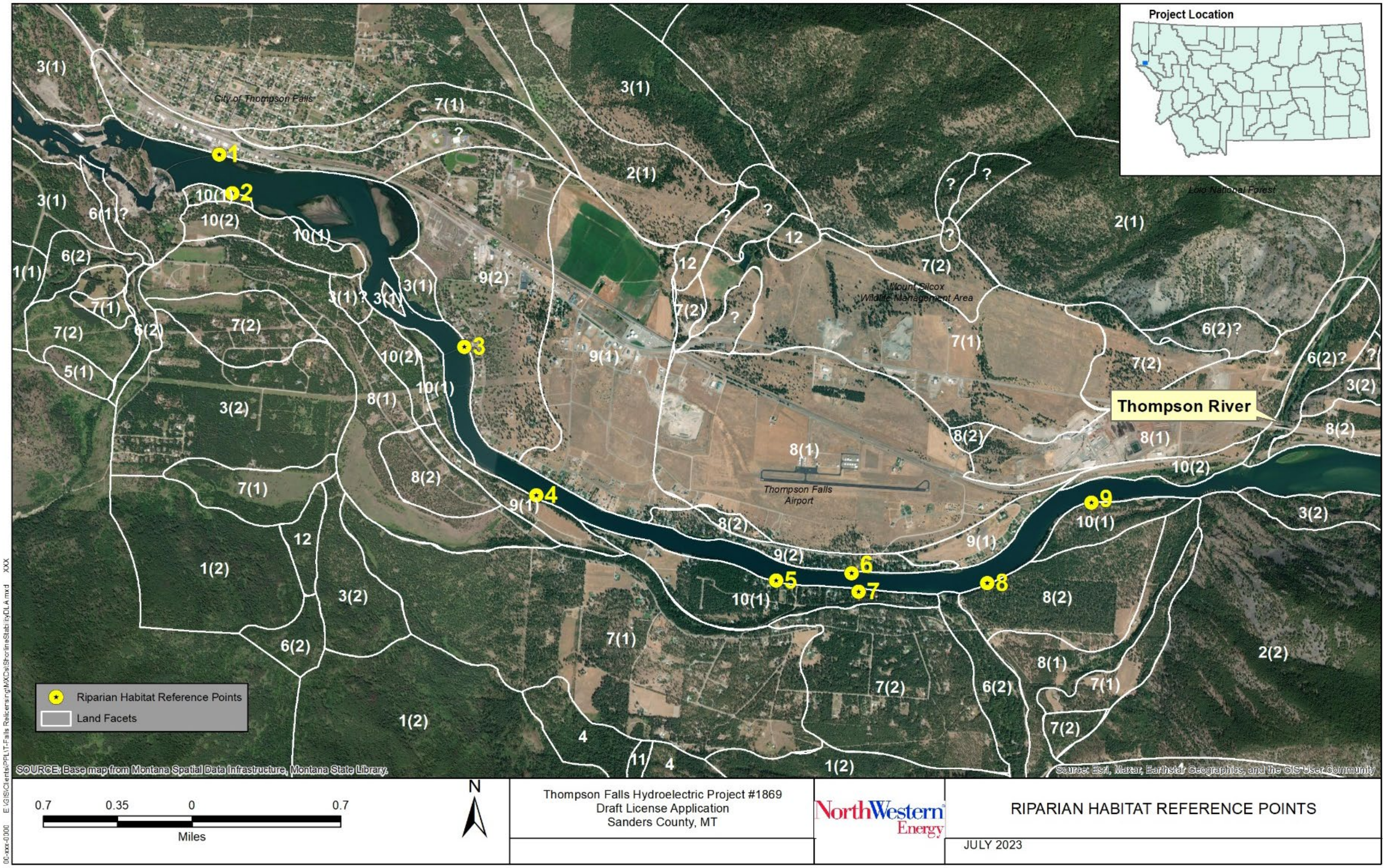
9.1.1.3.2 Functional Assessment of AA-2 (WG-2)

AA-2 consists of the three wetland areas in WG-2 totaling 0.55 acres. According to the MWAM, AA-2 is a Category III wetland. AA-2 received low ratings for listed/proposed T&E species, MNHP SOC habitat, and uniqueness. AA-2 received moderate ratings for general wildlife habitat, flood attenuation, production export/food chain support, and recreation/education potential and high ratings for short- and long-term surface water storage, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, and groundwater discharge/recharge. AA-2 received 6.0 out of 10 possible points (60%) and a total of 3.3 functional units.

9.1.2 Riparian Habitats

In 2021, NorthWestern assessed riparian habitats as part of the Operations Study (NorthWestern 2022). Riparian habitat is considered the vegetation above the full pool, and aquatic vegetation is considered the vegetation below that elevation, with the aquatic vegetation being either emergent (protruding above the water surface) or submergent (not protruding above the water surface). In 2021 riparian habitats were observed at nine reference points (**Figure 9-3**). The nine reference points extend from the boat restraint (near the dam) upstream to the mouth of the Thompson River. In 2022, NorthWestern assessed shoreline stability and aquatic vegetation at the same nine reference points (NorthWestern 2023).

Figure 9-3. Location of riparian habitat reference points



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Vegetation at the nine reference points varied significantly in both species composition and density (**Table 9-4**).

Table 9-4. Riparian Vegetation at Reference Points.

Reference Point Number	Description
1	Dense stand of non-native forbs and grasses, which were mostly mowed to the water's edge as part of the landscaping for this recreation site
2	Dense stand of grasses with a few interspersed conifer trees.
3	Dense mixture of grass and shrub species such as chokecherry, black hawthorn and service berry, and a few interspersed conifer trees
4	Less dense riparian vegetation due to more active erosion and the species mix consisted of grasses, shrubs and trees
5	Shoreline stabilization pilot project and dominated by a dense stand of grasses, with mixed survival of the shrub species that were planted for this pilot project
6	Low density stand of mostly grasses, with a few interspersed shrubs and conifer trees.
7	Dense stand of grasses, with a dense pocket of shrubs mixed in
8	Less dense riparian vegetation due to a boulder-type substrate not conducive to plant growth, and the plant species that do exist are mostly grasses
9	Less dense riparian vegetation due to more active erosion and also a boulder-type substrate that is not conducive to plant growth, and the plant species that do exist are a mixture of grasses, shrubs and conifer trees.

Source: NorthWestern 2022

Riparian habitats are present along the entire reservoir shoreline, other than where infrastructure is in place such as boat ramps, docks and rock riprap. Similar to the nine reference points, the vegetative density and species composition vary significantly. The reservoir shoreline downstream of the islands, located upstream of the confluence with the Thompson River, tends to have taller and steeper shoreline slopes with rockier soils that create narrow riparian habitats consisting of low to high density stands of grasses, forbs, shrubs and trees. The mouths of Cherry Creek and Thompson River are exceptions, each having a larger riparian habitat area as compared to the adjacent reservoir shoreline. The reservoir shoreline in the islands area, as well as the islands themselves, have less-steep slopes and finer soils creating large riparian habitat areas often densely vegetated including iconic riparian habitat species such as black cottonwood and willow species, which are much less common in the reservoir downstream of the islands. The reservoir shoreline upstream of the islands is more like the lower reservoir with narrower strips of riparian habitats with low to high density stands of vegetation.

Riparian habitat species have naturally adapted to fluctuating water levels in the reservoir, as well as even more dramatic fluctuations. Typical riparian habitats may be totally inundated at certain times of the year such as spring runoff or after a significant summer rainfall event, and at other times of the year such as the late summer and early fall when the water table may be below the root zone of the riparian plant species.

9.1.3 Littoral Zone

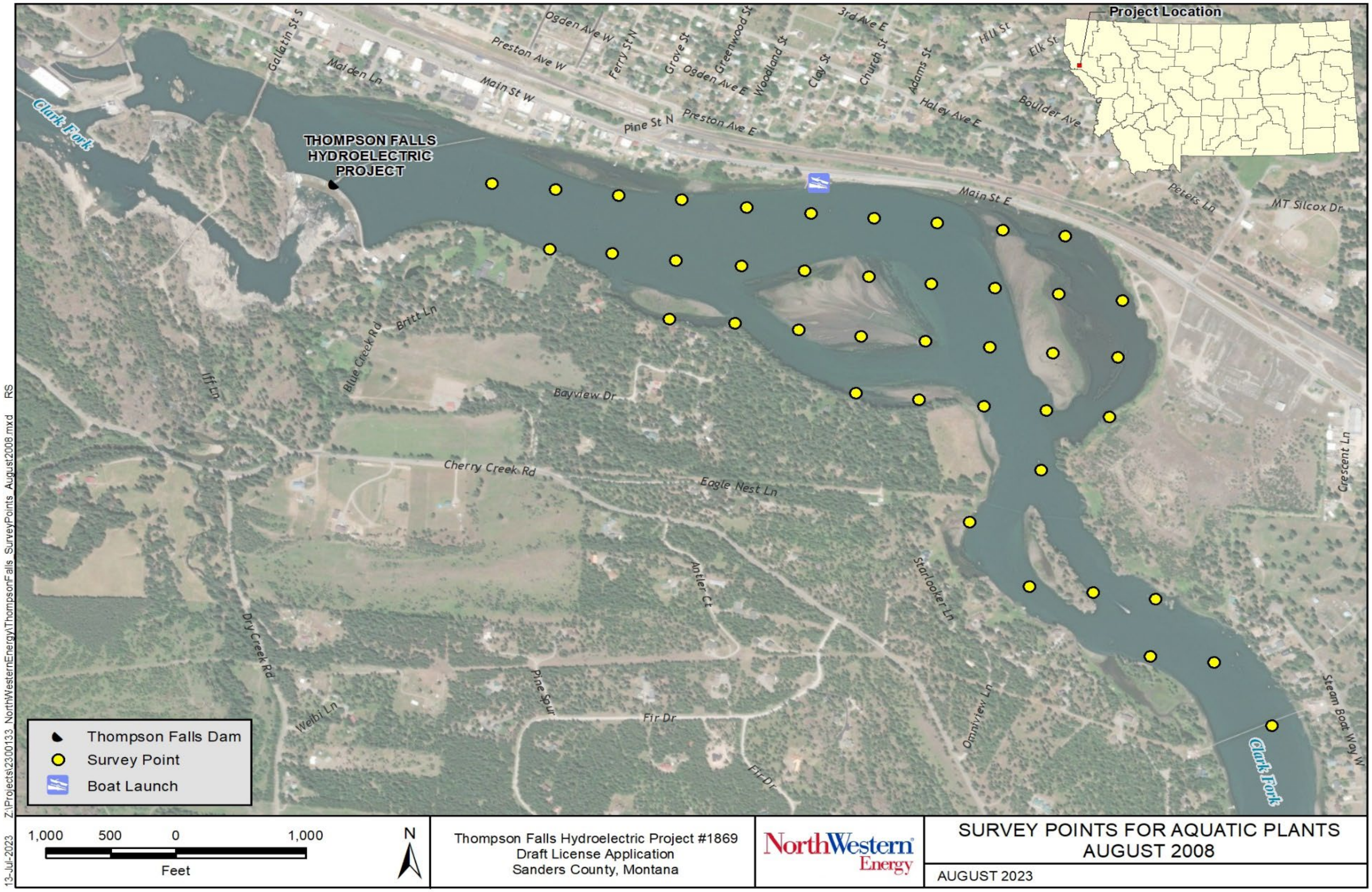
The littoral zone is defined as the nearshore area where sunlight can penetrate to the reservoir bottom, allowing for plant growth. In 2008, the littoral zone area in Thompson Falls Reservoir was defined by Madsen and Cheshier (2008) as extending to a depth of 25 feet, covering approximately 65 percent of the Thompson Falls Reservoir (Madsen and Cheshier 2009).

Aquatic vegetation surveys in Thompson Falls Reservoir and other reservoirs in the Lower Clark Fork River were conducted in 2008, **Figure 9-4** (Madsen and Cheshier 2009) and in 2016, **Figure 9-5** (Hansen Environmental 2016). These surveys were managed by the Sanders County Aquatic Invasive Plants Task Force. Surveys were completed in August in both years. Aquatic invasive plants documented or observed in the Thompson Falls Reservoir during these studies include curlyleaf pondweed, flowering rush, and yellow flag iris, all of which are on the Montana's noxious weed list (2019) and known to occur in Montana (FWP 2020).

In 2008, Thompson Falls Reservoir was described as having good water clarity. However, depths between 12 and 25 feet were not suitable for plant colonization in most areas due to steep slopes. Aquatic plants were present in about 63 percent of the 40 sites surveyed in the Thompson Falls Reservoir (Figure 9-4). A total of nine species were recorded in the littoral zone. Aquatic plants were not present at depths greater than 11 feet. The aquatic plant community was dominated by native species Eloda (*Elodea Canadensis*), coontail (*Ceratophyllum demersum*), and northern watermilfoil (*Myriophyllum sibiricum*). Nonnative invasive species observed include curlyleaf pondweed (*Potamogeton cripus*) (~77 acres) and flowering rush (*Butomus umbellatus*) (~28 acres) (Madsen and Cheshier 2009).

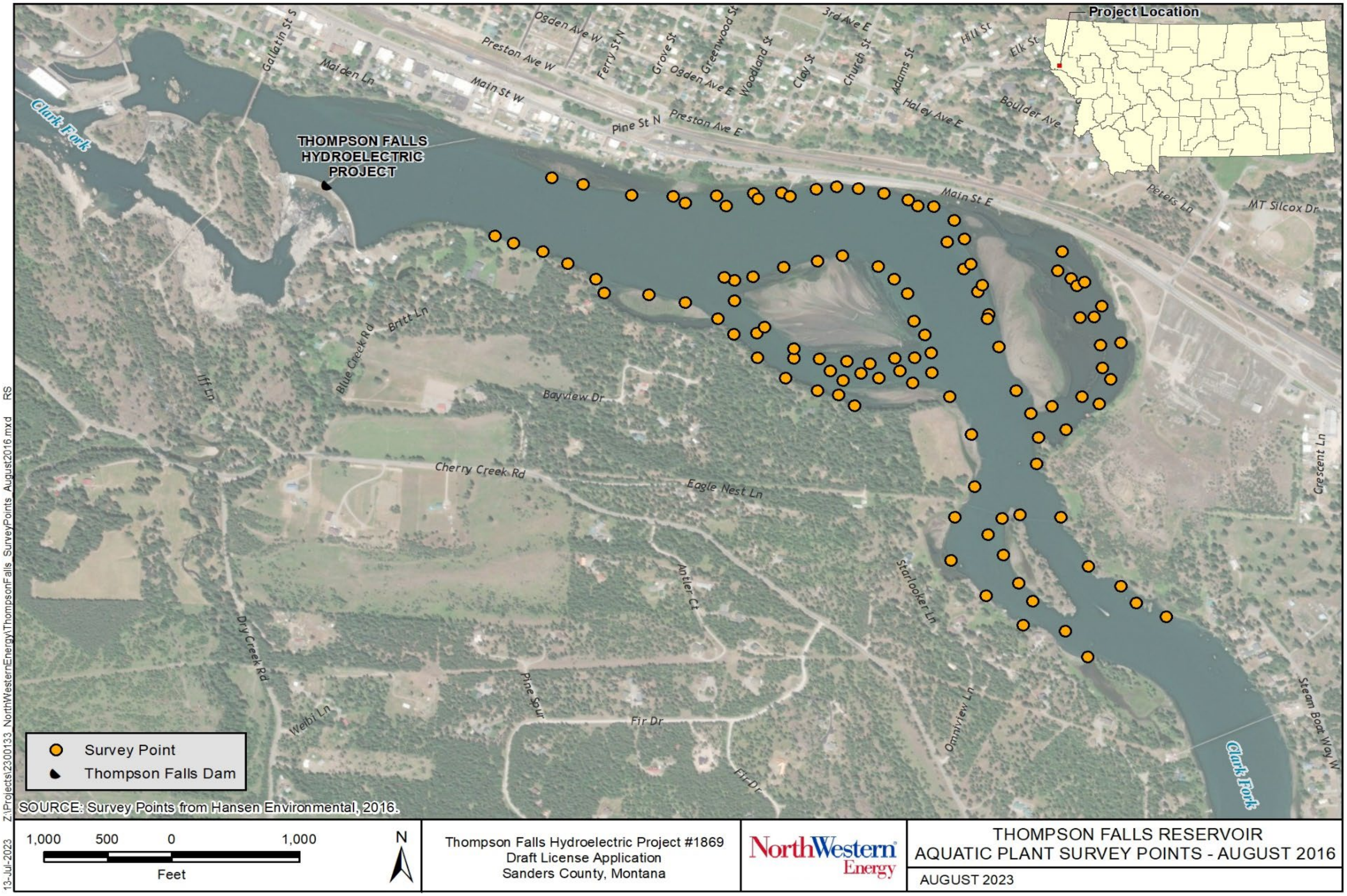
In 2016, Hansen Environmental surveyed 112 points in the Thompson Falls Reservoir at depths less than 15 feet (Figure 9-5). There were 11 species of aquatic plants identified and no aquatic plants were observed at depths greater than 13 feet. The aquatic plant community included primarily native species with the most dominant native plants represented by Eloda, coontail, and northern watermilfoil and other native plants including Chara (*Chara* spp.), water stargrass (*Heteranthera dubia*), white water buttercup (*Ranunclus aquatilis*), leafy pondweed (*P. foliosus*), sago pondweed (*P. pectinatus*), and Richardson's pondweed (*P. rishardonsii*). The two non-native species observed in the 2008 and 2016 surveys were flowering rush and curlyleaf pondweed (Madsen et al. 2009; Madsen and Cheshier 2009; Hansen Environmental 2016). Curlyleaf pondweed was observed at 19 percent of the sites, and flowering rush was observed at 13 percent of the sites (Hansen Environmental 2016). Although sampling methods differed between the 2008 and 2016 surveys, Hansen Environmental (2016) concluded the occurrence of these two-nonnative species appeared similar to 2008 results.

Figure 9-4: Thompson Falls Reservoir aquatic plant survey points, August 2008.



Source: Madsen and Cheshier 2009

Figure 9-5: Thompson Falls Reservoir aquatic plant survey points, August 2016.



Source: Hansen Environmental 2016

A qualitative review of aquatic vegetation and AIS along the reservoir shorelines was completed in 2021 and 2022 (NorthWestern 2022, 2023). Aquatic vegetation and AIS are common where the substrate is comprised of silt, sand and other fine materials, and much less common where the substrate is comprised of gravels, cobbles and other coarse materials. Upstream of the islands, aquatic vegetation and AIS are less prevalent since the shoreline tends to be comprised of coarse substrates, and/or the reservoir is more riverine in nature such that current flows and velocity reduce the ability for aquatic vegetation and AIS to become established. Flowering rush and yellow flag iris are AIS species that are fairly common in the reservoir. Flowering rush is particularly prevalent in the lower reservoir in areas of significant sediment deposition, close to the water's surface. Curlyleaf pondweed, an AIS with historic observations in the reservoir, is less prevalent than other species and was only observed at two wetland sites during recent evaluations (NorthWestern 2022, 2023). Eurasian watermilfoil, an invasive species common in the region and especially prevalent downstream of the Thompson Falls Project area, was not observed, though native northern watermilfoil is prevalent (NorthWestern 2022, 2023).

9.2 Environmental Measures

9.2.1 Existing Environmental Measures

9.2.1.1 Completed Environmental Measures

Under the existing license the following environmental measure was completed:

- In 2020 NorthWestern completed a pilot project utilizing a bioengineering approach to shoreline stabilization. The completed project involved revegetation of approximately 200 linear feet of eroding shoreline with native riparian plants.

9.2.1.2 Ongoing Environmental Measures

Under the existing license the following environmental measure is ongoing:

- Maintain and implement the *Standards for Design, Construction, Maintenance, and Operation of Shoreline Facilities*.

9.2.2 Proposed Environmental Measures

NorthWestern is not proposing any environmental measures related to wetlands, riparian habitats and littoral zones.

9.3 Environmental Effects

9.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the

Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the no action alternative, wetlands, riparian habitat and littoral zone within the Project would continue to function as they have in the past. Under the current operations, water fluctuations of up to 4 feet in the reservoir are permitted, which could potentially result in greater impacts to existing wetland and riparian vegetation than what was observed during the 2021 and 2022 study periods which looked at water fluctuations of up to 2.5 feet. Depending on the frequency and duration of the 4-foot fluctuations, both submergent and emergent vegetation, could potentially be impacted due to dewatering of the root zone for extended periods of time, resulting in changes to the plant species composition in these areas.

AIS such as flowering rush and yellow flag iris appear to be resilient to fluctuations in the reservoir elevation. AIS are difficult to eradicate and can have adverse effects on native vegetation and species. AIS spread from upstream sources that are outside the Project area, such as recreation (e.g., boating, fishing, recreationists), and from species like birds that can move in and out of the Project area.

Emergency operations occasionally occur when stanchions are tripped, and the reservoir is drawn down to crest for repairs. During the deep drawdowns, some littoral habitat is dewatered, and wetlands may temporarily lose connectivity to the main river channel.

9.3.2 Applicant's Proposed Alternative

9.3.2.1 Impacts of Proposed Operational Changes

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations.

NorthWestern's Operations Study included an evaluation of impacts to wetlands at pool elevations down to 2.5 feet below full pool (NorthWestern 2022, 2023). Current operations support shallow areas with aquatic plant growth, backwater channels, and wetland areas in Thompson Falls Reservoir. The Operations Study in 2021 and 2022 indicate much of the existing wetland and riparian vegetation is resilient to water fluctuations of up to 2.5 feet in the reservoir, as no changes to emergent or woody vegetation were observed throughout the study period.

Wetland 1, located on a side channel of the reservoir near Steamboat Island, was selected as a representative site for conditions in the lower reservoir (**Figure 9-6**). This wetland contains features that are classified as palustrine with emergent vegetation, as well as riverine features that have an unconsolidated bottom (MNHP 2021). There is a visible surface water inlet and outlet to Wetland 1.

Wetland 2 is located in the upper reservoir on the large island in the middle of the island complex upstream of the Thompson River confluence (**Figure 9-6**). This wetland is classified as palustrine and contains both aquatic bed and forested wetland features (MNHP 2021).

Wetland 3 is located in the upper reservoir on a small island near river left in the island complex upstream of the Thompson River confluence (Figure 9-6). This wetland is classified as palustrine and contains both aquatic bed and emergent wetland features (Montana NHP 2021).

In 2022, NorthWestern evaluated Wetland 1 and a new location, Wetland 4. Wetland 4 has similar characteristics as Wetland 1 and contains features that are classified as palustrine with emergent vegetation (MNHP 2021). Wetland 4 is situated in a backwater area along the shoreline of the reservoir and is shallow and very small in size (Figure 9-6).

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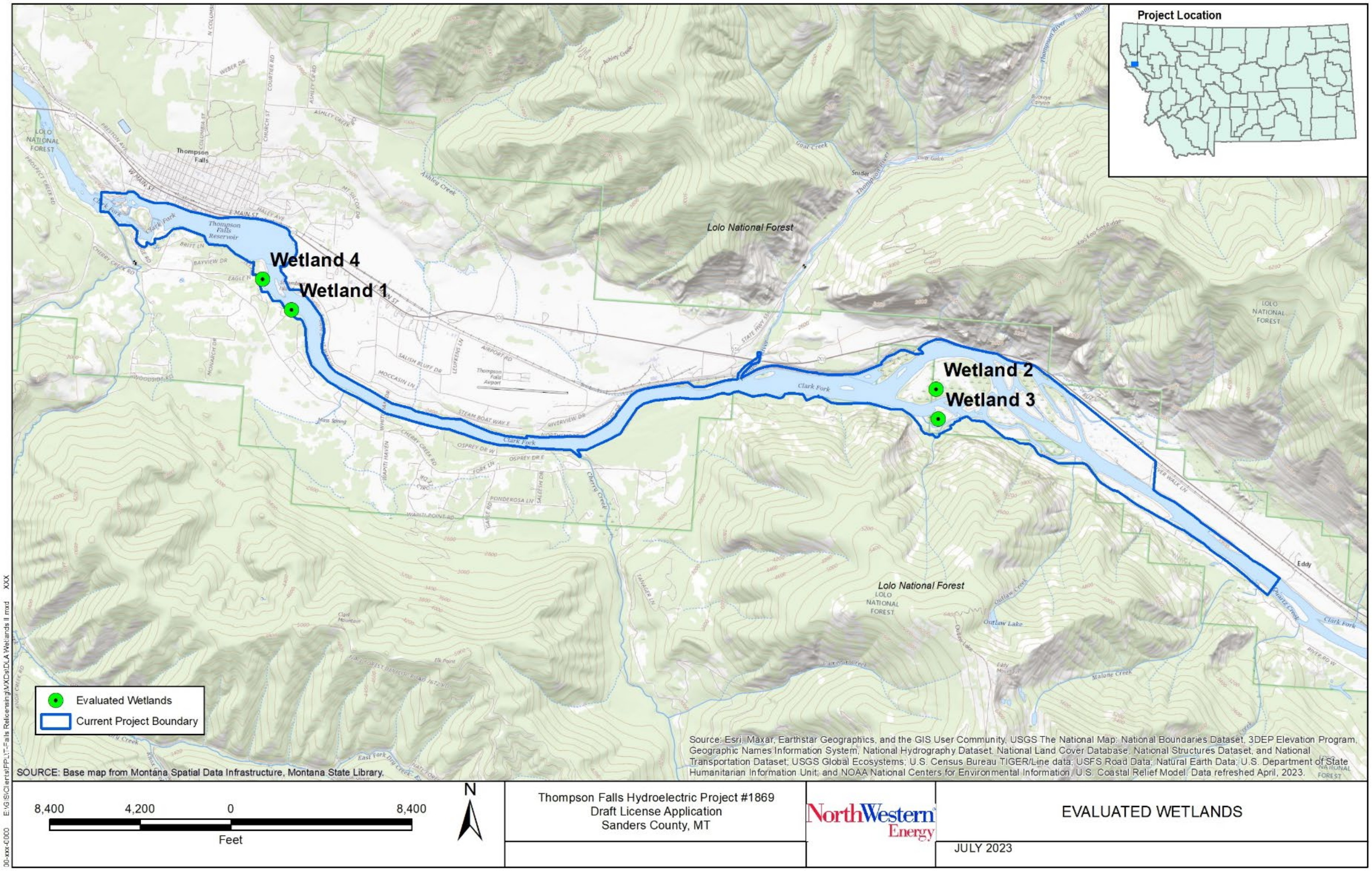
Figure 9-6. Location of Wetlands Evaluated During the Operations Study



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When the water surface elevation of the reservoir is approximately 1.5 feet below full pool, the side channel that feeds Wetland 1 becomes deactivated and the water volume in the wetland is significantly reduced. Conversely, when the water surface elevation of the reservoir goes above 2395.1 feet, the side channel re-activates and the volume of water in Wetland 1 increases (NorthWestern 2022).

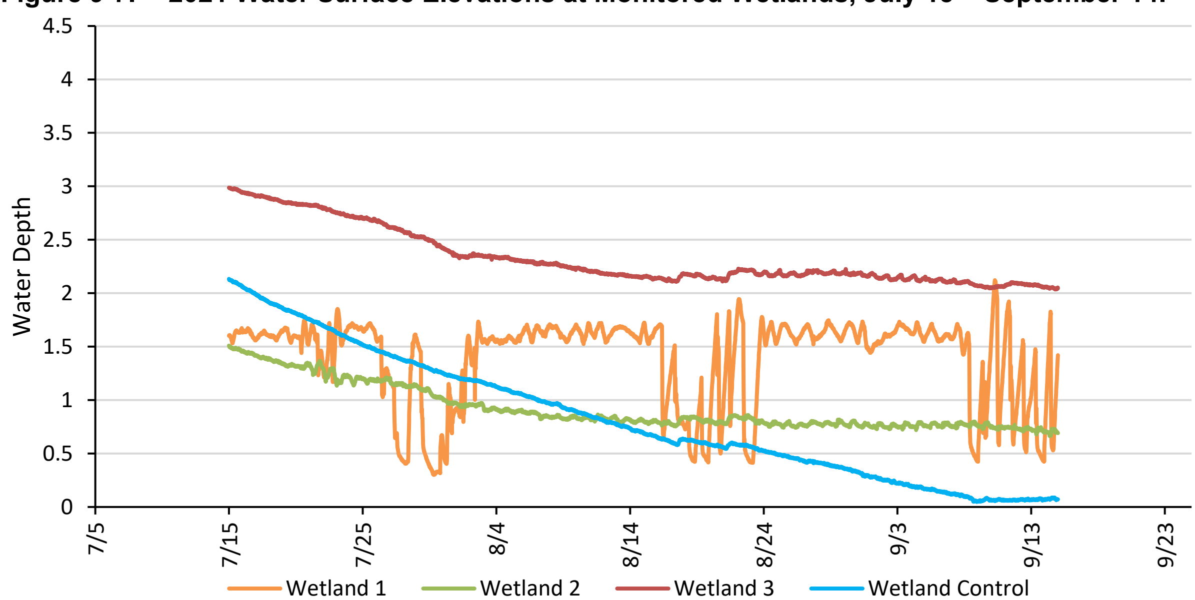
Wetland 2 becomes flooded during spring runoff and at times when the stage is high in the Clark Fork River. This was evidenced by the large amount of driftwood debris around the wetland. As the stage in the Clark Fork River recedes, there is no longer an active surface water connection upstream or downstream of Wetland 2, and it appears that the wetland slowly discharges to groundwater throughout the rest of the year. Although this wetland has a close proximity to surface water in the reservoir, there is no visual surface water connection to the reservoir (NorthWestern 2022).

Although Wetland 3 is in close proximity to surface water in the reservoir, there is no observed surface water connection to the reservoir.

Wetland 4 is very shallow, has a surface water connection, and frequently goes dry throughout the summer months when the water surface elevation at the dam dips below approximately 2,395.7 feet.

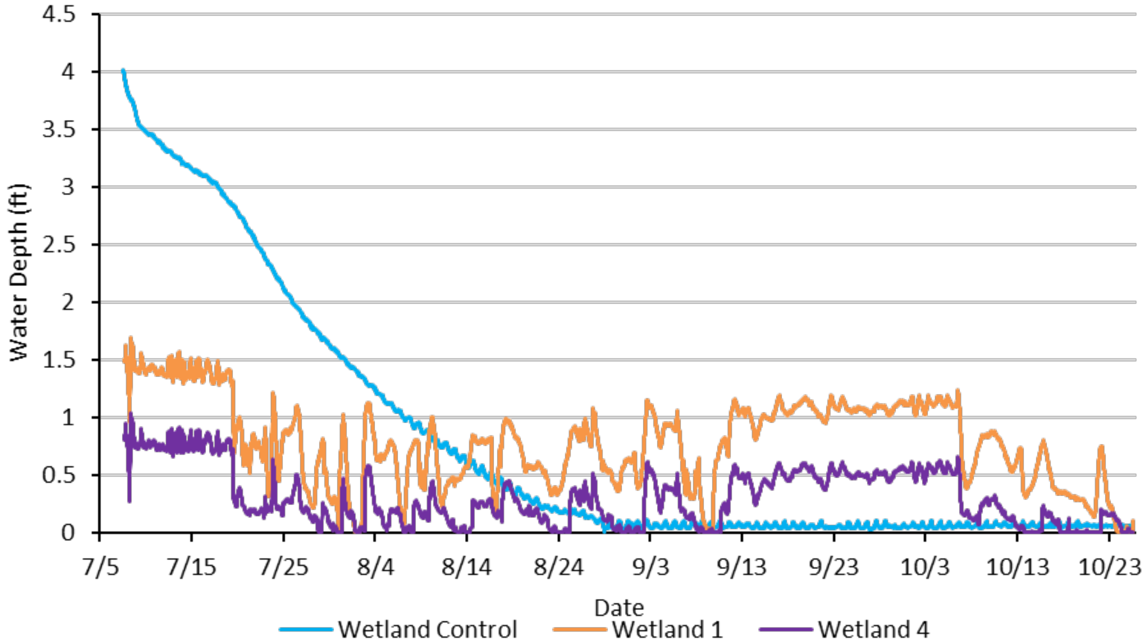
Results from the stage monitoring at the wetland sites are shown in **Figure 9-7** (2021 results) and **Figure 9-8** (2022 results). These figures graphically display the response or lack of response of each individual wetland site to changes in Project operations throughout each study season.

Figure 9-7. 2021 Water Surface Elevations at Monitored Wetlands, July 15 – September 14.



Source: NorthWestern 2022

Figure 9-8. 2022 Water Surface Elevations at Monitored Wetlands, July 7 – October 25.



Source: NorthWestern 2023

The results of the 2021 and 2022 Operations Study (NorthWestern 2022 and 2023) show the proposed alternative has the potential to affect 11.33 acres (**Appendix B – Wetlands Assessment Report**) of wetlands with a direct surface water connection to the reservoir. Wetlands hydrologically connected to the reservoir *via* groundwater, do not appear to be affected by fluctuations in the water surface elevation of the reservoir (NorthWestern 2023). Therefore, proposed operations are not expected to have an effect on aquatic vegetation and AIS that inhabit these wetlands (~200.4 acres).

Wetlands with a surface water connection to the reservoir (approximately 11.33 acres total) may be temporarily dewatered when the elevation of the reservoir is lowered but are restored when the reservoir is raised. Direct impacts to these types of wetlands are anticipated to be temporary in nature and may include loss of shallow aquatic habitat for fish, amphibians, birds, and other wildlife. This impact is anticipated to be short-term and intermittent and not result in any shift in aquatic or wildlife species use of the habitats.

Emergent vegetation at these sites is fairly resilient and may not be affected as much as the submergent vegetation. Fluctuating water levels due to operations appear to change the submergent vegetation, eliminating some that historically existed in the 0- to 18-inch zone. (NorthWestern 2023).

Changes to riparian habitats were not observed as a result of fluctuating water levels during the Operations Study (NorthWestern 2022). Fluctuating water levels did not appear to impact riparian habitats, as riparian habitats have naturally adapted to fluctuating water levels. Long term changes to aquatic vegetation species composition and prevalence, including AIS, may occur under proposed operations, especially in areas that are frequently dewatered. Changes to aquatic vegetation species composition and prevalence may have a positive, negative or neutral impact on other resource concerns and issues.

Under the proposed alternative, wetlands, and littoral zones would be impacted by 2.5-foot fluctuations in the reservoir. However, those impacts are less significant than with the no action alternative, whereby the reservoir could be drawn down 4 feet, which is a larger drawdown, and depending on inflows, and need for flexible generation could be of longer duration.

9.3.2.2 Impacts of Proposed Project Boundary Change

NorthWestern's proposed alternative includes changes to the Project boundary which will modify the acreage of wetlands in the Project boundary. The current Project boundary includes 10.98 acres of palustrine emergent wetland habitat. The proposed Project boundary contains 2.22 acres of palustrine emergent wetland habitat. The Project boundary modification will not change the form and function of these wetlands. The wetlands removed from the Project boundary will continue to be protected by applicable state and federal laws and regulations.

9.4 Unavoidable Adverse Impacts

Under the proposed alternative, dewatering impacts may occur at wetlands hydrologically similar to Wetlands 1 and 4. The extent of the impact will depend on the frequency and duration of flexible generation.

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10. Threatened and Endangered Species

This Section provides an analysis of federally T&E species, and federally proposed and candidate (P&C) species, that are known to occur or have the potential to occur in the FERC Project area.

10.1 Affected Environment

10.1.1 Threatened and Endangered Species

A request was made on January 23, 2023 to FWS through the Environmental Conservation Online System (ECOS) – Information for Planning and Consultation (IPaC) system for a species list that identifies T&E and P&C species as well as proposed and final designated critical habitat. On January 17, 2023, the status of whitebark pine (*Pinus albicaulis*) changed from candidate to threatened.[23]

The FWS T&E species list identified through ECOS-IPaC is provided in **Table 10-1**. A list of known biological opinions, status reports, or recovery plan(s) pertaining to the T&E species list is summarized in **Table 10-2**. The only designated critical habitat within the FERC Project boundary is for Bull Trout (*Salvelinus confluentus*).

Each T&E species is described briefly with focus on their potential presence, and the extent and location of any federally designated critical habitat, or other suitable habitat within the Project vicinity.

[23] https://ecos.fws.gov/ecp/species/R00E

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Table 10-1 List of T&E species identified by FWS ECOS-IPaC 2023

Species	Fish, Plant, or Mammal	Scientific Name	FWS Status (Year)	Habitat	Occurrence Potential
Bull Trout	Fish	*Salvelinus confluentus*	Threatened (1998) Critical Habitat (2010)	Clear streams, rivers, and lakes west of the Continental Divide Cool, clear, connected, complex stream habitat.	Present
Grizzly Bear	Mammal	*Ursus arctos horribilis*	Threatened (1975)	Variable habitats including meadow, forest and riparian. Requires large tracts of wilderness.	Potential to occur as transients (no denning sites).
Canada Lynx	Mammal	*Lynx canadensis*	Threatened (2000)	Subalpine coniferous forests, with a deep winter snowpack, dense understory, and high density of snowshoe hares.	Unlikely
Yellow-billed Cuckoo	Bird	*Coccyzus americanus*	Threatened (2014)	Tall, dense, expansive cottonwood and willow riparian forest. Requires habitat patches at least 25 acres in size.	Unlikely
Spalding's Campion (Spalding's Catchfly)	Plant	*Silene spaldingii*	Threatened (2001)	Open, mesic grasslands in the valleys and foothills, in deep, loamy soils along northerly aspects.	Unlikely
Whitebark Pine	Plant	*Pinus albicaulis*	Threatened (2023)	Windy, cold, high-elevation or high-latitude environments. Subalpine and krummholz habitats (mostly mountain ranges).	Not Present

Source: FWS ECOS-IPaC 2023a, 2023b, 2023c, 2023d, 2023e, 2023f.

Table 10-2. List of the biological opinion, species status report(s), designation of critical habitat, or recovery plan(s) pertaining to each T&E species in Table 10-1.

Species	Document/Report Title	Type	Date
Bull Trout	Environmental Conservation Online System (ECOS) https://ecos.fws.gov/ecp/species/8212	Status Updates	Accessed January 2023
	FWS Bull Trout Recovery Planning https://www.fws.gov/species/bull-trout-salvelinus-confluentus	Status Updates	Accessed January 2023
	FWS. 2008. Biological Opinion for Thompson Falls Hydroelectric Project Bull Trout Consultation. FERC Docket No. 1869-048- Montana. https://northwesternenergy.com/docs/default-source/default-document-library/clean-energy/environmental-projects/thompson-falls/thompson_falls_biological_opinion_2008.pdf	Biological Opinion	2008
	FWS. 2015. Columbia Headwater Recovery Unit Implementation Plan for Bull Trout. FWS, Montana Ecological Services Office. https://ecos.fws.gov/docs/recovery_plan/Final_Bull_Trout_Recovery_Plan_092915-corrected.pdf	Recovery Plan	2015
	Federal Register. 2010. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous U.S. Vol 75, No. 200, 63898-64070. https://www.govinfo.gov/content/pkg/FR-2010-10-18/pdf/2010-25028.pdf	Critical Habitat	2010
Grizzly Bear	ECOS https://ecos.fws.gov/ecp/species/7642	Status Updates	Accessed January 2023
	FWS. 2022. Species Status Assessment for the Grizzly Bear (*Ursus arctos horribilis*) in the Lower-48 States. Version 1.2, January 22, 2022. Missoula, Montana. 369 pp. https://ecos.fws.gov/ServCat/DownloadFile/213247	Status Report	2022
	FWS. 2021.Grizzly Bear in the Lower-48 States (*Ursus arctos horribilis*) 5-year status review: summary and evaluation. March, 2021. Denver, Colorado. https://ecos.fws.gov/ServCat/DownloadFile/196991	Status Report	2021
Canada Lynx	ECOS https://ecos.fws.gov/ecp/species/3652	Status Updates	Accessed January 2023
	FWS. 2017. Species Status Assessment for the Canada Lynx (*Lynx canadensis*) Contiguous U.S. Distinct Population Segment. Version 1.0, October, 2017. Lakewood, Colorado. https://ecos.fws.gov/ServCat/DownloadFile/213244	Status Report	2017
	U.S. 2000a. Recovery Outline Contiguous U.S. Distinct Population Sediment of the Canada Lynx. https://ecos.fws.gov/docs/recovery_plan/final%20draft%20Lynx%20Recovery%20Outline%209-05.pdf	Recovery Outline	2000

Species	Document/Report Title	Type	Date
Yellow-billed Cuckoo	ECOS https://ecos.fws.gov/ecp/species/3911	Status Updates	Accessed January 2023
	Federal Register. 2021. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Western Distinct Population Segment of the Yellow-Billed Cuckoo. Vol 86, No 75, 20798-21005. https://www.govinfo.gov/content/pkg/FR-2021-04-21/pdf/2021-07402.pdf#page=1	Critical Habitat	2021
Spalding's Catchfly	ECOS https://ecos.fws.gov/ecp/species/3681	Species Status	Accessed January 2023
	FWS. 2007. Recovery Plan for Silene spaldingii (Spalding's Catchfly). FWS, Portland, Oregon. xiii + 187 pages. https://ecos.fws.gov/docs/recovery_plan/071012.pdf	Recovery Plan	2007
Whitebark Pine	ECOS https://ecos.fws.gov/ecp/species/1748	Species Status	Accessed January 2023
	Federal Register. 2022a. Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for Whitebark Pine (*Pinus albicaulis*). Vol 87, 76882-76917. https://www.govinfo.gov/content/pkg/FR-2022-12-15/pdf/2022-27087.pdf#page=1	Species Status	2022
	FWS. 2021. Species Status Assessment Report for the Whitebark Pine (*Pinus albicaulis*) version 1.3. 118 pp+appendices. Available: https://ecos.fws.gov/ServCat/DownloadFile/226045	Species Status	2021

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10.1.1.1 Bull Trout

10.1.1.1.1 Habitat and Distribution

In 1998, the Bull Trout was federally listed under the ESA as a threatened species (Federal Register 1998). Critical habitat was designated in 2005 and revised in 2010 (Federal Register 2005; 2010). In 2015, FWS developed a recovery plan for Bull Trout (FWS 2015). Bull Trout are present within the Clark Fork River drainage and are known to occur within the FERC Project boundary.

Critical habitat for Bull Trout has been defined as a habitat unit that can maintain and support viable Bull Trout core areas (Federal Register 2005). The designated critical habitat includes the Columbia Headwater Recovery Unit (CHRU). Within the CHRU there are 35 Bull Trout core areas that occur within four geographic regions including the Clark Fork River, Flathead Lake, Coeur d'Alene Lake, and Kootenai River (FWS 2015). The Lake Pend Oreille core area contains a total of 35 local Bull Trout populations.

Within the CHRU, FWS identified 32 Critical Habitat Units (CHUs), including the Clark Fork River Basin CHU. The Clark Fork River Basin CHU (Unit 31) includes 3,328 stream miles and 295,587 acres) of lakes and reservoirs as critical Bull Trout habitat (Federal Register 2010). The Clark Fork River Basin has 12 subunits including the Lower Clark Fork River Critical Habitat Subunit (CHSU) encompassing the Project, located in Sanders and Missoula counties covering 295 miles of stream and 9,719 acres of surface area as designated Bull Trout habitat (Federal Register 2010).

The Lower Clark Fork River CHSU **(Figure 10-1**) provides essential foraging, migration and overwintering habitat for several local Bull Trout populations and includes designated critical Bull Trout habitat (FWS 2009). The Project is located within this designated critical Bull Trout habitat. As part of the critical habitat designation, the Thompson Falls Reservoir is considered a stream reach and not a lake due to the lack of reservoir storage capacity (Federal Register 2010). Two tributaries near the Project including Prospect Creek, located immediately downstream of the Main Channel Dam, and the Thompson River, located about 6 miles upstream of the Main Channel Dam, are designated Bull Trout critical habitat. Designated critical habitat in the Lower Clark Fork River and Middle Clark Fork River, representing CHU Unit 31, is shown in **Figure 10-1**. **Table 10-3** identifies the Lower and Middle Clark Fork River reaches and respective local Bull Trout populations identified by FWS (2015).

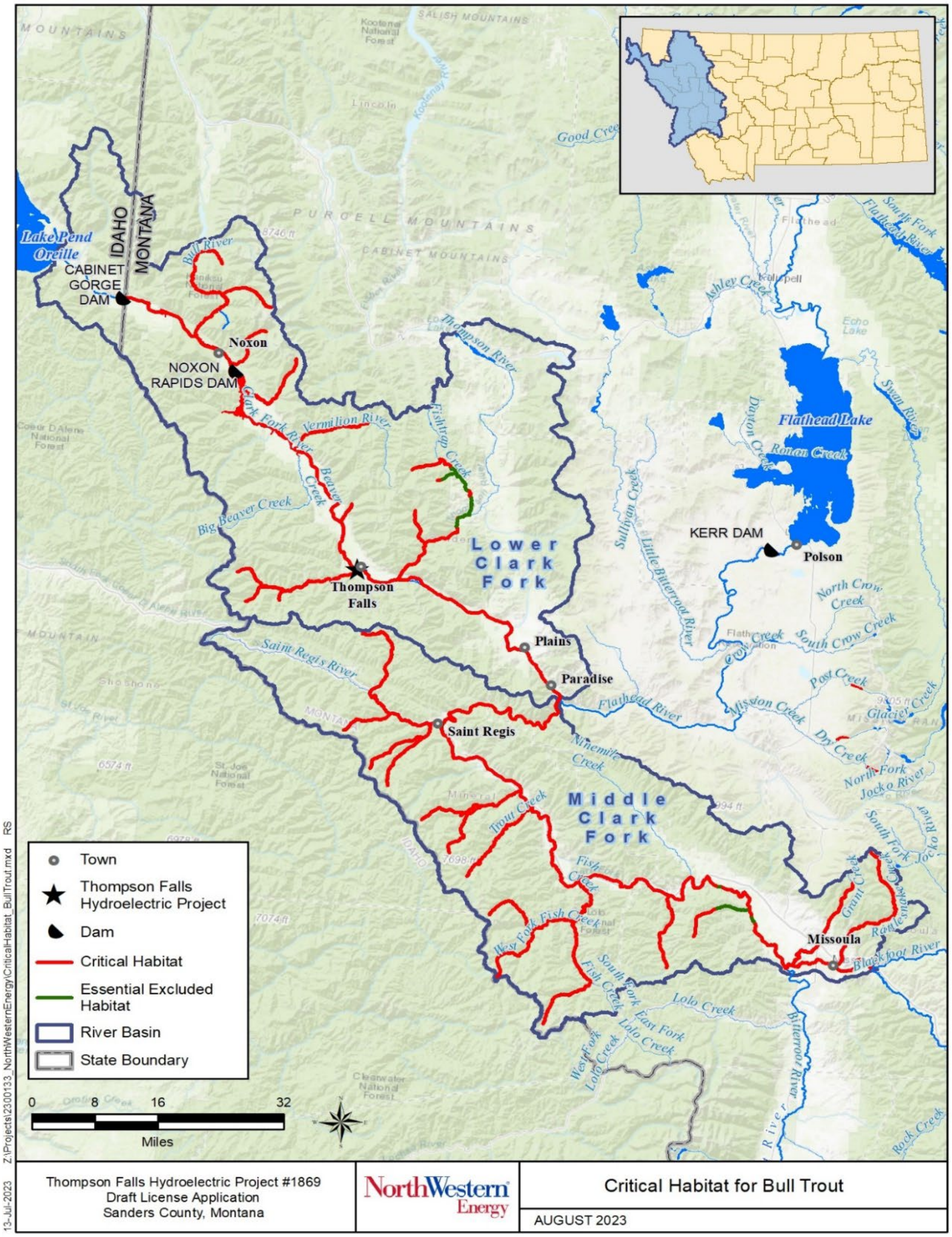
Since the upstream fish passage facility at the Project opened in 2011, between one and five Bull Trout have ascended the ladder annually, except in 2018 when there were none (NorthWestern 2023). During the 12 years of operation, 21 Bull Trout averaging 516 mm in length (range 320-620 mm) have ascended the ladder. Approximately 70 percent of the Bull Trout ascending the ladder were genetically assigned to the Thompson River drainage as their natal stream (specifically either Fishtrap Creek or West Fork Thompson River). Seven were subsequently detected in the Thompson River drainage via remote passive integrated transponder (PIT) tag array systems located in the mainstem and tributaries. These Bull Trout ascended the ladder under various river conditions with flows ranging from 8,100 to 56,100 cfs (measured in the Clark Fork River upstream of the dam) and stream temperatures from 43.88 to 72.14°F.

Table 10-3. Bull Trout spawning and rearing tributaries to the Lower and Middle Clark Fork rivers and Lower Flathead River.

Upstream or Downstream of Project	River Reach Description	Bull Trout Spawning and Rearing Tributaries to the Clark Fork River/Flathead River (smaller tributaries)
Downstream	Noxon Rapids Dam upstream to Thompson Falls Dam	Swamp Creek, Vermilion River, Graves Creek, Prospect Creek
Upstream	Lower Clark Fork River – ends at the confluence with the lower Flathead River	Thompson River (West Fork Thompson River, Fishtrap Creek)
Upstream	Lower Flathead River	Jocko River (North Fork and South Fork), Mission Creek, Post Creek, Dry Creek
Upstream	Middle Clark Fork River – starts at the confluence with the lower Flathead River and ends at the confluence with the Blackfoot River	St. Regis River (Little Joe Creek, Ward Creek, Twelvemile Creek), Cedar Creek (Oregon Gulch), Fish Creek (North Fork, West Fork and South Fork, Cache Creek), Petty Creek, Albert Creek, Grant Creek, Rattlesnake Creek

Source: FWS 2015

Figure 10-1. Map of Bull Trout designated critical habitat (CHSU Unit 31) in the Lower Clark Fork River and Middle Clark Fork River in Montana[24].



Source: FWS 2010

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[24] Under section 4(b)(2) of the Endangered Species Act, Congress provided discretionary authority to the Secretary of the Interior to exclude any specific area from a critical habitat designation—Essential Excluded Habitat—if the benefits of such exclusion outweigh the benefits of designation, so long as the exclusion will not result in the extinction of the species.

10.1.1.1.2 Bull Trout Life History

Life history characteristics of Bull Trout have been reported by several authors (Pratt 1985 and 1996; Fraley and Shepard 1989; Brown 1992; Thomas 1992; McPhail and Baxter 1996; Nelson et al. 2002). In the Clark Fork River drainage, Bull Trout have three life history patterns: resident, fluvial, and adfluvial. Resident Bull Trout spend their entire lives in the same (or nearby) streams in which they were hatched. Resident Bull Trout adults and juveniles generally confine their migrations to their natal streams. In fluvial and adfluvial populations, the adults spawn in tributary streams where the young rear for 1 to 4 years (Fraley and Shepard 1989). The juvenile Bull Trout then migrate downstream to a larger body of water, either a lake (adfluvial fish) or a river (fluvial fish), where they grow to maturity.

It has been suggested that the ability for Bull Trout to express multiple life history forms is an adaptive mechanism to variable environmental conditions (Nelson et al. 2002). For example, adfluvial and fluvial migration movement to lakes and larger rivers may take advantage of more abundant food sources allowing for greater growth and fecundity (Gross 1987 cited in Nelson et al. 2002). The resident life history form may be an adaptation to the presence of migration barriers/restrictions or where growth opportunities in the headwaters are greater than the cost of migration (Nelson et al. 2002).

In the Lower Clark Fork River drainage, there appears to be a wide season, approximately between April and August, when adult Bull Trout leave Lake Pend Oreille to begin their upstream migrations to headwater streams to spawn (Normandeau Associates 2001). Bull trout records at the upstream fish passage facility indicate most Bull Trout are moving upstream between April and June with some additional Bull Trout detections in the fish passage facility between August and October (NorthWestern 2018). Mature adults spawn in headwater streams during the fall (September–October). However, the timing of movement into the tributaries may vary. Radio telemetry data indicate a relatively wide range of time during which Bull Trout move into spawning areas, between the middle of July and the middle of October (Lockard et al. 2002, 2003, 2004).

Adult Bull Trout leaving Lake Pend Oreille are captured downstream of Cabinet Gorge Dam and transported to their assumed natal waters (after being genetically tested and assigned to an upstream tributary) upstream of either Cabinet Gorge Dam (genetic assignment to Region 2), Noxon Rapids Dam (genetic assignment to Region 3), or to above Thompson Falls Dam (genetic assignment to Region 4).

Bull Trout have more specific habitat requirements compared to other salmonids, requiring clean, cold, complex, and connected habitat. Spawning grounds are generally low gradient (less than 2%) with a water depth range from 0.1 to 0.6 meters, stream velocity between 0.09 meters per second (m/s) and 0.61 m/s, comprised of gravel/cobble substrate with less than 35 to 40 percent of sediments smaller than 6.35 mm in diameter, and high gravel permeability (Montana Bull Trout Restoration Team (MBTRT) 2000). In the Lower Clark Fork River drainage spawning activity peaks in September (Katzman and Hintz 2003; Katzman 2003; Moran 2003) when stream temperatures are generally less than 46.4°F (McPhail and Baxter 1996; Pratt 1996). Sexually mature adult Bull Trout may spawn in multiple years, although they do not necessarily spawn in consecutive years (Downs et al. 2006).

Rearing habitat requirements for juvenile Bull Trout include cold summer water temperatures (less than 59°F) provided by sufficient surface and groundwater flows. Warmer temperatures are associated with lower Bull Trout densities and can increase the risk of invasion by other species that could displace, compete with, or prey on juvenile Bull Trout. Juvenile Bull Trout are generally benthic foragers, rarely stray from cover, and they prefer complex forms of cover. High sediment levels and embeddedness can result in decreased rearing densities. Unembedded cobble/rubble substrate is preferred for cover and feeding and also provides invertebrate production. Highly variable streamflow, reduction in large woody debris, bedload movement, and other forms of channel instability can limit the distribution and abundance of juvenile Bull Trout. Habitat characteristics that are important for juvenile Bull Trout of migratory populations are also important for stream resident subadults and adults.

Both migratory and stream-resident Bull Trout move in response to developmental and seasonal habitat requirements. Migratory individuals can move great distances (up to 156 miles) among lakes, rivers, and tributary streams in response to spawning, rearing, and adult habitat needs (MBTRT 2000). Stream-resident Bull Trout migrate within tributary stream networks for spawning purposes, as well as in response to changes in seasonal habitat requirements and conditions. Open migratory corridors, both within and among tributary streams, larger rivers, and lake systems are critical for maintaining Bull Trout populations.

Historically, juvenile adfluvial Bull Trout in the Clark Fork River drainage outmigrated from tributary streams to feed and mature in Lake Pend Oreille. The adults would then migrate upstream from Lake Pend Oreille to the natal streams to spawn. This migration pattern has been disrupted by the construction of Cabinet Gorge Dam, Noxon Rapids Dam, and Thompson Falls Dam. Today, Bull Trout passage in the Lower Clark Fork drainage is, in part, facilitated by Avista's trap and transport program and NorthWestern's upstream fish passage facility. There is no fish passage facility or trap system present at Noxon Rapids Dam.

As part of the Avista transport program, Avista captures a portion of juvenile Bull Trout within their natal streams, implants them with PIT tags, and transports them to Lake Pend Oreille. Avista's downstream transport program does not include tributaries upstream of Thompson Falls Dam. Avista seasonally collects adult Bull Trout upstream of Lake Pend Oreille near the vicinity of Cabinet Gorge Dam[25]. A fin clip from each Bull Trout is genetically tested to determine their natal stream so they can be transported to (or near) their tributary of origin. Avista has operated the adult Bull Trout transport program since 2001. Fish transport upstream of Thompon Falls Dam, Region 4, began in 2007. Avista has transported an average 44 Bull

[25] Bull Trout have been collected for the transport program via trapping, electrofishing, and angling downstream of Cabinet Gorge Dam through 2022. A fish passage trap was built and commenced operation at Cabinet Gorge Dam in 2022.

Trout upstream of Cabinet Gorge Dam annually with about 16 percent (7 Bull Trout) transported to waterways upstream of Thompson Falls Dam. A portion of the adults captured at Cabinet Gorge Dam are fish that were previously transported downstream as juveniles. Avista's downstream transport program does not include tributaries upstream of Thompson Falls Dam

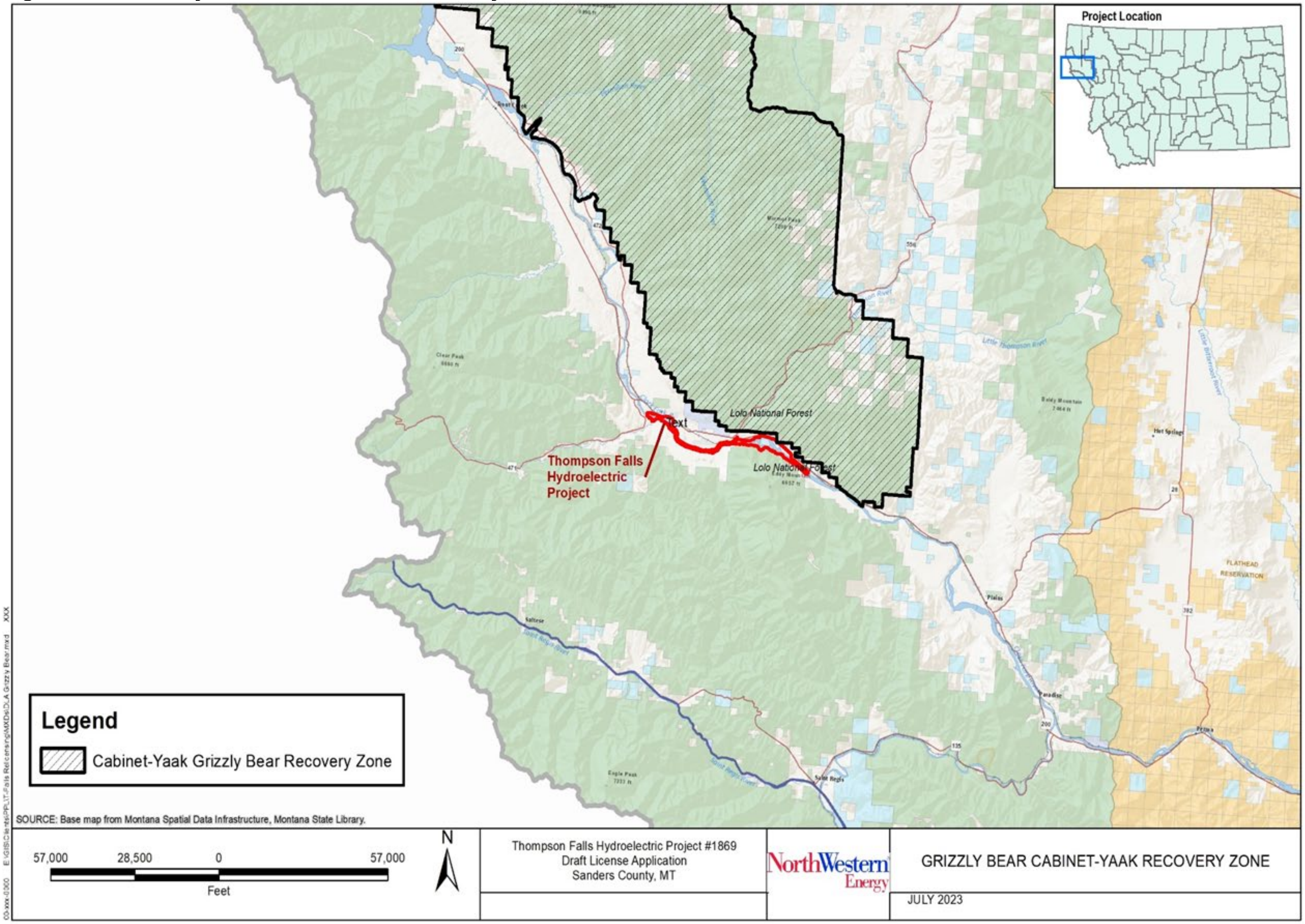
The Thompson River contains designated critical habitat for migratory (adfluvial/fluvial) and resident Bull Trout. Outmigrating juvenile Bull Trout from the Thompson River may pass downstream of Thompson Falls Dam and residualize in Noxon Rapids Reservoir. As adults, they can migrate upstream to their natal stream using the upstream fish passage facility at Thompson Falls Dam. Alternatively, they may continue their downstream movement to Cabinet Gorge Reservoir, or further to Lake Pend Oreille. There is no upstream fish passage facility or program at Noxon Rapids Dam, so Bull Trout that residualize in Cabinet Gorge Reservoir cannot return to tributaries upstream.

10.1.1.2 Grizzly Bear Habitat and Distribution

The grizzly bear was federally listed as a threatened species in 1975 in the conterminous 48 states, and the current distribution is limited to five areas in the western U.S. The Cabinet-Yaak Grizzly Bear recovery zone is about 6,800 km^2 of northwestern Montana and northern Idaho (**Figure 10-2**). The Project is nearby, but not within, the Cabinet-Yaak Grizzly Bear recovery zone. (Figure 10-2).

FWS estimated the 2016 grizzly population in the Cabinet-Yaak recovery zone to be approximately 55 individuals using mark-recapture techniques to estimate the population (Kasworm et al. 2017). Using all methods of detection (capture, rub tree DNA, corral DNA, photos), FWS identified a minimum of 35 individual grizzlies in the Cabinet-Yaak recovery zone in 2016. Thirteen of those bears were detected in the Cabinet Mountains (Kasworm et al. 2017). In 2020, the grizzly population in the Cabinet-Yak recovery zone was estimated to be 60 individuals (Kasworm et al. 2021). The recovery target population is 100 bears. The majority of sightings and habitat use appear to be more closed timber, timbered shrubfield areas in the Cabinet Mountains and less populated areas (Kasworm et al. 2007; 2017). Food habits for grizzlies in the Cabinet-Yaak recovery zone varies seasonally and includes, but is not limited to plants (grasses, shrubs, forbs), meat (deer, elk, moose), berries (huckleberry, whortleberry, serviceberry), and insects (Kasworm et al. 2017). Over the years, there have been confirmed grizzly bear sightings in the Thompson River drainage in 2014 (Kasworm et al. 2021), 2016 (B. Sterling, FWP, personal communication, April 5, 2018) and 2018 (Kasworm et al. 2021) and one in the Weeksville Creek drainage in 2018 (B. Sterling, FWP, personal communication, April 5, 2018). However, within the Project area no sightings have been documented in recent years.

Figure 10-2. Grizzly Bear Cabinet-Yaak Recovery Zone.



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10.1.1.3 Canada Lynx Habitat and Distribution

The contiguous U.S. distinct population segment of Canada lynx includes breeding populations in northwestern Montana/northern Idaho, north-central Washington, northeastern Minnesota, and Maine (FWS 2023b). The U.S. distinct population segment Canada lynx was federally listed as threatened species in 2000. Following the completion of the 5-year status review (FWS 2017), FWS announced on January 11, 2018 that Canada lynx may no longer warrant protection under the ESA and should be considered for delisting due to recovery (FWS 2018a).

Canada lynx are non-migratory, but movements of 27 to 137 miles have been recorded by lynx in northwestern Montana and northern Idaho (FWS 2017). Lynx occur in mesic coniferous forests that experience cold, snowy winters and provide a prey base of snowshoe hare (Ruediger et. al. 2000). Most of the lynx occurrences in the Northern Rocky Mountains are in the 4,920- to 6,560-foot elevation range (FWS 2000a). The Project boundary does not contain elevations within that range.

Critical habitat was initially designated in 2006 with revisions in 2009 and 2014, generally covering the boreal forests of northwestern Montana and the area around the Greater Yellowstone Ecosystem (79 FR 35303). Designated Canada lynx critical habitat is located in Lincoln, Missoula, Flathead, Glacier, and Lewis and Clark counties, approximately 32 miles northeast of the Project (FWS 2014). No critical habitat was designated in Sanders County, where the Project is located.

Habitat types within the FERC Project boundary do not contain or represent suitable habitat for Canada lynx. Canada lynx are not anticipated to be present within the FERC Project boundary or proximity of the Project (B. Sterling, FWP, personal communication, April 5, 2018). Therefore, the Project will have no effect on Canada lynx.

10.1.1.4 Whitebark Pine Habitat and Distribution

Whitebark pine was federally listed as threatened on January 17, 2023 (FWS 2023). Whitebark pine is located in the upper and subalpine ecosystems (5,900-9,300 feet). The Project is located below 3,000 feet and does not include upper or subalpine habitat. There is no suitable habitat for whitebark pine within the Project or immediate area and the species is not present. Therefore, the Project will have no effect on whitebark pine.

10.1.1.5 Spalding's Campion (Spalding's Catchfly) Habitat and Distribution

The Spalding's campion (also known as the Spalding's catchfly) was federally listed as threatened in 2001 (FWS 2001). The preferred habitat for this species is mesic (not extremely wet or dry) Pacific bunchgrass prairie dominated by native perennial grasses such as Idaho and rough fescue at elevations between 1,500 to 5,100 feet (USDA 2011). The plant species is documented in Sanders County near the borders with Lake and Flathead counties. Based on MNHP's predicted suitable habitat model, the Project and general Lower Clark Fork River drainage is unlikely to provide suitable habitat for Spalding's campion (Burkholder 2017). Therefore, the Project will have no effect on Spalding's campion.

10.1.1.6 Yellow-billed Cuckoo Habitat and Distribution

The western distinct population segment of the yellow-billed cuckoo was federally listed as threatened west of the Continental Divide in Montana in 2014 (FWS 2014a). In the west, yellow-billed cuckoo nest in tall cottonwood and willow riparian woodlands (MNHP and FWP 2019a). In Montana, the yellow-billed cuckoo is only known to occur in June and July (MNHP and FWP 2019a) and sightings are rare. The most recent sighting of the yellow-billed cuckoo bird in Montana was in the LNF near Missoula in 2012 (MNHP 2019). FWS proposed designated critical habitat for the yellow-billed cuckoo in 2014, but none is proposed within Montana (FWS 2014a; Federal Register 2021). A review of available habitat in the Prospect Creek drainage, near the Project area, determined habitat of low suitability occurs along the lower end of Prospect Creek. However, based on a site visit conducted in June of 2018, there were no patches of dense riparian forest large enough to provide adequate breeding habitat (Nyquist 2018). There are no known nesting areas or sightings of the yellow-billed cuckoo near or within the FERC Project boundary and there is no known breeding identified in Montana (Federal Register 2021). Therefore, the Project will have no effect on yellow-billed cuckoo.

10.1.2 Proposed and Candidate Species

A request was made on January 23, 2023 to FWS through the ECOS – IPaC system for a species list that identifies P&C species. The FWS P&C species list identified through ECOS-IPaC is provided in **Table 10-4**. A list of known biological opinions, status reports, or recovery plan(s) pertaining to the P&C species list is summarized in **Table 10-5**.

Each P&C species is described briefly with focus on their potential presence, and the extent and location of any federally designated critical habitat, or other suitable habitat within the Project area.

Table 10-4 List of P&C species identified by FWS ECOS-IPaC.

Species	Fish, Plant, or Mammal	Scientific Name	FWS Status (Year)	Habitat	Occurrence Potential
Wolverine	Mammal	*Gulo gulo luscus*	Proposed Threatened (2000)	Large tracts of essentially roadless wilderness in high elevation alpine and subalpine terrain.	Potential to occur as transients (no denning sites).
Monarch butterfly	Insect	*Danaus plexippus*	Candidate (2020)	Milkweed (primarily *Asclepias* spp.) for monarch butterflies (*Rhopalcera*) to lay their eggs and larval feeding. Diverse blooming nectar plants. Optimal temperatures 80.6-84.2°F	Unlikely

Source: FWS ECOS-IPaC 2023g, 2023h

Table 10-5. List of the biological opinion, species status report(s), designation of critical habitat, or recovery plan(s) pertaining to each P&C species in Table 10-4.

Species	Document/Report Title	Type	Date
American wolverine	ECOS https://ecos.fws.gov/ecp/species/5123	Status Updates	Accessed January 2023
	Federal Register. 2022b. Endangered and Threatened Wildlife and Plants; Request for New Information for the North American Wolverine Species Status Assessment. Vol 87, No. 225, 71557-71559. https://www.govinfo.gov/content/pkg/FR-2022-11-23/pdf/2022-25433.pdf#page=1	Status Update	2022
	FWS. 2018. Species status assessment report for the North American wolverine (*Gulo gulo luscus*). Version 1.2. March 2018. FWS, Mountain-Prairie Region, Lakewood, CO. https://ecos.fws.gov/ServCat/DownloadFile/187253	Status Update	2018
Monarch Butterfly	ECOS https://ecos.fws.gov/ecp/species/9743	Status Updates	Accessed January 2023
	Federal Register. 2022c. 87 FR 26152 26178. 2022. Endangered and Threatened Wildlife and Plants; Review of Species That Are Candidates for Listing as Endangered or Threatened; Annual Notification of Findings on Resubmitted Petitions; Annual Description of Progress on Listing Actions. Vol. 87 , No. 85, 26152-26178. Available: https://www.govinfo.gov/content/pkg/FR-2022-05-03/pdf/2022-09376.pdf#page=1	Status Update	2022

Species	Document/Report Title	Type	Date
	U.S. Fish and Wildlife Service Species Assessment and Listing Priority Assignment Form. 2021. Monarch butterly. Danaus plexippus. Available: https://ecos.fws.gov/docs/tess/publication/3726.pdf	Status Update	2021
	FWS. 2020a. Monarch (Danaus plexippus) Species Status Assessment Report. V2.1 96 pp + appendices. Available https://ecos.fws.gov/ServCat/DownloadFile/191345	Status Update	2020
	FWS. 2020b. Biological Opinion and Conference Opinion on the U.S. Fish and Wildlife Service's approval of a Candidate Conservation Agreement with Assurances and Candidate Conservation Agreement and its issuance of an associated Endangered Species Act Section 10(a)(1)(A) Permit (TAILS No. 03E00000-2020-F-0001). Available: https://ecos.fws.gov/tails/pub/document/17795801	Biological Opinion	2020

10.1.2.1 Wolverine Habitat and Distribution

FWS proposed the North American wolverine to be listed as a threatened species in 2000 (FWS 2000b). Currently, wolverines are managed at the state level (FWS 2011; FWS ECOS 2023).

Wolverine populations in Montana are considered healthy and a stronghold due to the available wilderness areas and roadless habitat in contrast to other states. It is estimated that populations are about 250 to 300 wolverines in the lower 48 states with the majority believed to inhabit Montana (FWS 2013). Until 2012, FWP regulated wolverine as a furbearer with a seasonal harvest season. The wolverine trapping season has been discontinued for an undetermined period of time.

Wolverines depend on large wilderness areas of alpine tundra and boreal mountain forests, relying primarily on coniferous forests in the western mountains. Wolverines in northwestern Montana have been observed moving to higher, cooler elevations during the summer and selecting areas with steep terrain with tree cover, meadows, boulder or talus fields. During the winter months, wolverines may move to lower elevations, but avoid low-elevation winter ranges occupied by predators or human activity (FWS 2018b). Individual dispersal movements can extend beyond 185 miles with seasonal habitat use. (MNHP and FWP 2019b). Denning habitat includes caves, rock crevices, crevices/opening under fallen trees, thickets, and or similar type of locations.

Wolverines have been observed in the Thompson River drainage, and Weeksville Creek drainage, north of the Project area (B. Sterling, FWP, personal communication, April 5, 2018), but not within the Project area.

No suitable wolverine habitat is present in the Project area. If wolverines are present at all, they are, at most, rare and transient visitors to the Project area. Therefore, continued operation of the Project will have no impact on wolverine.

10.1.2.2 Monarch Butterfly Habitat and Distribution

The monarch butterfly is a candidate species (FWS ECOS 2023) and is globally distributed throughout 90 countries, islands, and island groups representing 31 different populations (FWS 2020a). These butterflies are known for long-distance summer migration to the North American populations. There are two populations in North America, east and west of the Rocky Mountains (FWS 2020a). Western North America includes Canada, U.S. and Mexico and overwintering areas are primarily in groves of gum eucalyptus (*Eucalyptus globulus*), Monterey pine (*Pinus radiata*), and Monterey cypress (*Hesperocyparis macrocarpa*) along the coast of California and Baja California (FWS 2020a).

These butterflies migrate north between spring and fall and require blooming nectar plants for food during migration and breeding. The monarch butterfly requires milkweed plant species as a host plant for laying eggs and food source for the larvae. Monarch butterflies are also temperature sensitive with optimal temperature between 80.6° to 84.2°F and sublethal effects starting between 86° to 96.8°F (FWS 2020a). Temperatures exceeding 91.4°F are unsuitable for monarchs. Some of the key factors adversely impacting monarch butterflies in western North American include extreme widespread drought, disease, severe storm events, wildlife, widespread milkweed loss, and widespread insecticide spray events (FWS 2020a).

Historically, monarch butterflies have been documented in Sanders County (Kohler 1980). More recently, MNHP database for SOC indicate monarch butterfly occurrence has been verified only in Big Horn, Carbon, Carter, Custer, Missoula, Musselshell, Ravalli, and Rosebud counties in Montana (MNHP 2023). Distribution of monarch butterflies and habitat type may occur in a variety of urban and rural habitat types that provide milkweed plants and other flowering forbs (FWS 2020). Showy milkweed (*Asclepias speciosa*) is the primary milkweed species present west of the Rocky Mountains in Montana (MNHP and FWP 2023b). Showy milkweed is typically found in grasslands, meadows, fields, roadsides, marshes in plains and valleys (MNHP and FWP 2023b). MNHP records show observations of showy milkweed in the last 5 to 10 years in Sanders County, but density was low and the location east of the Project area (MNHP and FWP 2023b).

Based on available records, there are no known recent observations or sightings of monarch butterflies or host plant or breeding sites near or within the FERC Project boundary. Therefore, continued operation of the Project will have no effect on monarch butterfly.

10.2 Environmental Measures

10.2.1 Existing Environmental Measures

After Bull Trout were federally listed as a threatened species under the ESA in 1998, the Licensee prepared a 2003 Biological Evaluation that concluded the Project was likely adversely affecting Bull Trout. This determination led to a process to determine conservation measures to reduce "take." An interagency TAC was established and includes the Licensee, FWS, FWP, Avista, Montana DEQ, USFS, and the CSKT.

From 2003 to 2008, the Licensee worked cooperatively with the TAC members to clarify regulatory issues and conduct significant scientific and engineering evaluations and in-situ testing. The objectives of the evaluations and testing were to determine factors affecting Bull Trout and other fish passage behavior, full height upstream fish passage design and construction, and subsequent upstream fish passage facility and Project operations.

On November 4, 2008, the FWS filed the BO with FERC, concluding that the Project adversely affects Bull Trout and that the Licensee's proposed conservation measures would reduce, but not eliminate, adverse impacts of the Project. The BO accepted the Licensee's proposal to construct a full-height pool and weir fish passage facility. On February 12, 2009, FERC approved construction and operation of the upstream fish passage facility. The Thompson Falls upstream fish passage facility was completed in 2010 and placed in operation in 2011. Priorities for upstream fish passage at Thompson Falls defined by the TAC are:

- Pass Bull Trout

- Pass native species
- Pass non-native salmonid sport fish, but not to the detriment to the first two objectives (e.g., if Brown Trout expansion extends into Bull Trout systems)
- Overarching goal is volitional passage

However, volitional passage through the upstream fish passage facility is not permitted by FWP and FWS due to the presence of Walleye downstream of Thompson Falls Dam and the absence of an established Walleye population upstream.

In 2008, a MOU (PPL Montana 2008) was established among the Licensee, the FWS, FWP, and CSKT (voting TAC members) which established the terms and conditions for collaborating on the implementation of Bull Trout conservation measures at the Project. The MOU also specifies how funding by the Licensee is allocated by the TAC annually for the purpose of downstream Bull Trout passage mitigation measures. The MOU, which was updated every 5 years, originally signed by each party in 2008 and renewed in 2013 and 2020, will expire on December 31, 2025.

Protection and mitigation measures implemented or funded by the Licensee in recent years related to the Bull Trout and its critical habitat are listed in **Table 10-6**. NorthWestern funded $1.6 million of TAC approved off-site mitigation and restoration between 2009 and 2022 (Table 10-6).

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Table 10-6: Summary of Projects TAC approved for funding from the Licensee through the MOU that focuses on downstream Bull Trout passage mitigation measures, 2009-2023.

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
2009-2010	**Oregon Gulch Mine Restoration** – A tributary to Cedar Creek near Superior, MT flows into the Middle Clark Fork River. Fluvial Bull Trout documented to spawn in lower Oregon Gulch. Project objective is to restore about 2,000 feet of stream channel and 10 acres of adjacent floodplain and wetlands.	Trout Unlimited, FWP	$15,000 in 2009 $51,500 in 2010
2009 2010 2011 2012 2014 2016 2017 2018	**Bull Trout DNA Sampling, Clark Fork River** – Funds available for processing genetic samples taken of Bull Trout to improve genetic assignment database in the Lower Clark Fork River drainage.	Licensee	$5,000 in 2009 $5,000 in 2010 $5,000 in 2011 $5,000 in 2012 $10,000 in 2014 $10,000 in 2016 $16,500 in 2017 $10,000 in 2018
2009-2010	**Fish Creek Aquatic Passage Enhancement** – Fish Creek is a tributary to the Middle Clark Fork River and supports a fluvial Bull Trout population. Project objective is to restore unimpeded aquatic passage at 3 sites within the Fish Creek drainage.	Trout Unlimited, FWP, Nature Conservancy	$24,000 in 2009 $37,770 in 2010
2010	**Big Rock Creek Road Rehabilitation** – A tributary to the Thompson River which flows into the Lower Clark Fork River about 6 miles upstream of the Project and supports a resident population of Westslope Cutthroat Trout and Bull Trout. Project focused on providing stability and habitat to a meander bend that washed out a portion of the road, and to scarify and heavily revegetate the remnant road. Stabilizing the area will reduce sediment inputs and provide cover for fish and improve riparian area and channel form and function.	FWP	$6,000
2012	**Large Woody Debris (LWD) Placement in South and West Fork Fish Creek** – Project will place 21 structures of LWD in 5 reaches. DNRC donated trees and assistance.	Trout Unlimited	$20,000
2012	**Thompson River Drainage Evaluation Plan** – Produce a Bull Trout Recovery and Restoration Plan for the Thompson River drainage. Evaluate water temperatures in the drainage during the summer.	Licensee	$39,475
2012 2014	**Main Stem Fish Creek Land Acquisition** – Hulme Property – Funding used for the purchase of 2 private inholdings (80- and 148-acre parcels) along the lower main stem of Fish Creek to conserve vital Bull Trout habitat, provides a key migratory corridor and sub-adult rearing area for fluvial Bull Trout. FWP will own and include property in the Fish Creek Wildlife Management Area. Properties contain about 40 acres of riparian land and over 4,000 feet of Fish Creek channel.	Five Valleys Lands Trust and FWP	$115,300 in 2012 $120,000 in 2014

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
2013 2014 2015 2016	**Juvenile Bull Trout Outmigration of the Thompson River and into and through Thompson Falls Reservoir** (Montana State University Study) – Characterize movement of juvenile Bull Trout in the Thompson River and through Thompson Falls. The objective was to calculate travel time, describe travel rout, describe habitat use, and estimate survival. Glaid (2017) prepared a Master's Thesis summarizing results. A technical memo summarizing information is also available https://www.northwesternenergy.com/docs/default-source/default-document-library/clean-energy/environmental-projects/thompson-falls/thompson_falls_master_thesis_subadult_bull_trout_out-migration_072017.pdf	Montana State University, FWP	$37,932 in 2013 $50,405 in 2014 $50,966 in 2015 $24,669 in 2016
2013	**Update Jocko River Drainage Bull Trout Genetics** – Update the Jocko River drainage baseline for the Bull Trout genetics assignment database. Jocko River is a 4th order tributary to the Flathead River. Portions of the drainage are designated as critical habitat for Bull Trout, and collectively these areas comprise the Jocko River Core Area.	CSKT	$5,280
2014	**Thompson River Fish Surveys** – Survey streams in Thompson River for Bull Trout presence; fish surveys in Murr Creek, Mudd Creek, Alder Creek.	FWP	$29,933
2014	**Strategic Prioritization of Native Trout Restoration Actions in the Lower Clark Fork Using Spatially Explicit Decision Support Modeling** – Providing support for development of model.	FWS	$6,704
2014	**Bull Trout Sex Identification Marker** – Support funding for rapid response analysis. Abernathy Fish Technology Center has acquired the Bull Trout sex identification marker and is planning on incorporating this marker into their normal rapid response Bull Trout analysis.	Avista	$2,000
2014	**Prospect Creek Remote PIT Tag Reader** (Half Duplex [HDX] tags) – A tributary to the Lower Clark Fork River, located about 0.5 mile downstream of the Main Channel Dam at Thompson Falls. The goal is to install HDX PIT tag antenna arrays in the Prospect Creek drainage to monitor movements of PIT tagged adult and juvenile Bull Trout that migrate through the drainage. Avista installed a temporary HDX PIT Tag array in lower Prospect Creek. It was operational through mid-May (2014) when the upper and lower antenna broke. The array was reinstalled in August 27 and operational for the remainder of 2014 season.	Avista	$2,507
2015	**Update Little Joe Creek Bull Trout Genetics** – Update baseline data for Bull Trout in Little Joe Creek to accomplish routine updates to the lower Clark Fork genetic assignment database. The database is used to ensure correct assignment and transport of lower Clark Fork adult Bull Trout to their geographic basin of origin.	FWP	$3,000

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
2015	**West Fork Fish Creek Land Acquisition** – Rehbein Property – This parcel contains approximately 60 acres of riparian area and more than 10,000 feet of perennial stream channel (Bull Trout critical habitat), including West Fork Fish Creek, lower Bear Creek and lower Trail Creek (Middle Clark Fork River drainage). The West Fork Fish represents the migratory corridor for the 2 major Bull Trout spawning and rearing areas in Fish Creek (upper North and West Forks) and the 2 smaller tributaries that support viable Westslope Cutthroat Trout populations. The project would permanently protect a significant reach of the West Fork of Fish Creek and the lower portions of 2 tributaries from habitat degradation and facilitate enhancement activities along the stream corridor important to Bull Trout and Westslope Cutthroat Trout.	FWP	$40,000
2016	**Cedar Creek Road Relocation and LWD Enhancement Phase 2** – Cedar Creek flows northeast from the Idaho/Montana state line for approximately 20 miles before flowing into the Middle Clark Fork River. Cedar Creek is listed as a Priority Bull Trout Watershed by the USFS and was designated as core Bull Trout habitat by the Montana Bull Trout Scientific Group. Phase II includes rerouting a 0.18 section of road away from Cedar Creek and installing LWD in that section of stream to connect with work completed in 2015. This reroute section would be 1 of the largest within the Project area and further reduce sediment and provide for properly functioning channel and floodplain processes. Approximately 5-10 LWD structures would be augmented within this area to provide habitat, promote stream meandering and substrate sorting.	Trout Unlimited USFS	$30,000
2016	**Beartrap Fork Culvert Removal** (implemented in 2018) – Beartrap Fork is a large tributary to Radio Creek which flows into Fishtrap Creek in the Thompson River drainage. West Fork Fishtrap is an important for Bull Trout and Westslope Cutthroat providing spawning and rearing habitat. The cool water inputs from Beartrap Creek illustrate the importance to Fishtrap mainstem and the potential for Beartrap to at least provide thermal refuge to Bull Trout. The culvert on Beartrap Fork was identified as a partial fish barrier at higher flows, and possibly at low summer/fall flows. The project will remove the culvert and reconstruct the stream channel providing 5 miles of upstream access.	USFS	$11,000
2016	**Rattlesnake Creek Fish Screen Phase 1** – Rattlesnake Creek flows for 26 miles, beginning in the Rattlesnake Wilderness north of Missoula, Montana and ending at its confluence with the Middle Clark Fork River. Rattlesnake Creek is 1 of the major sources of trout recruitment for the middle Clark Fork River, a 100-mile reach of river located between Missoula and the Flathead River confluence. It supports a significant population of migratory Bull Trout and is 1 of only 6 major tributaries in the area known to support fluvial spawning. The creek also supports populations of native Westslope Cutthroat Trout, Mountain Whitefish and Sculpin, as well as Rainbow Trout, Brown Trout, and Brook Trout.	Trout Unlimited FWP	$13,125

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
	The project will include survey and design on the 4 irrigation diversions that do not currently have functional fish screens.		
2016, 2017, 2018, 2019	**Thompson River Coordinator** – Funding for the Thompson River watershed coordinator, whom works for the Lower Clark Fork Watershed Group a 501(c)(3) non-profit that works to facilitate collaborative restoration in the tributaries of the Lower Clark Fork River for the benefit of water quality, native fish and wildlife. The coordinator will work with partners in the Thompson River area to identify possible habitat improvement projects and opportunities through which NorthWestern could continue its efforts to recover native fish populations. Additionally, the Coordinator would work to secure grant funding sources and work with additional partners/landowners in the drainages in order to assist with large-scale projects.	FWP	$16,500 in 2016 $10,000 in 2017 $16,500 in 2018 $9,900 in 2019
2018	**Lower Fish Creek Property Acquisition** – Koch In-holding - Among FWP's purposes for purchasing the land (78 acres) is the objective to enhance fish and wildlife species and prevent this habitat from potentially being subdivided for development. More specifically, to "…protect some of the last and best remaining habitat for Bull Trout and Westslope Cutthroat Trout in the Clark Fork region by securing 1.2 miles of stream frontage and riparian habitat along Fish Creek."	FWP	$60,000
2018, 2019	**Crow Creek Design Phase 1 and Phase 2** – Crow Creek is a tributary to Prospect Creek which enters into the Lower Clark Fork River in the upper Noxon Reservoir (downstream of Thompson Falls Dam). Project is focused on design and implementation of channel restoration to improve channel pattern and profile, sinuosity, habitat diversity and complexity for native species such as Bull Trout, Westslope Cutthroat, and Cedar Sculpin.	FWP	$30,000 in 2018 $51,500 in 2019
2018, 2019	**Rattlesnake Dam Removal, Phase 1 and Rattlesnake Dam Removal** – Since that time the Dam has served no water storage or delivery purpose (and is no longer even viable as a back-up municipal system) but has continued to impact fish migrations and river processes (e.g., floodplain connections, sediment transport). The project will restore habitat for native fish (e.g., Bull Trout, Westslope Cutthroat Trout) and terrestrial wildlife, improving water quality in Rattlesnake Creek, improving riparian function and floodplain connectivity. Phase 1 – design. Phase 2 – project permitting, final design, and bid development.	Trout Unlimited	$20,000 in 2018 $50,000 in 2019
2018	**Prospect Remote PIT Tag Array System** – Installation of a remote PIT tag array near the mouth of Prospect to monitor PIT-tagged fish in the system. Array system will provide directionality and function year-round.	Avista, Licensee	$30,000

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
2018-2022	**Misc. Funding** – Funds available for processing genetic samples taken of Bull Trout to improve genetic assignment database in the Lower Clark Fork River drainage. Allows for immediate funding of equipment, stream restoration assessments or other conditions that may require urgent attention.	Licensee	$10,000 in 2018 $10,000 in 2019 $10,000 in 2020 $15,000 in 2021 $10,000 in 2022
2019	**West Fork Fishtrap Creek Road Realignment** – Fishtrap Creek and tributaries provide important Bull Trout habitat for spawning and rearing. The project has the following objectives: 1) Build new connector road between existing roads #7609 and #516 perpendicular to Fishtrap Creek. 2) Decommission approximately 600 feet of existing road #7609 parallel to mainstem Fishtrap Creek. 3) Reconstruct floodplain and stabilize newly constructed streambank and floodplain with large woody debris placement and woody vegetation.	USFS, Lower Clark Fork Watershed Group	$30,627
2020	**Fishtrap Creek Habitat Enhancement** – Through the implementation of the Fishtrap Creek Habitat Enhancement project in 2020, the amount of in-stream large wood was doubled throughout a 4,000-foot-long wood-limited reach upstream of 1 of the primary Bull Trout spawning reaches in the Thompson River drainage. Relatively low densities of Westslope Cutthroat Trout and Bull Trout have been documented in this project reach. Through habitat enhancement, increasing in-stream habitat complexity and diversity, this project aims to increase the carrying capacity of this reach for native trout. 30 log structures were built, consisting of over 100 pieces of large wood.	Trout Unlimited, Lower Clark Fork Watershed Group	$16,000
2020	**Thompson River Property Acquisition** – FWP acquired 40-acre property in September 2020 that is located on either side of the Thompson River. The property protects land from development near the confluence of the Thompson River. The property will become a designated parking area (Confluentus Corner) with walking access only to the river. FWP endeavors to maintain the rugged and undeveloped character of this area to limit traffic in the area and conserve the natural setting for aquatic and terrestrial resources.	FWP	$100,000
2021	**Big Rock Creek Barrier Design and Public Scoping** – Big Rock Creek is 1 of 3 drainages and the upper most tributary occupied by resident Bull Trout in the Thompson River watershed. The stream enters the Thompson River 32.6 river miles (RM) upstream of its confluence with the Clark Fork River, where Brown Trout represent over 95% of the trout community in this section of the mainstem. Sampling in the lower portions of Big Rock Creek at RM 1.3 in 2010 and 2013 (and in 2019 near RM 0.5) portray a fish community comprised of similar numbers of Westslope Cutthroat Trout and Brown Trout, with 1 Bull Trout encountered in 2010. Further upstream in the drainage the fish community is	FWP	$34,000

Year	Project Name - Project Description	Project Submitted By	Funding Approved by TAC
	dominated by Bull Trout and Westslope Cutthroat Trout, with an occasional Brown Trout occurring. Project funds feasibility assessment of developing a barrier, hydraulic and geologic investigations, design costs, fish survey and genetics, and Environmental Assessment.		
2022 2023	**Phase 1 – Thompson River Conservation Easement** **Phase 2 – Thompson River Conservation Easement** This project seeks to acquire a perpetual conservation easement on 48,032 acres of currently unprotected private timber company land owned by Green Diamond Resource Company in the Thompson River watershed in Sanders and Flathead counties. The proposed project would protect approximately 12,000 acres in Fishtrap Creek and Big Rock Creek drainages and 2 sections in the Deerhorn Creek drainage. The funds requested would serve as a portion of the non-federal match needed for the proposed Upper Thompson Connectivity project. The preliminary cost of this conservation easement is $16 million.	Trust for Public Land and FWP	$170,000 $100,000
2022	**Juvenile Bull Trout Downstream Study** – The intent of this project is to evaluate the feasibility of collecting and transporting juvenile Bull Trout from the Thompson River to Lake Pend Oreille. This project will determine the most efficient and effective capture methods, capture locations, and seasonal capture timing of juvenile Bull Trout in Fishtrap Creek and West Fork Thompson River. A long-term goal will be to evaluate adult returns from this work to help determine if this is a viable conservation action to increase populations in the drainage.	FWP, FWS, NorthWestern	$15,000
2023	**Thompson River Road Consolidation Coordination** – Funds to support staff to initiate a review of the issues and stakeholder concerns with consolidating the dual road system in the lower Thompson River drainage.	Trout Unlimited, Lower Clark Fork Watershed Group	$5,000

10.2.2 Proposed Environmental Measures

NorthWestern is proposing to implement the PM&E measures described below:

- Continue to maintain a minimum flow of 6,000 cfs or inflows, whichever is less, in the Clark Fork River downstream of the Project. If inflow is at or less than 6,000 cfs, then NorthWestern may go below the minimum in order to maintain reservoir elevation.
- Monitor TDG levels during high flow periods in the Clark Fork River and update the TDG Control Plan as necessary.
- Operate and maintain the upstream fish passage facility from mid-March through mid-October.
- Evaluate and assess opportunities to enhance the effectiveness of the existing upstream fish passage facility.
- NorthWestern is in discussions with other Relicensing Participants concerning other potential environmental PM&E measures.
- Continue to engage with TAC partners on PM&E.

10.3 Environmental Effects

The analysis of potential effects is limited to operations, as no new construction or development is proposed under the new license.

10.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

10.3.1.1 Bull Trout

Under the no action alternative, operation of the upstream fish passage facility would continue as it does presently. Bull Trout would continue to be captured during the seasonal March-October timeframe and capture efficiencies would remain the same.

Because the no action alternative includes occasional use of the top 4 feet of the reservoir for flexible generation options, this operational regime would have impacts to the upstream fish passage facility. As reported in the ISR, Operations Study when the reservoir elevation was 2.3 feet down (2,394.2 feet) the fish passage facility began to have operating issues. The HVJ slowed down as there was reduced water being fed to this feature. The fish sampling loop was inoperable due to the lack of water to fill the fish lift and anesthetizing tank. Pumps were shut off as they were drained, and the entire fish passage facility lacked sufficient flow and water to effectively capture fish. These impacts would reduce the amount of time under the no action alternative in which the upstream fish passage facility would be operable during the season and could decrease total numbers of Bull Trout passed upstream at the facility.

For Bull Trout there would be little to no impacts from reservoir elevation changes. The Initial and Updated Study Report Operations Study showed that no stranding of Bull Trout or other salmonids occurred in the 2 years of operations studies. As indicated in the Operations Study ISR, access for Bull Trout into and out of Cherry Creek and Thompson River remains at all reservoir elevations. There are no flow or depth barriers to fish movement from the no action alternative.

Under the no action alternative downstream fish passage survival would remain unchanged. Previous literature review efforts in 2007 (*Literature Review of Downstream Fish Passage Issues at Thompson Falls Hydroelectric Project* [GEI 2007]) and the 2022 Updated Literature Review Study Report indicate relatively high survival estimates at the Project with 94 percent through the new powerhouse (Kaplan turbine), 85 percent through the original powerhouse (Francis turbines), and 98 percent through the spillway. Combined survival estimates for trout measuring greater than 100 mm was estimated to likely be 91 to 94 percent. PIT tagging and floy tagging efforts have also documented downstream survival of adults through or over the facility (NorthWestern 2019).

In addition, downstream fish passage mitigation dollars ($100,000 annually) to improve Bull Trout survival would continue to be allocated focused on tributaries. Actions such as habitat restoration, streamside property acquisitions or easements would be sought after by NorthWestern Energy and agency and nonprofit partners. Although these actions are focused for Bull Trout improvements, other species such as Westslope Cutthroat Trout, which coexist in these same tributaries would also see benefits from these activities.

The no action alternative would have no effect on TDG levels or associated GBT in Bull Trout located downstream of the facility. The current TDG control plan and gate sequencing would remain in operation. Previous investigations have found little GBT symptoms at any discharges in adult fish. Furthermore, salmonids captured at the upstream fish passage facility have not exhibited signs or symptoms of GBT during the 13 years of operation.

The Project would continue to release a minimum flow of 6,000 cfs, which is sufficient for Bull Trout passage into the Project area. There are no known impacts to Bull Trout identified as related to minimum flows. The bypass channel provides a wetted channel sufficient for upstream fish passage. Bull Trout would continue to have access to the fish passage facility. The Prospect Creek confluence would remain connected to the mainstem Clark Fork River and accessible to Bull Trout.

10.3.1.2 Grizzly Bear

Continued operation of the Project is likely to have no impact on grizzly bears because grizzly bears presence is, at most, rare and transient. The valley bottom and developed lands within the Project boundary cannot provide the security that grizzlies require due to the relatively small and narrow extent of the Project boundary. The location of these lands adjacent to the urban development of the City makes use by grizzly bears even less likely. Grizzly bears would tend to avoid these areas, and neither grizzley bears, nor their sign, have been reported in or around the City or Project.

10.3.2 Applicant's Proposed Alternative

10.3.2.1 Bull Trout

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser of 6,000 cfs or inflow will be maintained downstream during normal operations. NorthWestern does not propose additional construction or rehabilitation of the Project.

The applicant's proposed alternative includes a modification to Project operations that allow for reservoir fluctuations of 2.5 feet. Given that the current license allows fluctuations up to 4 feet the impacts to T&E species are no different than those described above in the no action alternative, including impacts associated with upstream and downstream fish passage, and TDG and fish stranding. Additionally, NorthWestern proposes to evaluate and assess opportunities to enhance the effectiveness of the existing upstream fish passage facility.

The applicant's proposed alternative includes a modification of the Project boundary which would have no impact on Bull Trout.

10.3.2.2 Grizzly Bear

As with the no action alternative, the Proposed Action Alternative is likely to have no impact on grizzly bears because grizzly bears presence is, at most, rare and transient. The valley bottom and developed lands within the Project boundary cannot provide the security that grizzlies require due to the relatively small and narrow extent of the Project boundary. The location of these lands adjacent to the urban development of the City makes use by grizzly bears even less likely. Grizzly bears would tend to avoid these areas, and neither grizzly bears, nor their sign, have been reported in or around the City or Project.

10.4 Unavoidable Adverse Impacts

Based on the results of the Fish Behavior Study (NorthWestern 2023) upstream fish passage for Bull Trout is limited to those fish that locate and ascend the fish passage facility. Similarly, continued operations will result in minimal fish passage mortality from passage through turbines and over the dam during spill. Stranding of Bull Trout is not anticipated to occur under either alternative.

These unavoidable adverse impacts are mitigated through implementation of PM&E's and any future reasonable and prudent measures, and terms and conditions of the BO.

11. Recreation

11.1 Affected Environment

The Project is located in western Montana, in a region with abundant outdoor recreation opportunities, including Glacier and Yellowstone National Parks. LNF covers over 2 million acres of western Montana, with about 103.78 acres of federal lands within the current FERC Project boundary. The KNF borders the LNF and is located downstream of the Project. The KNF covers about 2.2 million acres of the northwestern section of Montana bordering Canada. There are no KNF lands in the FERC Project boundary. Other nationally important recreation areas in the region, within a 200-mile-radius, include the Cabinet Wilderness, Great Bear Wilderness, Bob Marshall Wilderness, Mission Mountain Wilderness, and the Scapegoat Wilderness. The National Bison Range is approximately 60 miles east of Thompson Falls.

This Section provides an analysis of developed and dispersed recreation resources open to the public and opportunities within the Project Area, including areas within 0.5 mile of the FERC Project boundary. These sites support water-based activities such as fishing, motor boating, use of personal motorized watercraft, non-motorized canoes, kayaks, and similar vessels, along with floating and swimming. These sites also offer terrestrial-based activities including day hiking, running, and picnicking, as well as passive activities such as photography, wildlife viewing, and sight-seeing.

11.1.1 Existing Recreation Facilities Near the Project Area

The April 30, 1990 FERC order amending the license contains specific recreation-related direction to the Licensee. Article 404 approved a Licensee plan for recreation development of Island Park. Article 405 required the Licensee to construct a parking area, restrooms, garbage facilities, and interpretive signs on the south shore of the Clark Fork River. Article 406 required monitoring of recreational use of the Project area. Article 407 required the installation of a boat ramp and floating dock at Wild Goose Landing Park, improvements to the Flat Iron Ridge Fishing Access Site boat launch downstream of the Project, and installation of signs around Project shorelines warning visitors of potentially fluctuating water levels.

Article 404 was subsequently amended by FERC on May 21, 1993 to allow the Licensee to file a revised report on recreation resources detailing the Licensee's proposal for recreation development of Island Park. On March 24, 1994, the Licensee filed a revised report on recreation resources in compliance with the requirements of amended Article 404. On September 14, 1994, FERC approved the Licensee's revised recreation report.

The FERC-approved recreation report called for developments on Island Park to emphasize the natural setting, with foot trails and bicycle paths on the island, and eliminate motorized travel. The recreation report also provided that the Licensee contribute $20,000 towards the rehabilitation of the Historic High Bridge.

Following is a description of recreation sites that exist within or adjacent to the Project boundary, are on NorthWestern-owned property, or where maintenance of the site is funded by NorthWestern (**Table 11-1, Figure 11-1**).

Table 11-1: Recreation areas in the vicinity of the Project.

Recreation Area	Property Ownership and Managing Entity	Inside FERC Project Boundary?	Site Amenities
Island Park	Located on NorthWestern property. Managed by NorthWestern.	Yes	Day use site between Main Dam and Dry Channel Dam. Non-motorized access with adjacent parking areas, interpretation, picnic tables, benches, trails, fish passage viewing, garbage facilities, and vault toilets.
Cherry Creek Boat Launch	Located on Sanders County property. Managed by Sanders County.	Partially	Day use boat launch site with picnic facilities and vault toilet.
South Shore Dispersed Recreation Area	Located on NorthWestern property. Managed by NorthWestern.	Partially	Day use shoreline access area with dispersed parking and informational signs. Vault toilet and garbage facilities are nearby at the Historic High Bridge.
Wild Goose Landing Park	Located on NorthWestern and city of Thompson Falls' (City) property. Managed by City under management agreement with NorthWestern.	Partially	Community park with boat launch and dock, swimming dock, toilets, informational signs, parking, garbage facilities, and picnic facilities.
Power Park	Located on NorthWestern and City property. Managed by NorthWestern.	No	Community park with benches, tables, group use pavilion with running water, toilets, informational and interpretive signage, and parking.
Powerhouse Loop Trail	Located on NorthWestern and other private property, and within Highway 200 right-of-way. Managed in cooperation with Thompson Falls Community Trails Group.	Partially	Non-motorized trail with benches, vault toilet, and adjacent parking.
Sandy Beach (dispersed)	Dispersed beach area located on NorthWestern	No	Undeveloped beach area along the Powerhouse Loop Trail below the tailrace.

Recreation Area	Property Ownership and Managing Entity	Inside FERC Project Boundary?	Site Amenities
	property adjacent to Powerhouse Loop Trail below the tailrace and generating facilities.		
North Shore Boat Restraint	Located on NorthWestern property. Managed by NorthWestern.	Partially	Undeveloped shoreline above the Main Dam with benches, picnic tables, a small dock, and parking.
North Shore Dispersed Use Area (including former sawmill site)	Dispersed shoreline access partially located on NorthWestern property and within Highway 200 right-of-way, and partially on private property.	Partially	Undeveloped shoreline area along the northeast shoreline of the main reservoir, popular for dispersed shoreline fishing.

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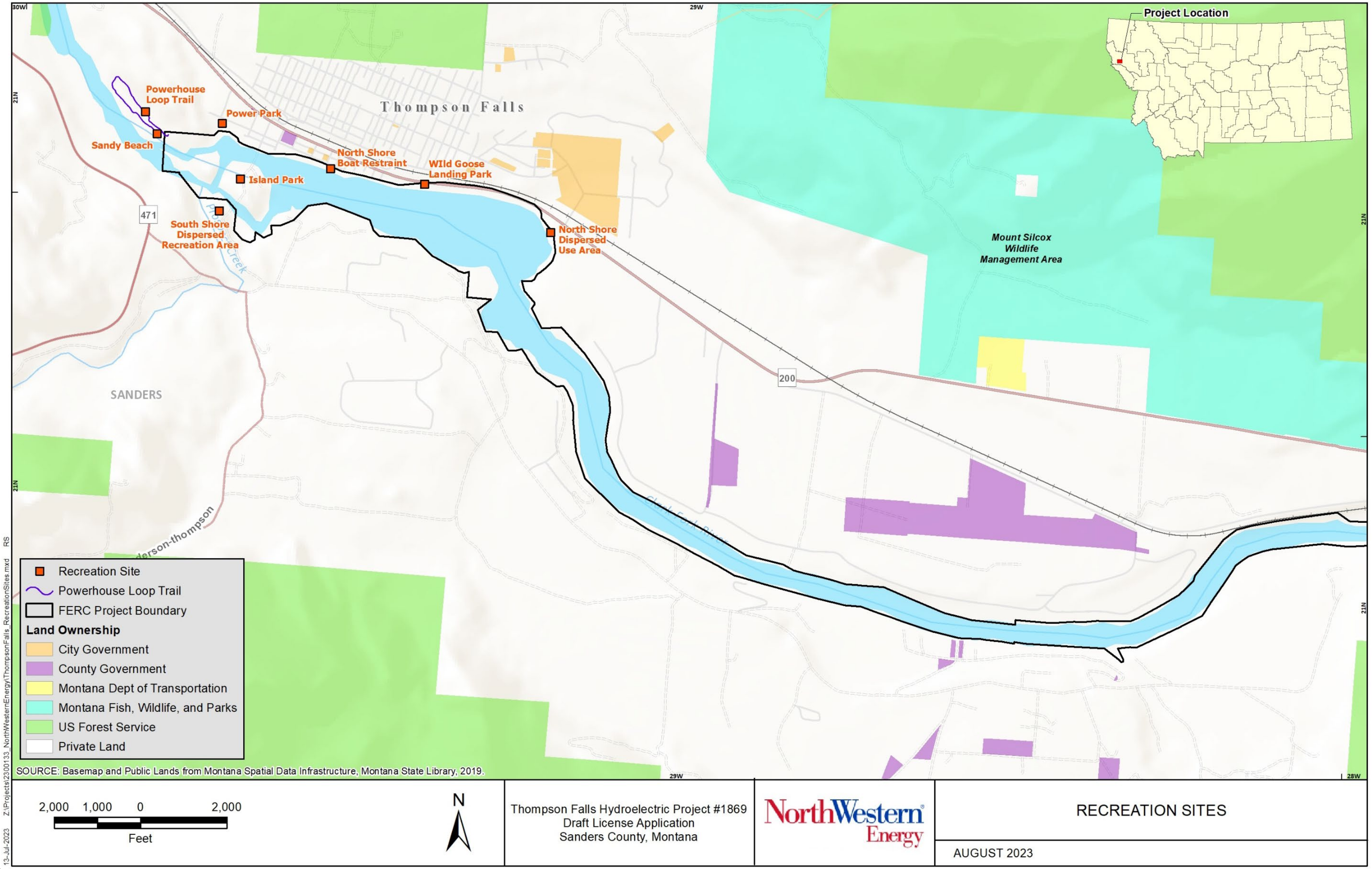
Figure 11-1: Map of recreation areas within or adjacent to the Project Area.



Note: Existing Project boundary extends 6 miles upstream from the upper edge of this map.

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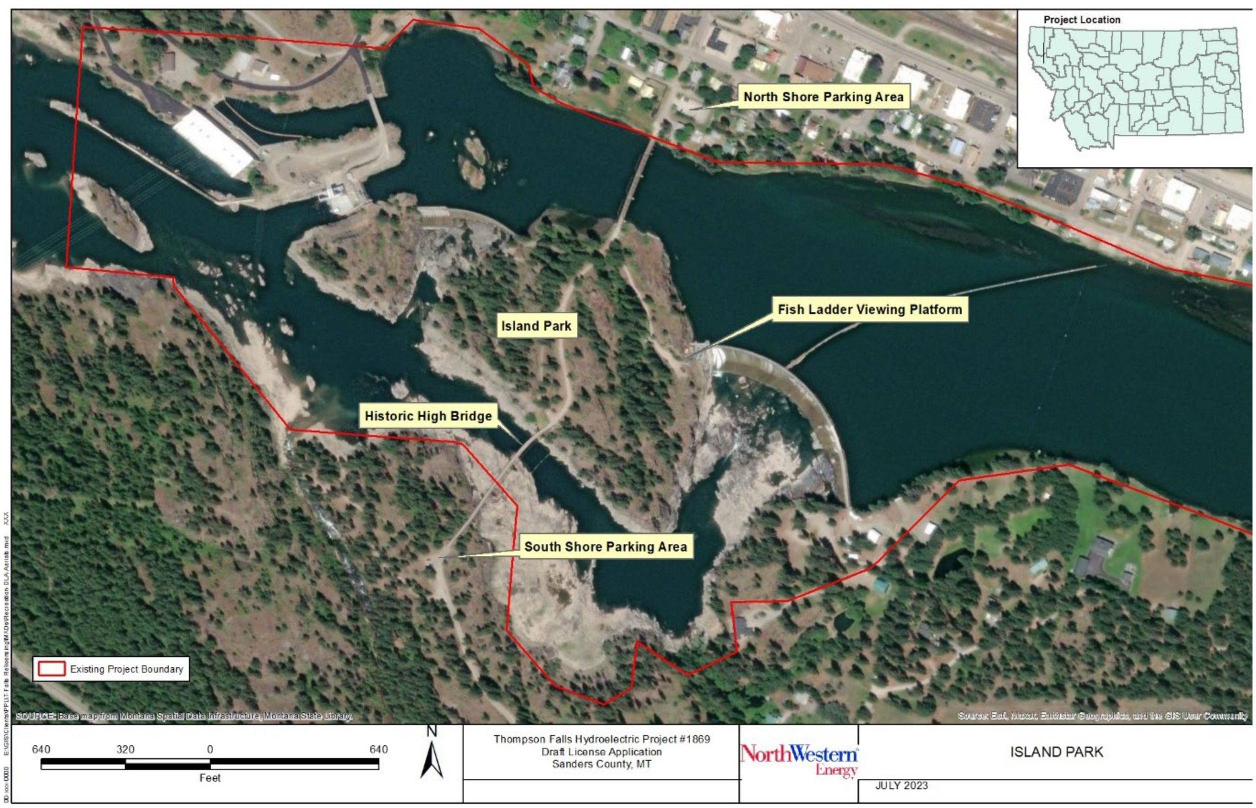
11.1.1.1 Island Park

Located on NorthWestern-owned property, Island Park is operated and maintained by NorthWestern. The site offers trail-based recreation with views of the waterway and Project facilities. To better accommodate public access to the island from the north shoreline, the Licensee purchased three undeveloped City lots 100 feet from the Gallatin Street Bridge and developed them to provide a public parking area. Designated ADA parking is available directly adjacent to the bridge, within the City's right-of-way for Gallatin Street. The parking area accommodates 17 vehicles, and the Gallatin Street Bridge provides walk-in access to the island.

Benches, picnic tables, and an ADA-accessible restroom are provided along trails on the island. The upstream fish passage facility public viewing platform, constructed in 2012 on the eastern edge of the island, offers views of the Main Channel Dam and the fish passage facility. Interpretive information regarding operation of the fish passage facility and fish species of interest was placed at the viewing platform as well. Interpretation throughout Island Park includes historical information related to building of the Thompson Falls Project, the Prospect Plant, and other geographically and culturally significant topics. (**Figure 11-2** and **Photographs 11-1**).

Figure 11-2: Aerial image of Island Park.

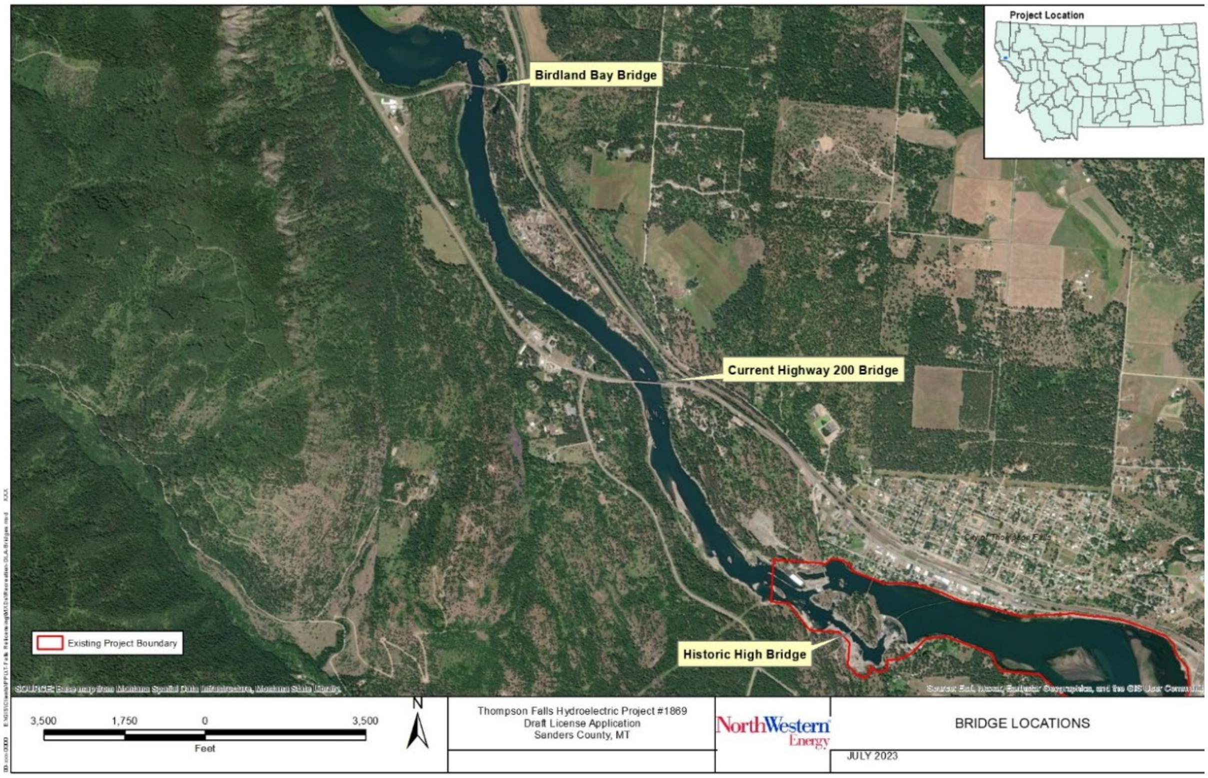


Photographs 11-1: Island Park at Gallatin Street Bridge (top left); internal island trails (top right), visitors on the fish passage facility viewing platform (bottom left); interpretive panels at overlook above Main Channel Dam (bottom right).

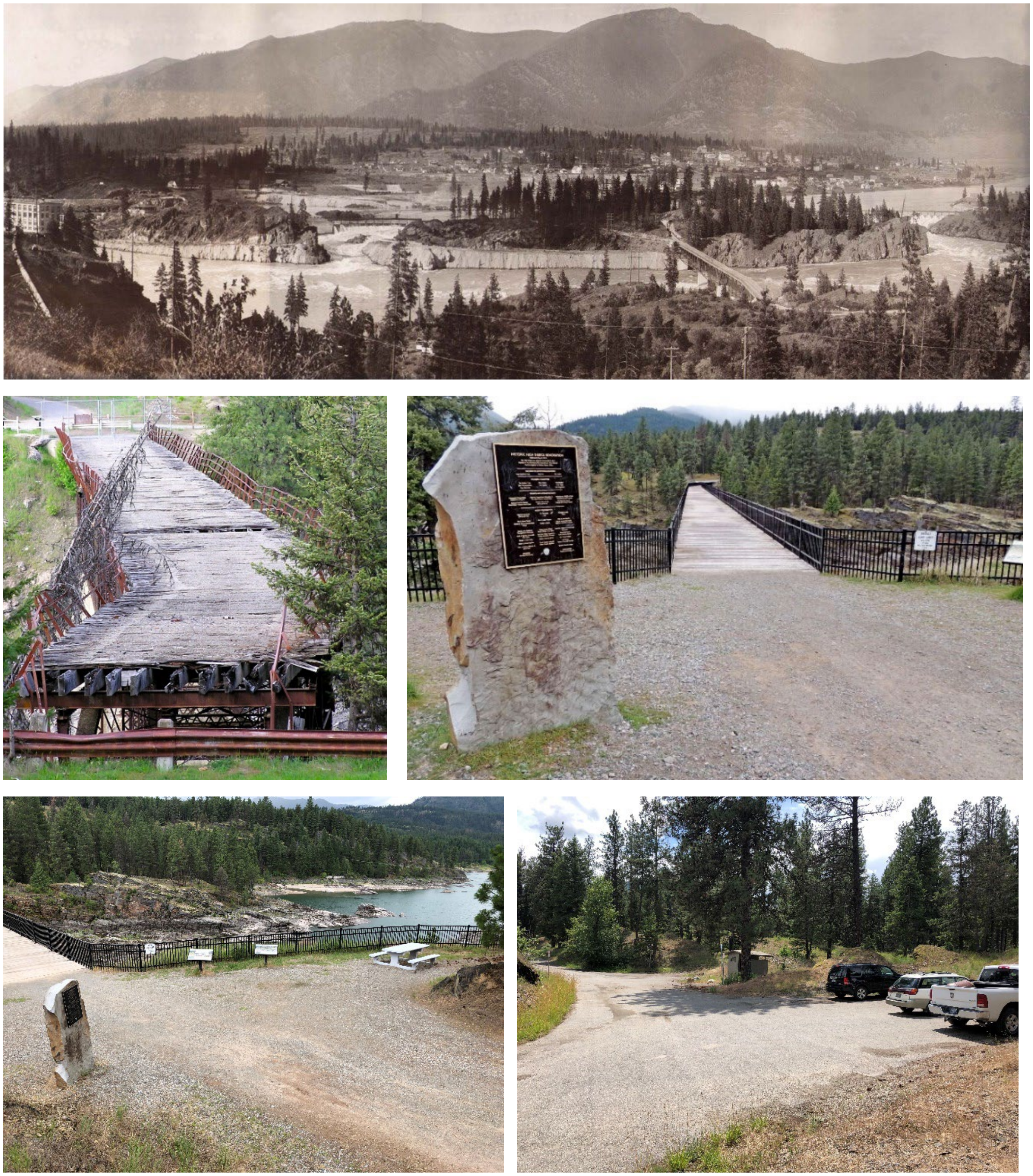
The Historic High Bridge links Island Park to the south shore and completes the non-motorized throughway from homes along the south shore to the downtown area of Thompson Falls on the north shore. The Historic High Bridge is located on NorthWestern-owned property, which is subject to a 60-foot easement held by Sanders County. The county owns, operates, and maintains the bridge, which is not a FERC-licensed Project work.

Originally constructed in 1911 to support construction of the Thompson Falls Project, the bridge was the primary route across the Clark Fork River at Thompson Falls until 1928, when a new bridge was built over the river at Birdland Bay (**Figure 11-3**). The Historic High Bridge linked the Prospect Creek and Cherry Creek areas to Thompson Falls until the early 1970s, when it was closed to vehicular use due to deterioration of the decking. It remained open as a foot and bicycle bridge until 1979, when it was closed to all use due to safety concerns.

Figure 11-3: Aerial image of the location of nearby bridges.



The Historic High Bridge is a 588- foot-long Parker/Pratt Deck-Truss designed bridge. It was included on the NRHP as part of the Thompson Falls Hydroelectric Dam Historic District (the District was originally listed in 1986 and updated in 2022). The design is unique as the deck is built atop the trusses. It has eight spans, a wood deck and stringer spans. The trusses are constructed of steel connected by pins and supported on concrete piers. Sanders County and Project partners facilitated reconstruction of the bridge and opened it for non-motorized public use in 2010. The Project won a 2011 award from the National Trust for Historic Preservation and an Engineering Excellence Award from the American Council of Engineering Companies. Designated parking for four vehicles, including one ADA parking spot, and an ADA-accessible restroom are provided adjacent to the south end of the Historic High Bridge (**Figure 11-3** and **Photographs 11-2**).



Photographs 11-2: The original Historic High Bridge (top, circa 1920); the deteriorated bridge, prior to reconstruction (2008, middle left); current day view of the reconstructed pedestrian and bicycle bridge (2018, middle right); interpretation and picnic facilities at north end of bridge (bottom left); parking area and restroom at south end of bridge (bottom right).

11.1.1.2 Cherry Creek Boat Launch

About 4 miles upstream of the Main Channel Dam, the Cherry Creek Boat Launch is located on property owned, operated and maintained by Sanders County. The parcel is a designated public park related to the neighboring subdivision, and the site is primarily intended to serve the neighboring landowners. The site provides public access for launching small watercraft on the south shoreline. Picnic facilities, parking for about six vehicles, and a restroom are provided at the site (**Figure 11-4** and **Photographs 11-3**). Cherry Creek Boat Launch is also the beginning of a water trail with a take-out at Wild Goose Landing Park on the north shoreline.

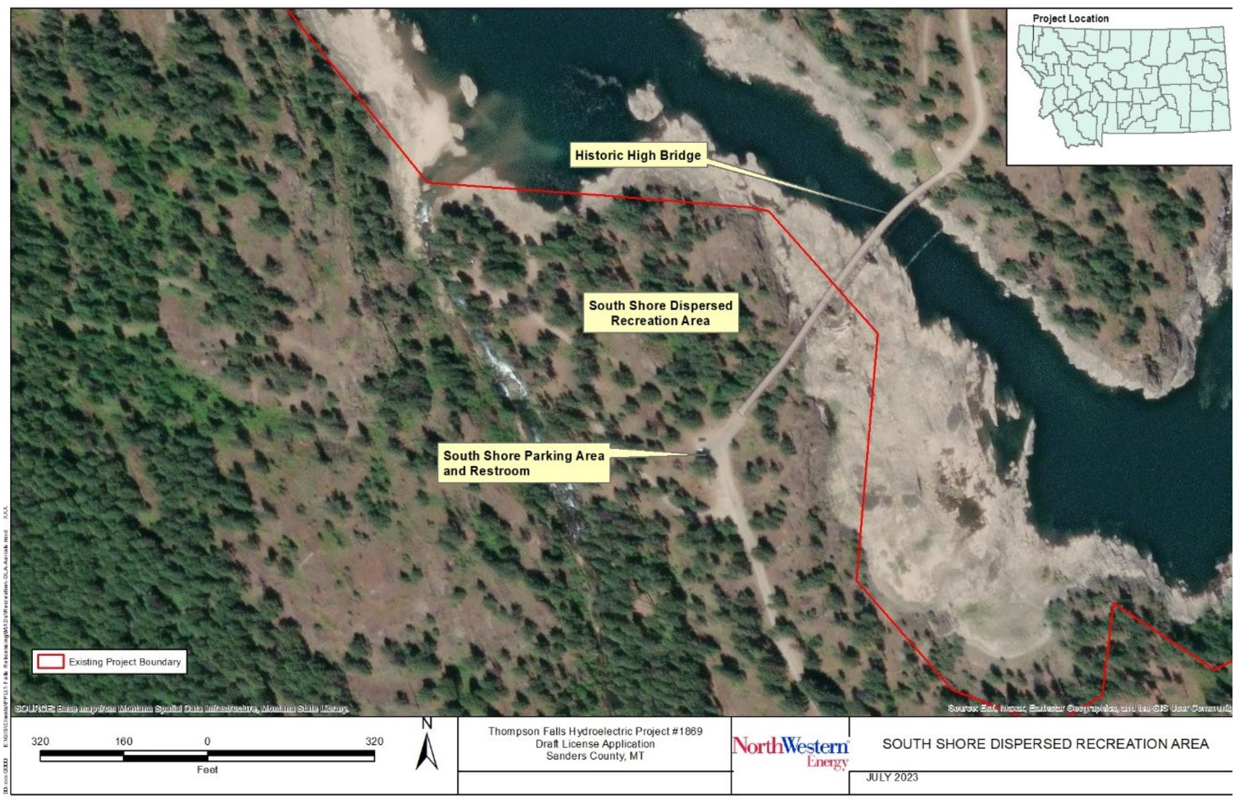
Figure 11-4: Aerial image of the Cherry Creek Boat Launch.

Photographs 11-3: Cherry Creek Boat Launch restroom and picnic areas (left); boat ramp and launch dock (right).

11.1.1.3 South Shore Dispersed Recreation Area

The South Shore Dispersed Recreation Area, which is located on NorthWestern-owned property and operated and maintained by NorthWestern, encompasses the south shoreline of the river upstream and downstream of the Historic High Bridge. Large rock outcrops line the upstream shoreline, while the downstream shoreline offers wooded day use areas for picnicking or relaxing as well as shoreline areas along the rocky banks and gravel bars near the mouth of Prospect Creek. The area is popular for fishing near the mouth of Prospect Creek and in the Clark Fork River. The dispersed use area accommodates parking and has informational signage related to fluctuating water levels as required by Article 407 of the Project license. A vault latrine is located nearby, adjacent to the south end of the Historic High Bridge (**Figure 11-5** and **Photographs 11-4**).

Figure 11-5: Aerial Image of the South Shore Dispersed Recreation Area.



Photographs 11-4: South shore area (top left); fishing along the shoreline at the south shore area (right); parking area at south shore area (bottom left).

11.1.1.4 Wild Goose Landing Park

Wild Goose Landing Park is managed by the City. The eastern portion of the park is located on property owned by NorthWestern and the western portion is on property owned by the City. The park provides open space, picnic facilities, a plumbed restroom, a boat launch and stationary dock, a floating swim dock, and shoreline fishing. Designated parking adjacent to the restroom facility accommodates 10 vehicles, including one ADA-designated parking space, while about 10 more vehicles may park in dispersed areas along the access road adjacent to the boat launch (**Figure 11-6** and **Photographs 11-5**).

NorthWestern partnered with the Sanders County Community Development Corporation in 2018 to improve the approach to the launch dock, add a boat bumper to the stationary dock, install fold-down cleats for boat mooring, and add an information kiosk and site signage.

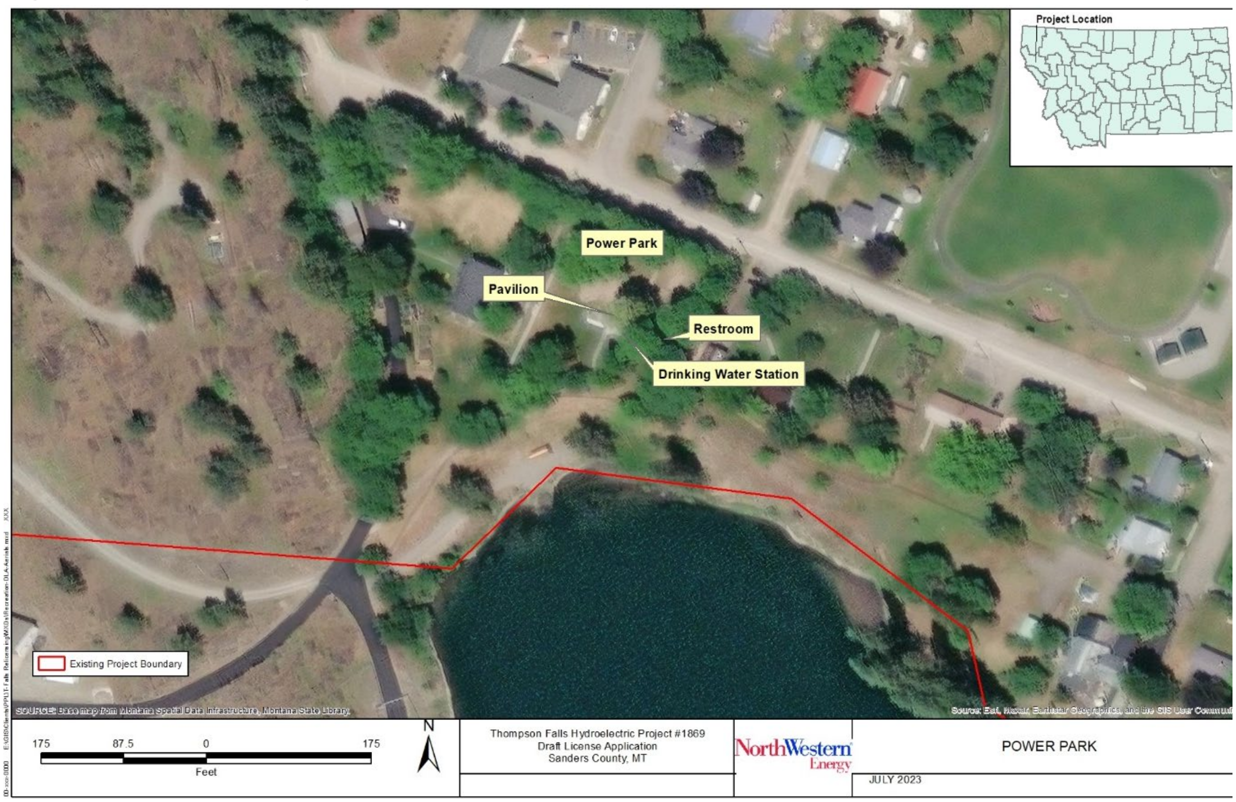
Figure 11-6: Aerial Image of Wild Goose Landing Park.

Photographs 11-5: Wild Goose boat launch and dock (top left); picnic area near boat launch (top right); park picnic area (bottom left); restroom facility (bottom right).

11.1.1.5 Power Park

Power Park, which is located on property owned by NorthWestern and the City and operated and maintained by NorthWestern, is an ADA-accessible City park along the north shoreline, just above the original powerhouse. The park offers multiple picnic tables, benches, mature shade trees, parking for 10 vehicles, an information sign related to the hydroelectric generating capacity of the Project (as required by FERC, Part 8), as well as views of Project facilities and an information kiosk which directs visitors to public recreation opportunities in and near Thompson Falls. A long-standing group use pavilion was destroyed by fire in late 2021 and NorthWestern completed rebuilding that facility in summer 2023. The group-use pavilion offers a sheltered area with countertops and electrical plug-ins, a separated plumbed restroom facility, trash service and a pet waste station. In addition, 13 new shade trees were planted at the park in the fall of 2022. The park serves as a parking area for visitors that seek to access the Powerhouse Loop Trail by following sidewalks within the park to trail segments linked by the Powerhouse access road. The park is a popular venue for numerous outdoor events each year (**Figure 11-7** and **Photographs 11-6**).

Figure 11-7: Aerial Image of Power Park.



Photographs 11-6: July 2023 photos of information kiosk (top); bench overlooking Project facilities along trail access at edge of park (middle left); restroom (middle right); and new pavilion (bottom).

11.1.1.6 Powerhouse Loop Trail and Sandy Beach

The Thompson Falls Community Trails Group (Trails Group) was formed in partnership with NorthWestern and other community stakeholders with the intent of constructing non-motorized trails in and around Thompson Falls.

The first trail segment to be completed under direction of the Trails Group was the Powerhouse Loop Trail, a 2.3-mile loop trail downstream of the Thompson Falls Powerhouse and outside the Project boundary. This trail and its various routes were supported by volunteer workdays, trail construction grants, and efforts by the Licensee to construct linking trail segments. The Licensee also installed a new vault toilet near the trailhead.

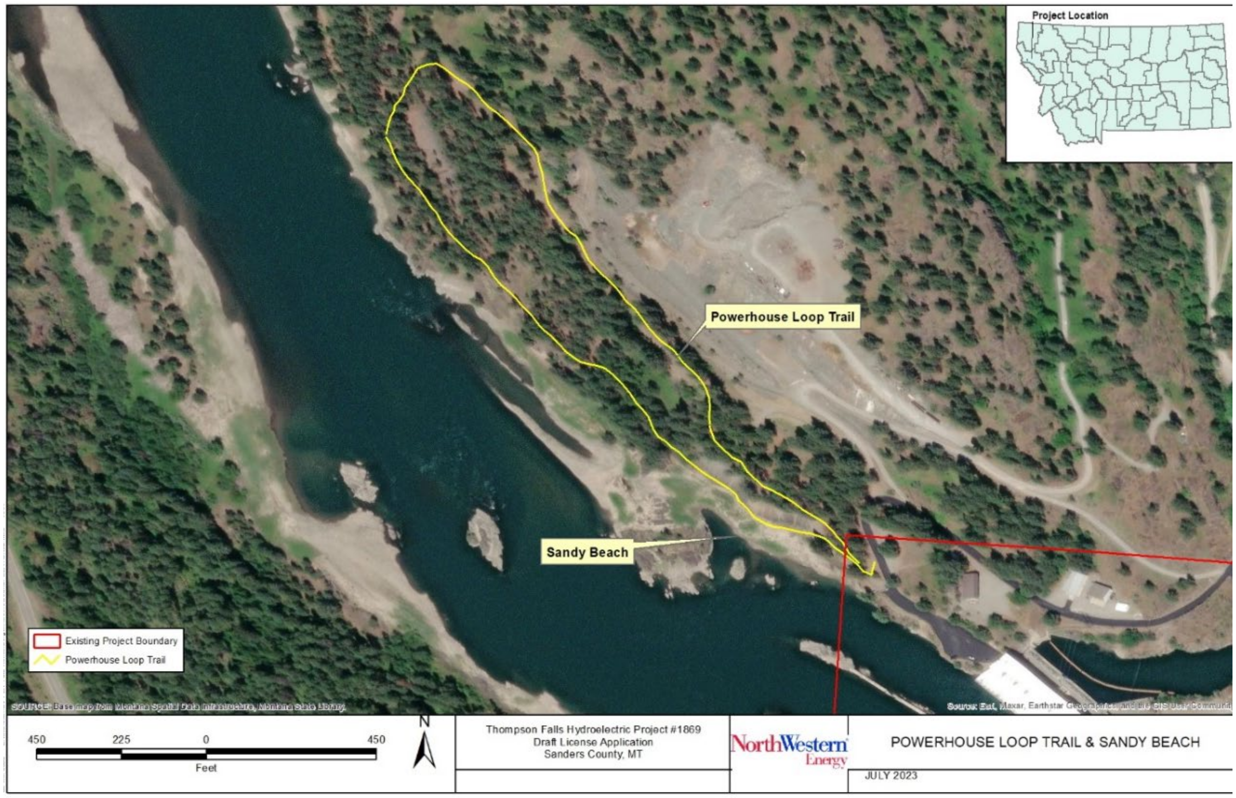
Donations were received to purchase two benches for an overlook area along the trail, and eventually for other trail locations and along trails in Island Park. The Licensee assisted by assembling and installing the benches.

The Loop trail is located primarily outside of the Project boundary, downstream of the powerhouse, with portions of the trail on property owned by public and private entities other than NorthWestern. A section of the trail is also within the Highway 200 right-of-way and is operated and maintained by the Trails Group, with assistance from NorthWestern and Sanders County. The 2.3-mile trail begins at Power Park and follows the powerhouse access road to a trailhead area near the powerhouse gate. From there, it continues downstream through NorthWestern-owned lands that are not within the Project boundary, to the area near privately-owned Rimrock Lodge adjacent to the Highway 200 bridge. Finally, the trail loops up through Rimrock Lodge property, follows Highway 200 east to Pond Street where it then links back to Power Park via Pond Street.

Connecting trail segments exist in addition to the main loop trail described above. These segments offer a low-water route along the shoreline of the upstream portion of the trail and a high-water route atop a tall embankment of the upstream portion when the low-water route is flooded during spring run-off. These connecting segments offer options for visitors to utilize and experience different portions of the area. The purpose of the Loop Trail is to provide trail-based recreation and exercise options in close proximity to the west end of Thompson Falls.

Sandy Beach is a swimming hole that is accessed by the low-water route of the Powerhouse Loop Trail at the upstream end. The dispersed swimming hole is nestled behind a large rock outcrop and gravel bar, providing for a deep pool adjacent to a sandy shoreline. Density of vegetation at the site varies throughout the peak recreation season. The small beach comfortably accommodates a few people, but typically not more than one or two recreation groups at a time. (**Figure 11-8** and **Photographs 11-7**).

Figure 11-8: Aerial Image of Powerhouse Loop Trail and Sandy Beach.

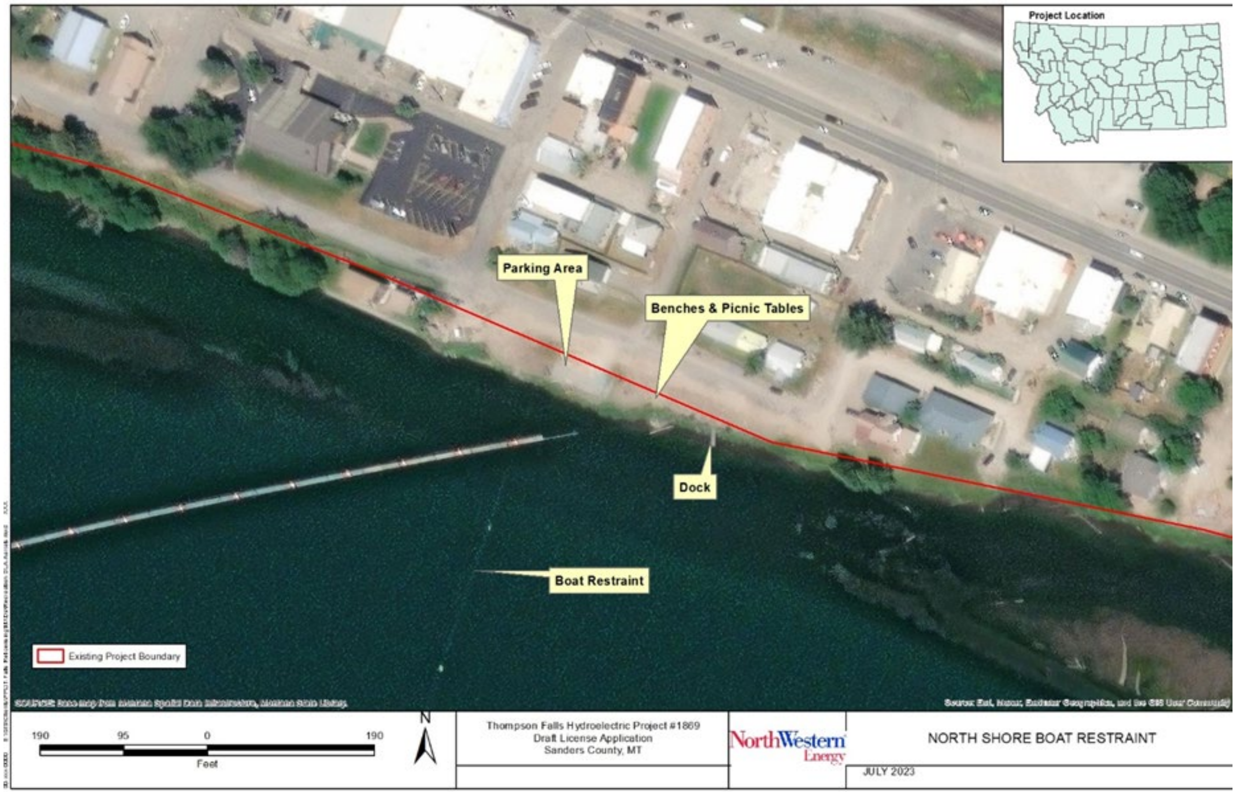


Photographs 11-7: **Trailhead area (top left); restroom (top middle); bench at overlook (top right); junction of high water and low water trails (bottom left); Sandy Beach (bottom right).**

11.1.1.7 North Shore Boat Restraint

The boat restraint is anchored on north shoreline property owned by NorthWestern and the City, and operated by NorthWestern. The site includes benches, picnic tables, an open grassy area for viewing the waterway and Project facilities, parking, and a small dock (**Figure 11-9** and **Photographs 11-8**).

Figure 11-9: Aerial Image of North Shore Boat Restraint.

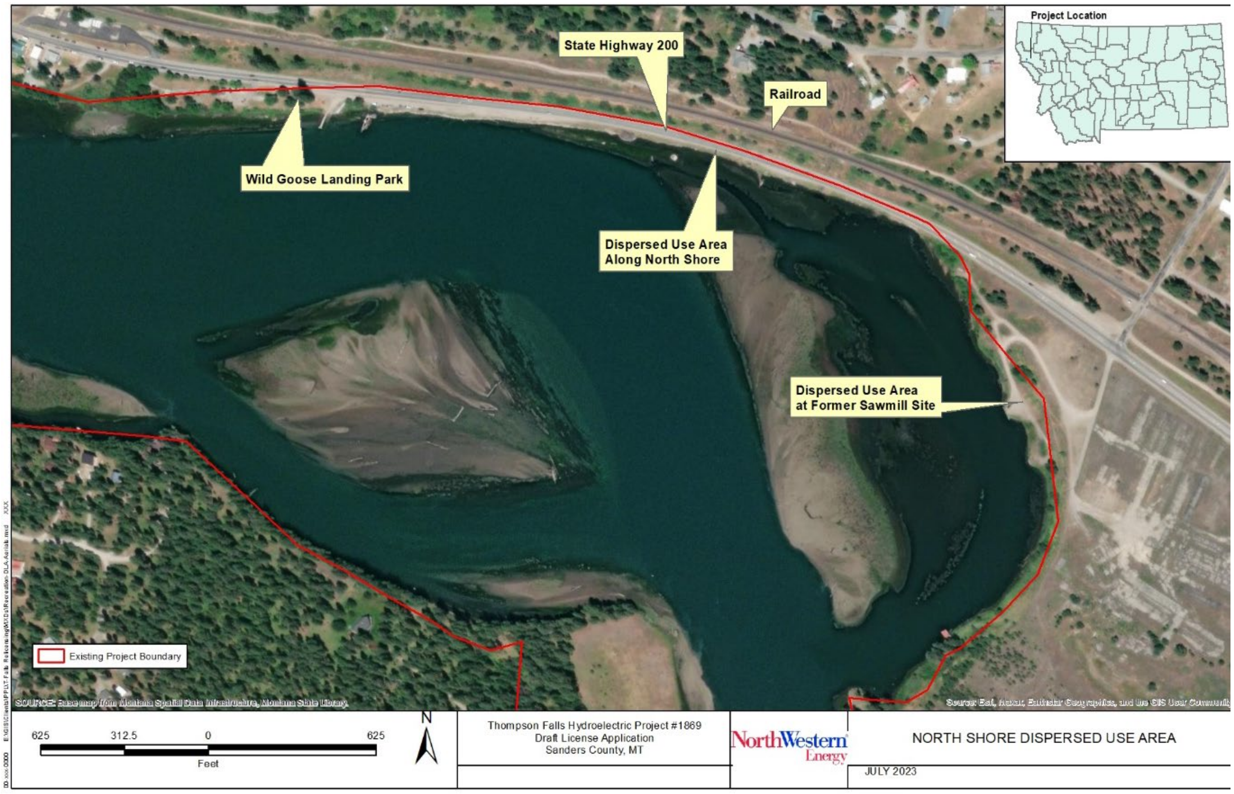


Photographs 11-8: Upstream view of boat restraint area.

11.1.1.8 North Shore Dispersed Use Area (including former sawmill site)

Dispersed fishing occurs on the north and northeast shorelines of the reservoir upstream of Wild Goose Landing Park and adjacent to Highway 200 and the former sawmill site. There are no facilities, improvements, or direct management of the area, which is a mix of ownership and easements by Montana Department of Transportation and private entities (NorthWestern, BNSF Railway, and former sawmill operators) (**Figure 11-10** and **Photographs 11-9**). NorthWestern does not manage or maintain this area.

Figure 11-10: Aerial Image of North Shore dispersed use area (including former sawmill site).



Photographs 11-9: North shoreline along Highway 200 (top row); northeast shoreline adjacent to former sawmill site (bottom row).

11.1.2 Visitor Monitoring

Recreation visitor monitoring has been conducted for the Thompson Falls Project pursuant to Article 406 of the 1990 amendment. Following issuance of the amended license, the Licensee conducted peak-season (Memorial Day–Labor Day weekends) surveys of visitors to recreation sites in 1993, 2003, 2008, 2014, 2018, and most recently in 2021. The primary goal of the visitor survey is to understand use of recreation sites and identify any issues related to public recreation access. Specifically, the surveys examined visitor and trip characteristics related to previous site use, length of visit, group size, recreation activity participation, motivations to visit, opinions about the adequacy of recreation facilities, any problems encountered, and visitor demographics. Another dimension of visitor monitoring includes examination of the volume of visitor use at recreation sites using automated technologies that allow for monitoring vehicle access or pedestrian access to recreation sites. When coupled with visitor and trip characteristics gathered by the recreation visitor survey, this information provides a more complete picture of recreation site use. Results from the 2021 Thompson Falls Recreation Visitor Survey conclude that visitors are highly satisfied with the facilities and opportunities available. A full analysis of 2021 visitor survey results is provided in the following section, along with an analysis of the volume of visitor use of recreation sites.

11.1.2.1 Recreation Visitor Survey Results and Site Use Monitoring

The 2021 Recreation Visitor Survey was conducted at recreation and public access sites within or adjacent to the Project boundary during the peak recreation season (Memorial Day–Labor Day weekends). More than three-fourths of all visitors to recreation sites were from Montana (78%) and more than one-third (36%) were from Thompson Falls (NorthWestern 2022). Visitors from Washington and Idaho comprised 16 percent of all visitors (10% and 6%, respectively). Most visitors (60%) were repeat visitors, while 40 percent were first time visitors.

Overall, 85 percent of all visitors in 2021 indicated they were very or extremely satisfied with the site they were using. Additionally, feelings of crowdedness were low, with 96 percent indicating they felt not at all or not very crowded. Being outdoors and enjoying nature were primary motivations for visits, and visitors reported experiencing no problems of any kind during their visit.

Over time, while visitor and trip characteristics and visitor satisfaction have remained fairly consistent, visitors' desire for changes to recreation facilities or management declined from 43 percent in 2008 to 26 percent in 2014, 15 percent in 2018, and 1 percent in 2021. This decline is largely due to the numerous upgrades made to recreation sites and expansion of recreation opportunities in the Thompson Falls Project Area since 2008. Upgrades have largely consisted of additional amenities such as trails, benches and picnic tables, as well as more toilet facilities and designated parking areas.

A few visitors suggested improvements during the 2021 recreation visitor survey. Generally, improvements pertained to a request for additional picnic tables, picnic facilities, and restrooms.

The volume of use at five recreation sites was monitored during the peak recreation season of 2021 using automatic traffic and trail counters. These sites were Island Park, the Powerhouse Loop Trail, Wild Goose Landing Park, South Shore Dispersed Use Area, and Cherry Creek Boat Launch. Counts for Sandy Beach are included with the Powerhouse Loop Trail since access to the beach originates on the trail and counts for the Historic High Bridge are included as a portion of the Island Park counts. Estimating use with automatic counters at Power Park, the North Shore Boat Restraint, and the North Shore Dispersed Use Area is not possible due to the varied nature of access to these sites.

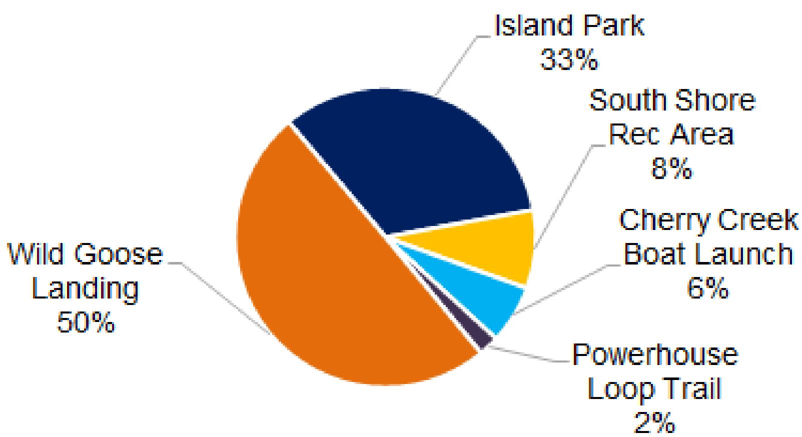
A total of 33,399 visitor groups were counted at the recreation sites monitored with automatic counters during the peak recreation season (May 28 – September 9) in 2021. Of that total, 16,649 groups visited Wild Goose Landing Park, accounting for half of the recorded visitation. One-third of recorded visitation occurred at Island Park (11,091 visitor groups, including use of the Historic High Bridge), while 735 groups utilized the Powerhouse Loop Trail (2% of total, including Sandy Beach). Eight percent (2,819 visitor groups) accessed the South Shore Dispersed

Recreation Area, and 2,105 groups (6%) visited the Cherry Creek Boat Launch (**Table 11-2** and **Figure 11-11**).

Table 11-2: Visitation estimates of recreation sites, peak season 2021.

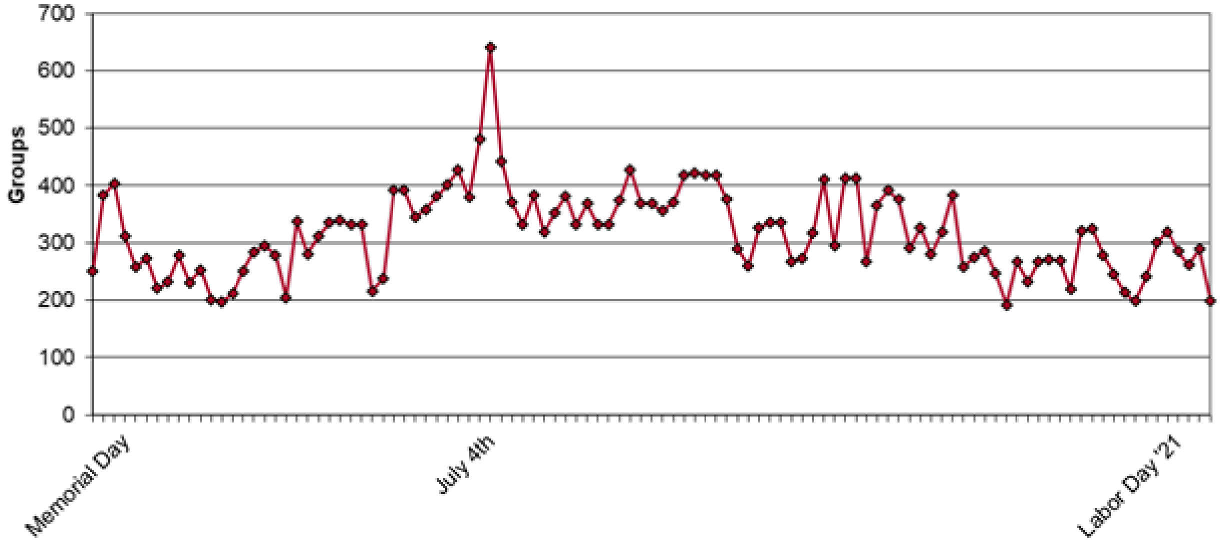
Recreation Area	2021 Peak Season Visitor Groups	Percent of Monitored Visitation
Wild Goose Landing Park	16,649	50%
Island Park (including use of the Historic High Bridge)	11,091	33%
Powerhouse Loop Trail (including Sandy Beach)	735	2%
South Shore Dispersed Recreation Area	2,819	8%
Cherry Creek Boat Launch	2,105	6%
Total	**33,399 Visitor Groups**	

Figure 11-11: Breakdown of recreation visitation by monitored site, peak season 2021.



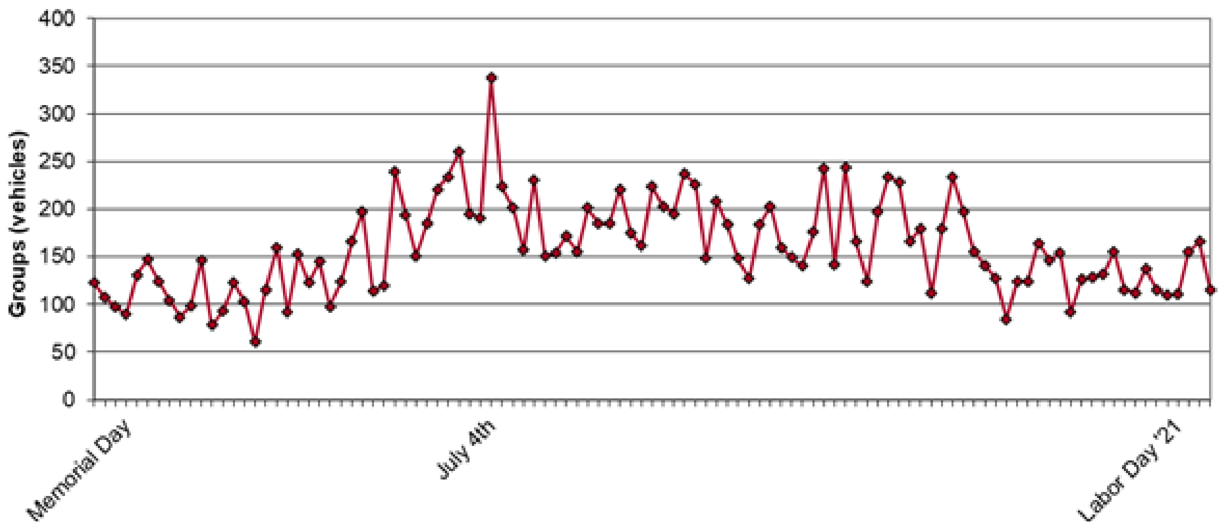
The highest visitation to all counted sites combined occurred on July 4, 2021, when 642 visitor groups accessed the monitored sites (**Figure 11-12**). Together, the monitored sites hosted an average of 318 recreation groups per day during the peak recreation season of 2021.

Figure 11-12: Daily visitor groups to selected recreation sites, peak season 2021.



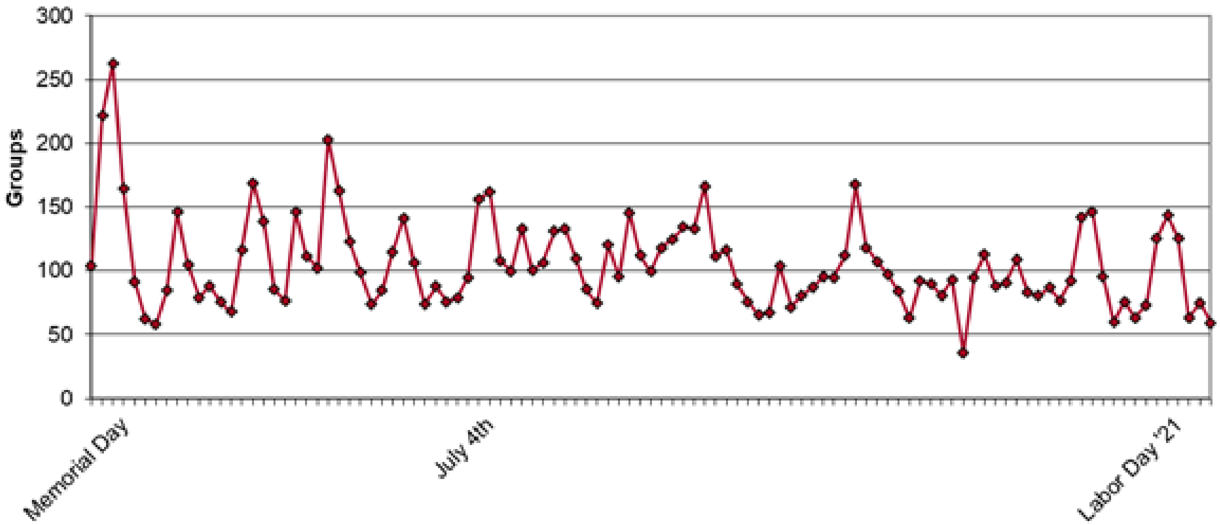
On average, Wild Goose Landing Park hosted 159 group visits per day, totaling more than 16,500 group visits during the peak use season. The highest level of use occurred on the July 4th holiday with 337 visits (**Figure 11-13**).

Figure 11-13: Daily visitor groups to Wild Goose Landing Park, peak season 2021.



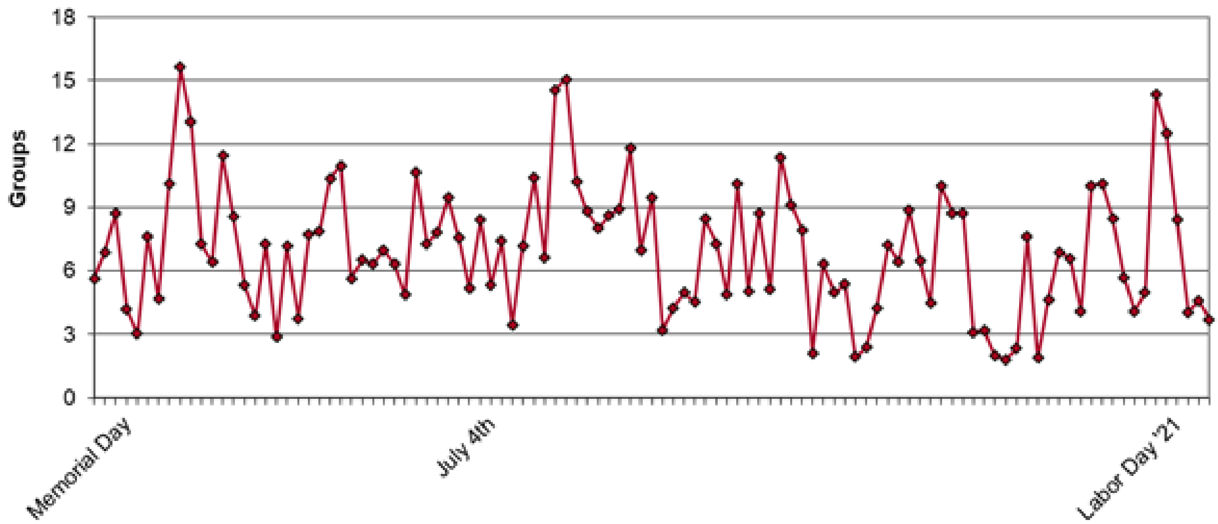
Between May 28 and September 9, 2021, Island Park (including use of the Historic High Bridge) hosted 11,091 visitor groups. The highest use of the site was recorded on May 30 (Sunday of Memorial Day weekend) with 263 groups (**Figure 11-14**). On average Island Park hosted 106 groups per day.

Figure 11-14: Daily visitor groups to Island Park (including use of the Historic High Bridge), peak season 2021.



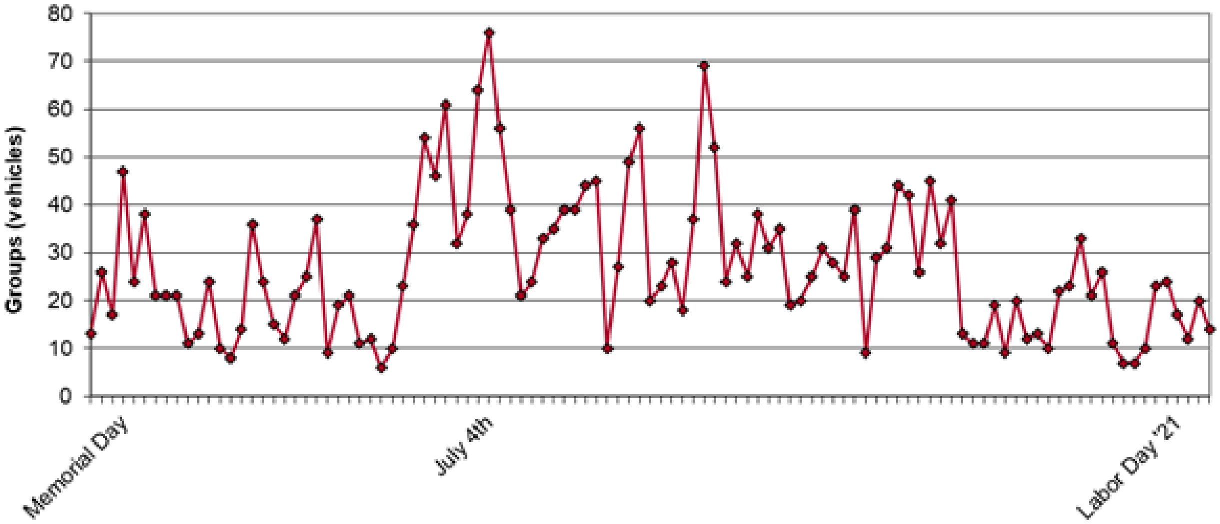
The Powerhouse Loop Trail (including Sandy Beach) hosted a total of 735 group visits during the peak recreation season of 2021. Peak use was recorded on June 25 with 16 groups (**Figure 11-15**).

Figure 11-15: Daily visitor groups to Powerhouse Loop Trail (including Sandy Beach), peak season 2021.



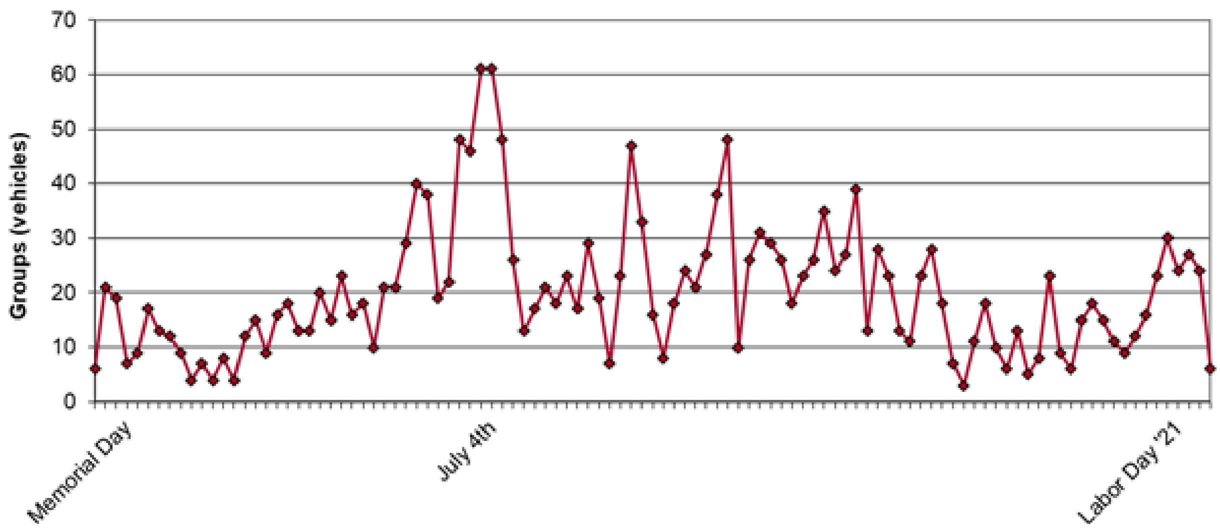
During the peak recreation season of 2021, the South Shore Dispersed Recreation Area hosted 2,819 groups, an average of 27 groups per day. Peak use occurred on July 4 with 76 groups (**Figure 11-16**).

Figure 11-16: Daily visitor groups to South Shore Dispersed Recreation Area, peak season 2021.



Cherry Creek Boat Launch hosted a total of 2,105 visitor groups during the peak recreation season of 2021. Highest use was recorded on July 3 and 4, when 61 visitor groups accessed the site each day (**Figure 11-17**). The site hosted 20 groups per day, on average, throughout the entire season.

Figure 11-17: Daily visitor groups to Cherry Creek Boat Launch Site, peak season 2021.

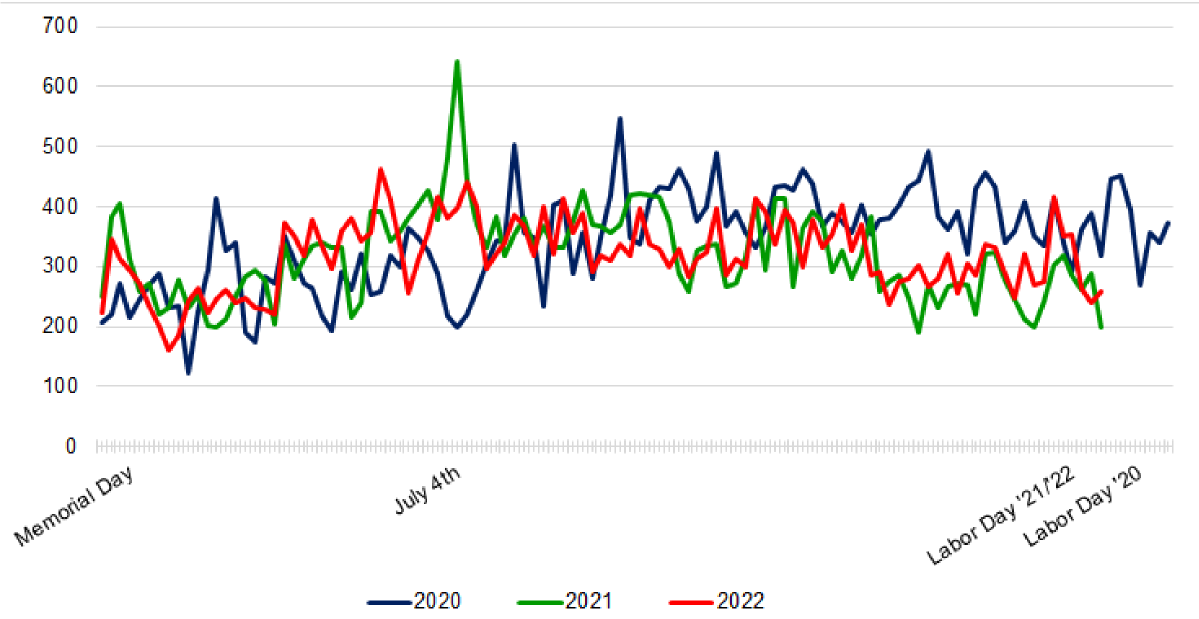


Change in the volume and timing of visitation to recreation sites over time is normal, and visitation is often dependent on factors such as weather (especially temperature and precipitation), water flows (duration and intensity of spring runoff or drought), local-area conditions (such as wildfire), economics (fuel prices, for example), and social conditions (such as a global pandemic). Total visitation to monitored recreation sites during the peak recreation season declined by 4 percent overall between 2020 and 2022 (**Table 11-3**). That fluctuation in visitation was due to the 2020 recreation season having an extra week compared to 2021 and 2022 since the Labor Day holiday fell on September 7. Patterns of use of recreation sites were largely similar during 2020, 2021, and 2022 (**Figure 11-18**).

Table 11-3: Visitation to Monitored Recreation Sites, peak season 2020-2022.

Recreation Area	2020 Peak Season Visitor Groups	2021 Peak Season Visitor Groups	2022 Peak Season Visitor Groups
Wild Goose Landing Park	15,198	16,649	16,131
Island Park (including use of the Historic High Bridge)	11,866	11,091	12,086
Powerhouse Loop Trail (including Sandy Beach)	909	735	753
South Shore Dispersed Recreation Area	2,217	2,819	2,556
Cherry Creek Boat Launch	4,603	2,105	1,860
Total Visitor Groups	**34,793**	**33,399**	**33,386**

Figure 11-18: Daily visitor groups to Monitored Sites, peak season 2020-2022.



11.1.2.2 Angling Pressure

FWP conducts biennial statewide mail-in angling use surveys from a random sample of resident and nonresident licensed anglers. The most recent data from 2020 showed Thompson Falls Reservoir had an estimated 2,607 angler days comprised of 2,430 resident anglers and 177 nonresident anglers (**Table 11-4**). Over the past 16 years, mean angler days per year was 1,970. Resident anglers represent a mean 79 percent of the angler use, and non-resident anglers represented 21%. Out of 1,200 fisheries FWP monitors for angler use, Thompson Falls Reservoir average rank in 2020 was 197 and over the past 16 years was 286.

Table 11-4: **Thompson Falls Reservoir angler use statistics 2005-2020.**

	Total	Resident AD	Rel % Res use	Non-resident AD	Rel % Non-Res use	State Rank
2020*	2607	2430	0.93	177	0.07	197
2019	3436	1629	0.47	1807	0.53	141
2017	3896	3895	1.00	0	0.00	131
2015	3565	2495	0.70	1070	0.30	144
2013	4621	4304	0.93	316	0.07	135
2011	146	52	0.36	94	0.64	774
2009	243	177	0.73	66	0.27	616
2007	1664	1664	1.00	0	0.00	177
2005	1080	1080	1.00	0	0.00	258
mean	2362	1970	0.79	392	0.21	286

Note: *survey out of biennial sequence to evaluate increased public use during pandemic

Between 2013 and 2020, angling pressure in Thompson Falls Reservoir trended downward, to a 2020 low of 2,607 angler days. By comparison, angler pressure in neighboring Noxon Reservoir trended upward to a high of 41,171 angler days in 2020 and nearby Flathead Lake (which also trended upward) supported 50,699 angler days in 2020 (**Table 11-5**).

Table 11-5: Angler Days – Thompson Falls, Noxon, and Cabinet Gorge reservoirs.

	Total Pressure (angler days)				
Waterbody	**2013**	**2015**	**2017**	**2019**	**2020**
Thompson Falls Reservoir	4,621	3,565	3,896	3,436	2,607
Noxon Reservoir	32,848	20,564	27,550	31,568	41,171
Flathead Lake	46,432	21,956	42,196	46,141	50,699

Source: League and Ball 2020; Selby and Skaar 2019; Selby et al. 2019; Selby et al. 2017, 2015

11.1.3 Other Recreation Sites and Facilities

The Thompson Falls area has an abundance of nearby recreation opportunities unrelated to the Project (**Table 11-6**).

Table 11-6: Property ownership and managing entity of nearby recreation areas unrelated to the Project.

Recreation Area	Property Ownership and Managing Entity
Ainsworth Park	Located on City property; managed by City.
Railway Park	Located on City property; managed by City.
Rose Garden Park and Fort Thompson Playground	Located on City property; managed by City.
Swimming Pool and Park	Located on City property; managed by City.

Recreation Area	Property Ownership and Managing Entity
Community Center, Softball Field, and Dog Park	Located on City property; managed by City and volunteers.
Babe Ruth Baseball Field	Located on City property; managed by City.
Bighorn and Grizzly Parks	Located on City property; managed by City.
Thompson Falls State Park	Located on DNRC property, under perpetual easement; managed by FWP with assistance by Avista.
State Park Trail	Located on private property; managed by Avista, FWP, and Thompson Falls Community Trails Group.
River's Bend Golf Course	Located on private property; managed by private entity.
Flat Iron FAS	Located on private property; managed by FWP with assistance by Avista.
US Forest Service Trails	Located on USFS property; managed by USFS.
Mount Silcox Wildlife Management Area	Located on FWP property; managed by FWP.

Note: City = city of Thompson Falls

Ainsworth Park lies northeast of Power Park. Historically, baseball games were hosted on the field, but deterioration of the covered grandstands and lack of room for expansion of the field resulted in a complete re-design and renovation of the park. The space now includes a walking trail, irrigation, a monument to US Armed Forces, a pavilion, restrooms, gravel parking area, and amphitheater.

Railway Park lies along Main Street of Thompson Falls, between the railroad and Highway 200, across from the west end of the downtown area. Benches, a Veterans of Foreign Wars monument, and landscaping offer a pleasant view for visitors and passersby.

The Rose Garden Park and Fort Thompson Playground are situated along Main Street, between the railroad and Highway 200, roughly 0.5 mile east of Railway Park. The park contains rose bushes and mature trees, along with picnic tables, a playground, and a seasonal portable restroom.

The swimming pool and adjacent park are located on City property next to the high school complex on Golf Street, about 0.5 mile north of Highway 200. The park provides a playground, picnic tables, pavilion, and swimming pool.

The softball field, Community Center, and dog park are on City property across from the high school complex on Golf Street, about 0.5 mile north of Highway 200. The softball field and dog park are managed by volunteers. The City rents the Community Center for social gatherings, community meetings, and other events or purposes.

The Babe Ruth Baseball Field was constructed in 2018 on City property behind the Search and Rescue building, about 0.25 mile off Highway 200 on Golf Street. The site hosts baseball games and is operated by volunteers.

Bighorn and Grizzly parks were dedicated to the City as part of the Ashley Creek subdivision. The park areas are undeveloped but offer open space for surrounding residents.

Thompson Falls State Park offers day use and overnight use. Managed by FWP, the site is located approximately 2 miles downstream of the Thompson Falls Powerhouse, adjacent to the Birdland Bay Bridge. In addition to overnight camping, the site contains day use picnic facilities, group use facilities, a boat launch, and fishing pond with an ADA-accessible fishing pier and pavilion. The site can be accessed by vehicles from Blue Slide Road or by non-motorized means from the State Park Trail. Compared to visitors to recreation sites within the Project Area, whom are typically day use recreationists from Sanders County or nearby areas, visitors to Thompson Falls State Park are twice as likely to be from outside of Montana and are primarily visiting for two nights. The State Park is an important draw for the Thompson Falls area as a whole, but it serves a population of visitors that largely makes use of Noxon Reservoir and differs from those that frequent the Project Area (REC Resources 2013).

The State Park Trail provides a non-motorized link between the Powerhouse Loop Trail and Thompson Falls State Park from a junction slightly upstream of the Rimrock Lodge property and Highway 200 bridge. The trail segment is aligned along shoreline property and terminates at the State Park.

The River's Bend Golf Course and Birdland Bay RV Resort provide a privately managed golf course and RV resort just downstream of Thompson Falls State Park on the northeast shoreline of the Clark Fork River.

Across from River's Bend Golf Course, the Flat Iron Fishing Access Site on the west shoreline (approximately 3 miles downstream from the Thompson Falls Powerhouse) is a day use boat launch site that also offers ADA-accessible fishing. The launch area provides parking for 14 vehicles with trailers including one ADA-designated spot. A picnic table and seasonal portable restroom are also provided in the launch area. Other areas of the site offer two fishing platforms (one of which is ADA-accessible), picnic tables, a vault toilet, and space to park about 20 vehicles along the access road. The site is managed by FWP.

In areas further removed from the Project, the USFS provides a network of fitness trails at the Mule Pasture 0.5 mile north of downtown Thompson Falls, as well as trails that provide access to Weber Gulch, Sqaylth-kwum Creek, and Ashely Creek.

The Mount Silcox (Wildlife Management Area) WMA, managed by FWP, is open to public access April 1 through November 30 and lies approximately 2 miles to the east of Thompson Falls. A parking area is provided just north of Highway 200. The WMA is more than 1,500 acres in size and provides winter and spring range for bighorn sheep, recreational access to adjacent public lands, and winter range for elk.

11.2 Environmental Measures

11.2.1 Existing Environmental Measures

Under the existing license the Licensee developed recreation amenities and facilities at Island Park, Wild Goose Landing, and the south end of High Bridge. The ongoing maintenance and weed control has continued at these sites. In addition, recreational use surveys have been completed as required. The most recent recreation survey found a high level of satisfaction among recreational users in the Project area. A complete list of completed and ongoing measures can be found in **Exhibit E - Section 2.1.4 – Existing Environmental Measures**.

11.2.2 Proposed Environmental Measures

NorthWestern proposes the following recreational measures as part of the new license:

- Operate and maintain Wild Goose Landing Park, including bathrooms, parking areas, garbage service, and general site and facility upkeep in collaboration with the City.
- Operate and maintain Island Park, excluding the Historic High Bridge, which is owned and maintained by Sanders County. NorthWestern's duties include upkeep of the parking area on the north shore near the Gallatin Street Bridge and on the south shore adjacent to the Historic High Bridge, interpretive information and the upstream fish passage facility viewing platform, as well as benches, picnic tables, vault latrines, and safety signage throughout Island Park and parking areas.
- Operate and maintain Power Park, including maintenance of the group-use pavilion and plumbed restroom facility, drinking water station, information kiosk, and benches.
- Manage the South Shore Dispersed Recreation Area as a primitive day use access site and to perform upkeep, operation and maintenance of the site.
- Develop and implement a Recreation Management Plan that includes these listed sites.

11.3 Environmental Analysis

11.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2** – **Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 –**

Proposed Environmental Measures would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

Under the current license, reservoir water level fluctuations to 4 feet below full pool could occur periodically. An operations test conducted in 2019 showed significant impacts to public and private boat docks, and boat launching ramps, when the reservoir elevation was 4 feet below full pool.

Table 11-7: Recreation Access at 2.5 feet and 4 feet below full pool

Location	Recreation Access at 4 feet below full pool	Recreation Access at 2.5 feet below full pool
Wild Goose Landing Park	Boat launch was usable. Fixed-pier launch dock could not be used for launching, floating swim dock barely reached the water. The shoreline areas adjacent to the park and launch not accessible for fishing or swimming due to the exposed mud and aquatic vegetation.	Public boat launching facilities and associated docks remain usable.
North shoreline, within the City limits between Project and Wild Goose Landing Park	Private docks did not reach the water, shorelines were muddy and not suitable for public use. A shallow shelf existed adjacent to the north shoreline between the boat barrier anchor and Wild Goose Landing Park. Water at the interior portion of the shelf was 2'-3' deep, but access between the main waterbody and shoreline areas was cut off. No access onto or off of the water at north shoreline areas.	Access to the reservoir from privately owned docks was moderately to significantly impacted at half of the stationary docks. About half of floating docks functioned adequately.
South Shoreline opposite the downtown area	Docks along privately-owned shorelines did not reach the water's edge and vertical banks were exposed that appeared unstable with a high risk of erosion.	Access to the reservoir from privately owned docks was moderately to significantly impacted at half of the stationary docks. About half of floating docks functioned adequately.
Mid-Reservoir	Sand bars and mud flats were emergent making access to the reservoir difficult.	Access to the reservoir from privately owned docks was moderately to significantly impacted at half of the stationary docks. About half of floating docks functioned adequately.
South side of Steamboat Island	Docks did not reach the water and were unusable.	Access to the reservoir from privately owned docks was moderately to significantly impacted at half of the stationary docks. About

Location	Recreation Access at 4 feet below full pool	Recreation Access at 2.5 feet below full pool
		half of floating docks functioned adequately.
Cherry Creek Boat Launch	Very difficult to launch from the ramp. End of the ramp dropped off sharply, launch dock sat at a very steep angle. Shoreline areas actively calved and sloughed.	Public boat launching facilities and associated docks remain usable.
Upper End of Project Area	Access channels were shallow with more prominent obstacles posing an elevated risk to navigation. Floating mats of vegetation were prominent throughout the riverine section.	Access to the reservoir from privately owned docks was moderately to significantly impacted at half of the stationary docks. About half of floating docks functioned adequately.

In addition, the FERC Project boundary would not be adjusted under the no action alternative, which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes. Specifically, this would limit consistent oversight, management, and maintenance of sites such as Power Park, the South Shore Dispersed Recreation Area, and areas that connect Island Park to the north and south shorelines.

11.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser or 6,000 cfs or inflow will be maintained downstream during normal operations.

The number and type of facilities that provide opportunities for public recreation in the Project Area are adequate and meet the needs of visitors. Monitored recreation sites associated with the Project host approximately 35,000 group visits each year during the peak recreation season (*refer to* **Table 11-3**), and ratings of crowdedness are only slightly higher than "Not at all Crowded" (NorthWestern 2022). Surveys of visitors also indicate that recreationists are highly satisfied with recreation opportunities and amenities that are available and have little desire for more. When visitors have requested more amenities, more picnic facilities are generally desired, but visitors make no mention of needs for additional sites. Therefore, NorthWestern is not proposing to construct additional recreation facilities.

11.3.2.1 Impacts of Proposed Operational Changes

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations.

All developed and dispersed recreation areas are accessible by vehicle, on foot, or both, and exist within close proximity to the City and associated residential areas. Fluctuating reservoir elevations will have no effect on access to public recreation sites (NorthWestern 2023).

Recreational access to the Powerhouse Loop Trail, Sandy Beach and the South Shore Dispersed Recreation Area, below the dams and powerhouse, is not negatively affected by changes in operations. At Sandy Beach, the elevation and depth of the swimming hole changes as generation is increased or decreased, but flows are tempered by adjacent rock outcrops. The Low Water Route of the Powerhouse Loop Trail may be flooded during spring runoff, but not as a result of flexible capacity operations. The South Shore Dispersed Recreation Area is downstream of the spillways but upstream of the powerhouses, so only flow changes related to opening and closing of gates on the spillways (and not by changes to the volume of water going through the generating facilities) affect flows at this site. Island Park and Power Park do not offer access to the waterway so there is no impact to recreational access at these sites related to Project operations.

The North Shore Boat Restraint and North Shore Dispersed Areas only offer shoreline views of the waterway and shoreline fishing, but not good shoreline access to the waterway due to the vegetation along shallow shorelines at these sites, so reservoir fluctuations will have minimal to no impact on recreational access at these locations. There may be greater difficulty in some areas for shoreline fishing due to the amount of the dewatered shoreline at lower reservoir elevations, but it is not uniform throughout the reservoir and many areas are available for shoreline fishing, even during low elevations.

Public boat launching facilities at Wild Goose Landing Park and Cherry Creek Boat Launch remain usable at reservoir elevations down to 2.5 feet below full pool as both facilities had at least 2.5 feet of water at the end of the ramps at this elevation and access to launch docks was only slightly impacted at 2.5 feet below full pool (NorthWestern 2022). This was also true for the community subdivision boat ramps at Salish Shores and North Shore Estates. Therefore, reservoir elevation fluctuations will not significantly affect the availability of boat ramps and associated docks for public access to the waterway under the proposed operations. Impacts to public recreation facilities was much less than what was observed at 4-foot drawdown (*refer to* **Table 11-7**). Access to public docks and to the waterway from public docks is adequate at all reservoir elevations down to 2.5 feet below full pool (NorthWestern 2022).

Effects of proposed operations on privately-owned docks varies with the amount of reservoir fluctuation, dock location, and specifications of each dock. About 20 percent of all docks on the reservoir are stationary docks, while the remaining 80 percent are floating docks.

Access to stationary docks from the shoreline is unimpeded by fluctuating reservoir elevations since the elevations of these docks don’t fluctuate. However, access to boats moored at stationary docks was moderately to significantly impacted at elevations 1.5 feet below full pool and lower due the increased vertical distance between the top of the dock and the floor of the watercraft. Access to the reservoir from stationary docks was moderately to significantly impacted at half of the stationary docks when reservoir elevations were 2.5 feet below full pool due to dewatering of the docks (NorthWestern 2023).

Access to privately-owned floating docks becomes impeded at lower reservoir elevations, when gangways and access ramps become steeper as the floating dock elevation lowers with the water elevation, and some floating docks become pitched toward the waterway as the near-shore floats become grounded. Docks aligned perpendicular to the shoreline were impacted less than docks aligned parallel to the shoreline as a larger portion of perpendicular docks typically remained floating. The same is true for floating docks with longer gangways or access ramps compared to those that were shorter, which were typically angled more steeply during full pool than longer gangways. Considering access to floating docks, overall, including the steepness of gangways, whether the floating dock remained fairly level with the water or was pitched due to grounding of near-shore floats, and whether the floating dock remained floating (and thus was not dewatered), about 90 percent of floating docks functioned adequately at 1.5 feet below full pool, about 70 percent functioned sufficiently at 2.0 feet below full pool, and about 50 percent of floating docks functioned adequately at 2.5 feet below full pool (NorthWestern 2022).

Aquatic vegetation, native and invasive, are abundant along shallow shorelines. In many cases, this vegetation surrounds docks and impacts access areas since much of the submerged vegetation is just below the water surface at full pool elevation and occupies the top 2 to 3 feet of the water column, which is the same area that swimmers and boats occupy. Results from the Operations Study demonstrate a potential loss of aquatic vegetation in the near shore area up to 18 inches of water depth range (from full pool) which would benefit recreation in the near shore areas.

11.3.2.2 Impacts of Proposed Project Boundary Change

NorthWestern also proposes a Project boundary adjustment that will include Project recreation sites, providing for jurisdiction over those site and facility resources by NorthWestern and FERC to ensure public recreation needs are met.

The number and type of facilities that provide opportunities for public recreation in the Project Area are adequate and meet the needs of visitors. Monitored recreation sites associated with the Project host approximately 35,000 group visits each year during the peak recreation season (*refer to* **Table 11-3**), and ratings of crowdedness are only slightly higher than "Not at all Crowded" (NorthWestern 2022). Surveys of visitors also indicate that recreationists are highly satisfied with recreation opportunities and amenities that are available and have little desire for more. When visitors have requested more amenities, more picnic facilities are generally desired, but visitors make no mention of needs for additional sites. Therefore, NorthWestern is not proposing to construct additional recreation facilities. However NorthWestern is proposing to modify the Project boundary to incorporate several existing recreation sites.

The proposed Project boundary will incorporate the sites depicted on **Figures 11-19 and 11-20** including:

- The entirety of Power Park.
- The North Shore Parking Area, the north end of the Gallatin Street Bridge (where the automatic vehicle gate and the ADA parking spot are located) as well as the South Shore Parking Area (adjacent to the Historic High Bridge) and vault latrine, and the entirety of the Historic High Bridge, to the Island Park recreation site.
- The entirety of the South Shore Dispersed Recreation Area and adjacent NorthWestern-owned shoreline lands.
- An expanded boundary around Wild Goose Landing Park to include the downstream picnic area to the boat launch area currently within the Project boundary.

Figure 11-19: Aerial view of proposed Project boundary modification at Power Park, Island Park, and South Shore Dispersed Recreation Area.

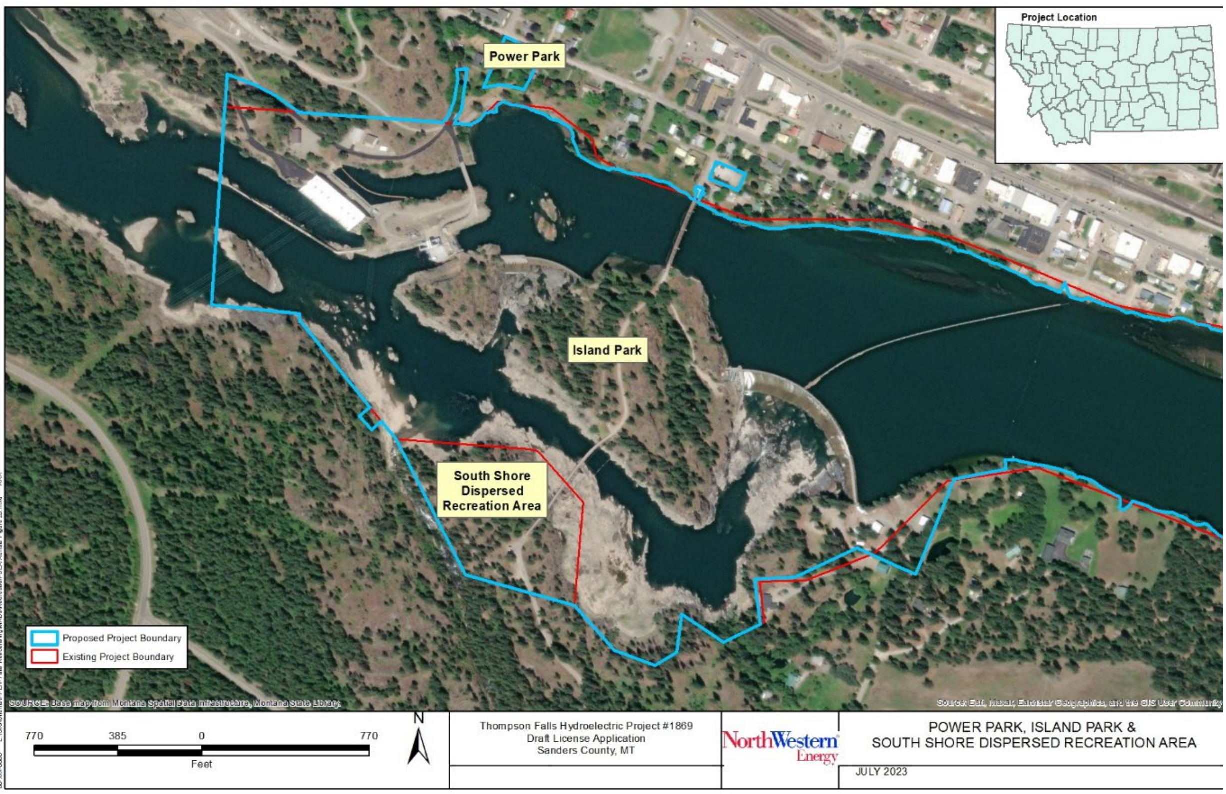
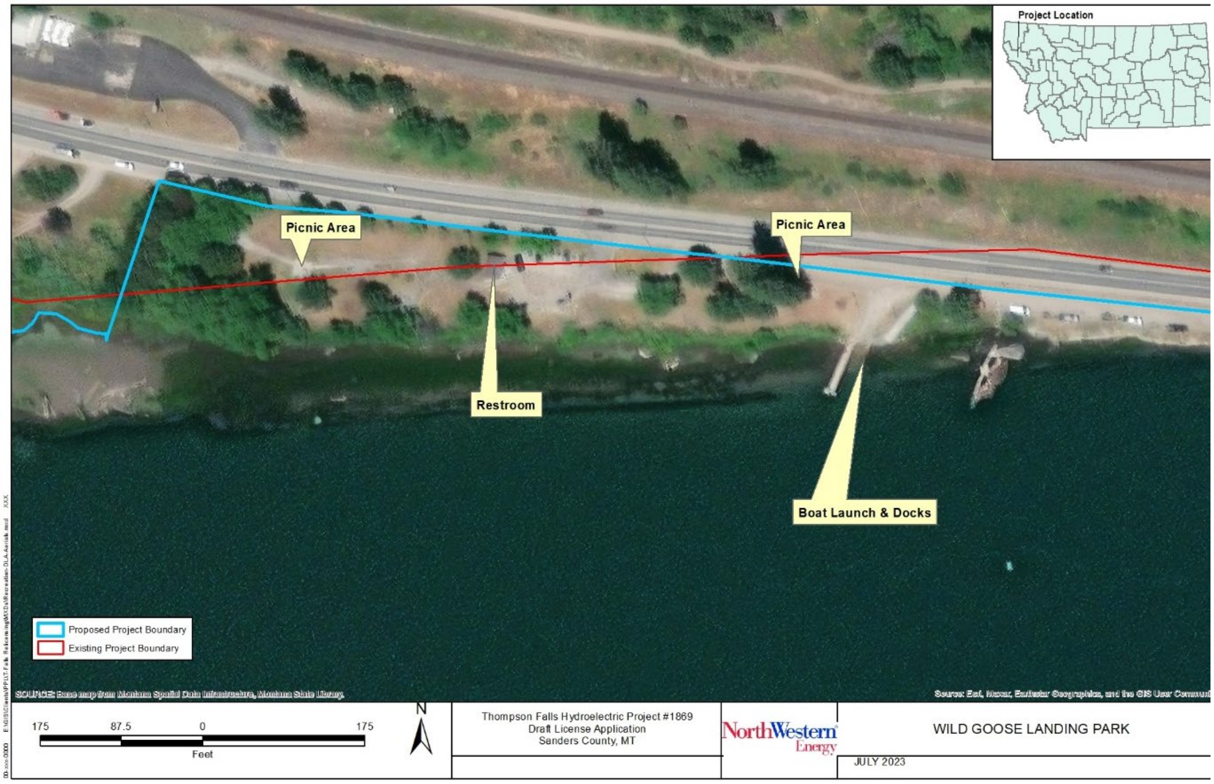


Figure 11-20: Proposed Project boundary modification at Wild Goose Landing Park.



Including these sites in the Project boundary will align the Project boundary with current site management and jurisdiction. In addition, it will provide a mechanism for cooperative management and assurance that the sites continue to be operated and maintained through the new license term.

NorthWestern proposes to operate and maintain Power Park, Island Park, and the South Shore Dispersed Recreation Area to provide recreation access and amenities to the public. Finally, NorthWestern proposes to cooperatively manage Wild Goose Landing Park with the City to provide adequate water access and recreation opportunities. NorthWestern will develop a Recreation Management Plan in consultation with appropriate Relicensing Participants, which will be filed with FERC for approval.

11.4 Unavoidable Adverse Impacts

Waterway fluctuations due to flexible capacity generation will impact, in varying degrees, access to private docks and access to the waterway from private docks, based on multiple factors. Some private docks appear to have been built to only provide access to the reservoir at or near full pool elevations, and not to withstand reservoir fluctuations as proposed or as allowed in the current license. These structures are generally floating docks that don't extend very far from shore or have short gangways or are stationary docks. Impacts to private recreational access for some of the private dock structures that exist within the Project area will be unavoidable as they were not designed to accommodate reservoir fluctuations.

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12. Cultural Resources

12.1 Affected Environment

12.1.1 Cultural Resources Background Information

Cultural resources are evidence of past human use of an area. Management of cultural resources involves the long-term preservation of their historic values and consideration of the effect of a licensee's action on them. Cultural resources may include the Project facilities and other historic architectural and engineering properties, precontact and historic archaeological sites, and properties of traditional religious and cultural significance to Native American tribes (FERC 2002).

The lower Clark Fork River is located within a unique cultural and environmental region referred to as the Kootenai-Pend Oreille section of the Eastern Plateau culture area. Previous research has revealed extended and continuous human occupation of the region beginning possibly 12,000 years ago (Krigbaum 2016). Precontact hunter-gatherer land use resulted in numerous occupational sites, lithic scatters, rock cairns, burials, game drives/traps, and culturally modified trees. Comparatively large occupational sites are usually limited to major river drainages, but Native American peoples frequented higher elevation mountainous areas during the summer months as well. They developed travel routes traversing major stream drainages and saddle and ridge systems. These higher elevation areas provided hunter-gatherers with a wide range of resources from roots, seeds, and berries to deer, elk, and mountain sheep (Bacon 2013).

The Clark Fork River Valley surrounding Thompson Falls is at the core of traditional Kootenai, Salish, and Pend d'Oreille tribal territories (Schwab et al. 2001). For many millennia those tribes occupied a vast tract of the Northern Rockies, Plains, and Plateau of Western North America (CSKT 2020). The Clark Fork River served as those people's road, and it continues to be of central importance to tribal life in the region.

Thompson Falls was named after British explorer, geographer, and fur trader David Thompson who founded the North West Company fur trading post called Salish House in 1809. The community is located next to natural waterfalls on the Clark Fork River. The arrival of the railroad in 1881 brought the first real Euro-American activity to the area. Two years later, when the gold rush hit nearby Coeur d'Alene, Idaho the town grew to accommodate the men going over the Murray Trail to the mines. It is estimated that up to 5,000 men passed through the nearby settlement of Belknap, drinking in the saloons and sleeping in tents or one of the hotels. When the settlement of Thompson Falls forced the train to stop short of Belknap, another more popular trail developed up Prospect Creek over the route known now as Thompson Pass. The original townsite of Thompson Falls was surveyed in 1893, with the first substantial period of expansion and development occurring between 1905 and 1917. The Thompson Falls Dam, in operation since

1915, was constructed atop the original falls (SHPO 1986). Its electrical power supply was a major contributor to all manner of industrial, agricultural, and commercial improvements in the area during the early 20th century.

12.1.2 Previously Recorded Cultural Properties

In 2017 and 2022, NorthWestern requested the SHPO complete file searches of the 23 land sections encompassing the Thompson Falls Project. The resulting file searches (SHPO References 2017090701 and 2022120101) revealed that the SHPO holds records documenting nearly 40 cultural resource inventory and/or documentation projects that have been completed within those land sections. Additionally, review of the Library of Congress' records identified seven Historic American Building Survey/Historic American Engineering Record documentation projects conducted within those land sections. Finally, consultation with the Lolo National Forest provided information concerning four past or ongoing cultural resource investigations that extend within the sections.

NorthWestern reviewed all reports identified in the SHPO, Library of Congress, and Lolo National Forest file searches and determined that 25 inventory or documentation projects encompass lands within the Thompson Falls Project APE. **Table 12-1** below lists those projects.

Table 12-1: Previous cultural resource inventory and documentation projects.

Date	Author(s)	Title
1982	Bowers and Hanchette	An Evaluation of the Historic and Prehistoric Cultural Resources in the Thompson Falls, Ryan, and Hauser Dam Areas
1983	Greiser	Cultural Resource Inventory Thompson Falls Canada Goose Brood Rearing Project Area
1984	Murphy	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Dry Channel Bridge (MT-29)
1984	Murphy	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Main Channel Bridge (MT-28)
1986	Koop	National Register of Historic Places Inventory-Nomination Form: Thompson Falls Hydroelectric Dam Historic District
1991	Wyss and Axline	Cultural Resource Inventory and Assessment of F 6-1(48)52 Thompson Falls East
1993	Johnson	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Powerhouse Forman's Bungalow (MT-90-A)
1993	Johnson	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Garage (MT-90-C)
1993	Johnson	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Chicken House (MT-90-B)
1995	Rossillon	Thompson Falls Island Thompson Falls Hydroelectric Project (FERC No. 1869) Cultural Resource Inventory and Evaluation
1997	Thompson, Schneid, and Hubber	Report of a Cultural Resources Inventory of the Eddy Flats Project Corridor
2000	Rossillon	Thompson River – East Highway Reconstruction and Bridge Replacement
2008	Dickerson	Thompson Falls Hydroelectric Development Proposed Fish Ladder Project
2008	Renewable Technologies, Inc.	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Main Channel Dam (MT-90-D)
2008	Renewable Technologies, Inc.	Historic American Engineering Record, Thompson Falls Hydroelectric Project, Warming Hut (MT-90-E)
2012	Bacon, Karuzas, and DeCleva	Lolo National Forest Heritage Program Inventory Report, Clark Fork Corridor Fuels Reduction
2014	Bacon	Lolo National Forest Heritage Program Inventory Report, Yellowstone Pipeline Abandonment on Lolo National Forest Lands
2016	Krigbaum	Class III Cultural Resource Investigations of Taft-Hot Springs No. 1 Access Roads
2016	Karuzas	Cultural Resource Report: Copper King Fire
2017	New, Sackman, and Harder	Cultural Resource Survey for the Hot Springs-Noxon Transmission Line Project within Lolo National Forest
2018	Karuzas	Northwestern Energy Thompson Falls to Burke A & B 115kV Transmission Line

Date	Author(s)	Title
2018	Dickerson	Thompson Falls-Kerr 115kV A-Line Structure Relocations, Sanders County, Montana
2019	Dickerson	Thompson Falls Shoreline Stabilization
2019	Dickerson	Thompson Falls Trail Addition
2022	Scheuring	Cultural Resources Report West Lolo Fire Complex and Thorne BAER

Notes: kV = kilovolts

The 25 previous cultural resource investigations resulted in documentation of 11 cultural properties that reportedly lay within, or appear to abut, the Project APE. Many of those were documented prior to the development or routine use of GPS technology and the recorders hand-drew the site boundaries on topographic maps. As a result, the exact locations and spatial extents of several previously recorded cultural properties are ill-defined. The 11 previously recorded cultural properties include nine historic sites and two that contain both precontact and historic components. Those are listed in **Table 12-2** below.

Table 12-2: Previously recorded cultural properties.

Site Number	Name	National Register Status	Ownership
24SA0130	Salish House	Undetermined	Private
24SA0131	Historic Resources of Thompson Falls (Multiple Properties)	Individual Properties National Register Listed	Private
24SA0165	Thompson Falls Hydroelectric Dam Historic District	National Register Listed	NorthWestern Energy
24SA0199	Northern Pacific Railroad	Eligible	Private
24SA0291	Precontact/Historic Artifact Scatter	Undetermined	Private
24SA0352	Plains-Thompson Falls pre-1924 Roadbed	Ineligible	Public and Private
24SA0593	Railroad Chinese Camp	Undetermined	Private
24SA0674	Yellowstone Pipeline	Ineligible	Public and Private
24SA0690	Livestock Corral and Storage Area	Undetermined	Private
24SA0719	Thompson Falls to Burke A & B 115kV Transmission Lines	Ineligible	Public and Private
24SA0756	Thompson Falls-Kerr A Transmission Line	Ineligible	Public and Private

Notes: kV = kilovolts

12.1.3 2021-2022 Cultural Resource Inventory

In 2021 NorthWestern updated the 1982 National Register listing of the only historic architectural and engineering property within the Project, namely the Thompson Falls Hydroelectric Dam Historic District. Because 34 years had passed since listing and several contributing elements to the district had been altered or demolished over time, the update served to clarify the current National Register status of each element. It resulted in an official amendment to the 1986 National Register listing accepted by the National Register in June 2022.

NorthWestern completed intensive cultural resources inventory of the Thompson Falls Project APE during the 2022 field season (**Figures 12-1** and **12-2**). It is important to note that the inventory included all areas where NorthWestern proposes changes to the Project boundary. (**Figures 12-3** and **12-4**). The 2022 cultural resource inventory resulted in documentation of six cultural resources that lay within the Project APE, all of which had been previously recorded. Fieldwork revealed that five previously recorded cultural properties reported to be within or abutting the Project APE are, in fact, outside the Project APE. No new cultural properties were identified.

The six cultural properties within the Project APE are portions of the Thompson Falls Hydroelectric Dam Historic District (24SA0165), Northern Pacific Railroad (24SA0199), Plains-Thompson Falls pre-1924 Roadbed (24SA0352), Yellowstone Pipeline (24SA0674), Thompson Falls to Burke A & B Transmission Lines (24SA0719), and Thompson Falls-Kerr A Transmission Line (24SA0756). Two of those properties, the Thompson Falls Hydroelectric Dam Historic District and Northern Pacific Railroad are eligible for, or listed in, the NRHP. The remaining four (24SA0352, 24SA0674, 24SA0719, and 24SA0756) are ineligible for National Register listing.

The 2022 cultural resource inventory revealed that five previously recorded cultural properties reported to be within or abutting the Project APE are, in fact, outside the APE boundary. Those include 24SA0130 (Salish House), 24SA0131 (Historic Resources of Thompson Falls), 24SA0291 (precontact/historic artifact scatter), 24SA0593 (railroad Chinese camp), and 24SA0690 (livestock corral and storage area).

Figure 12-1: Thompson Falls 2021-2022 inventory area, west end.

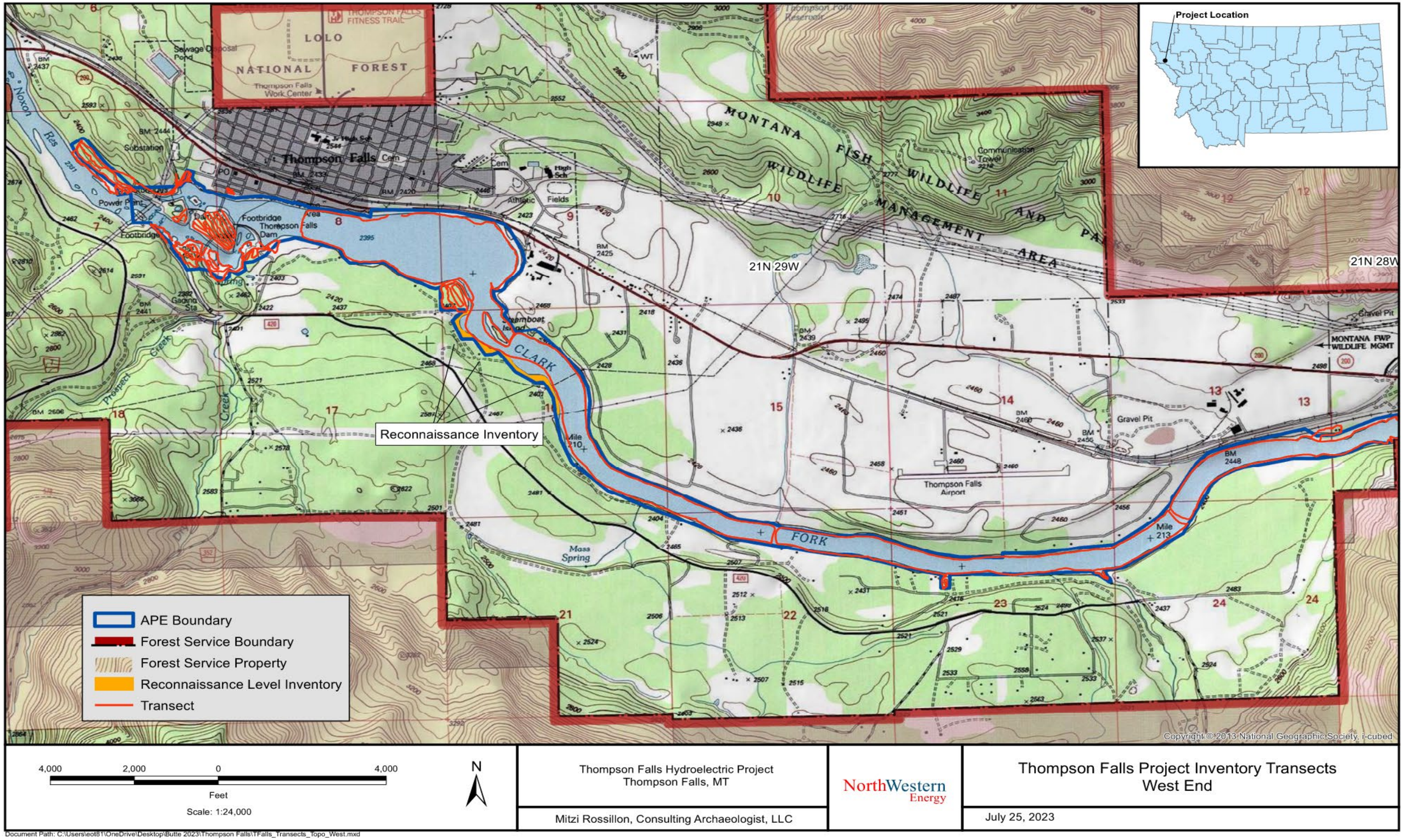


Figure 12-2. Thompson Falls 2021-2022 inventory area, east end.

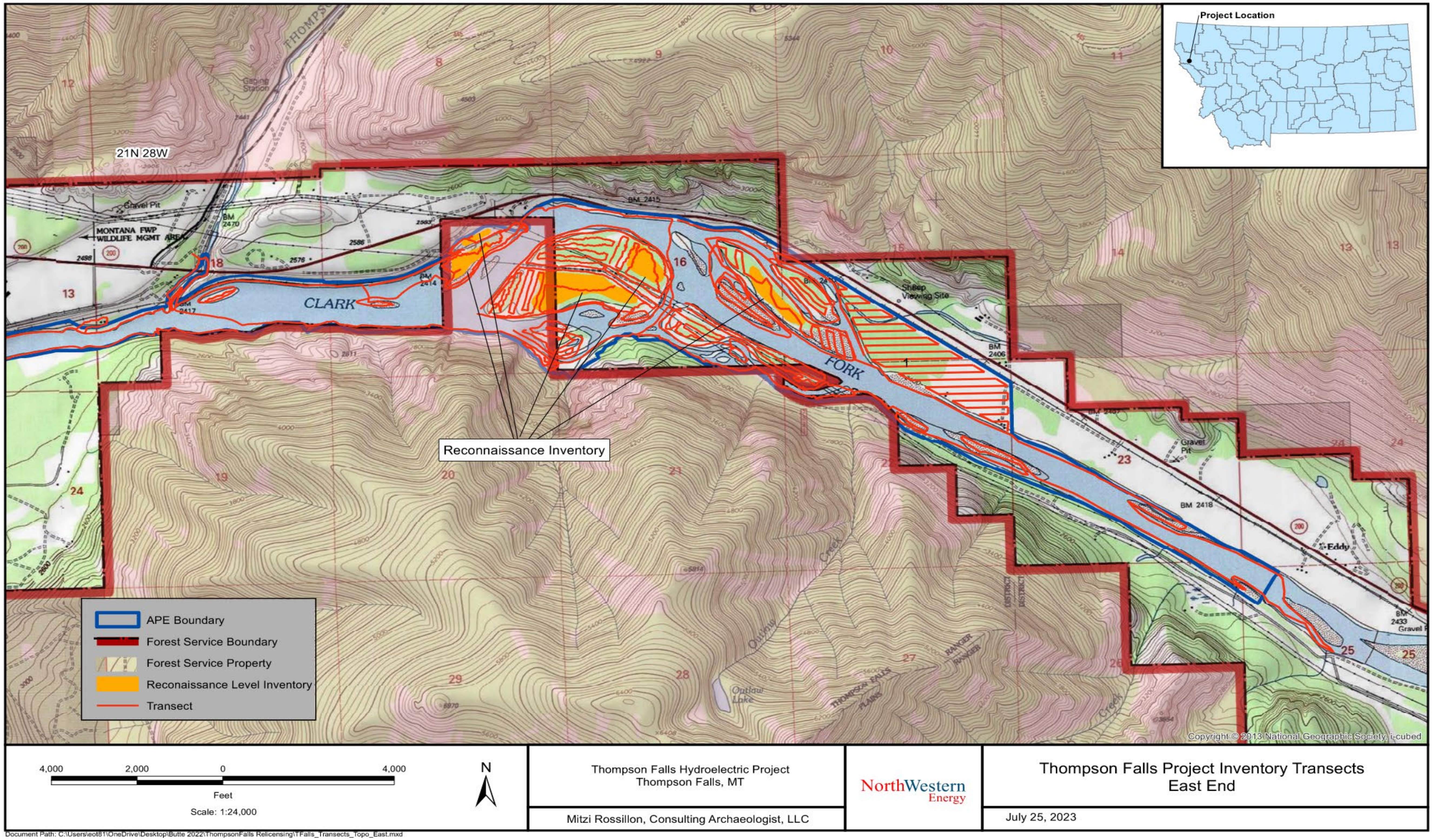


Figure 12-3. Thompson Falls proposed FERC license boundary, west end.

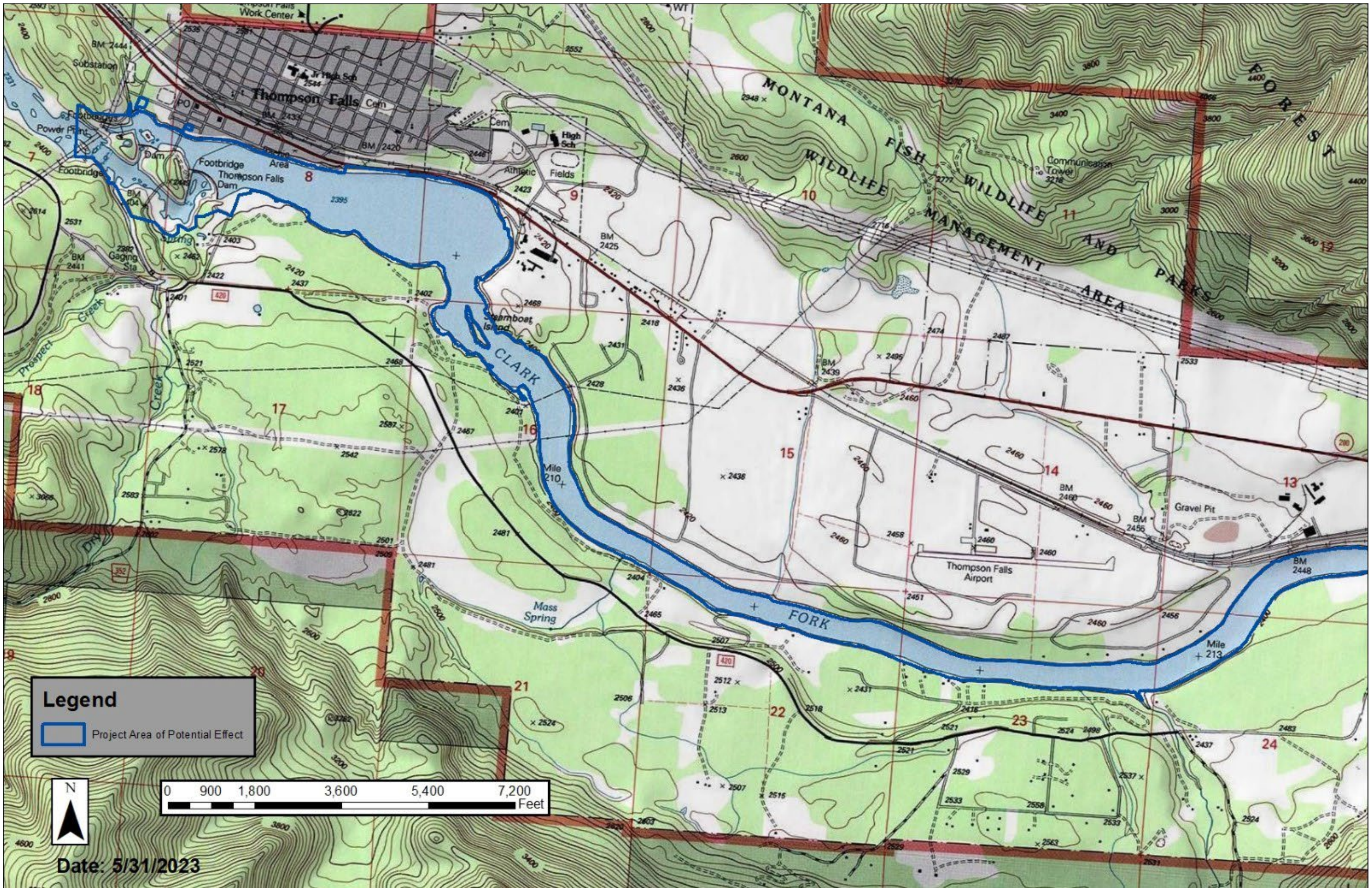
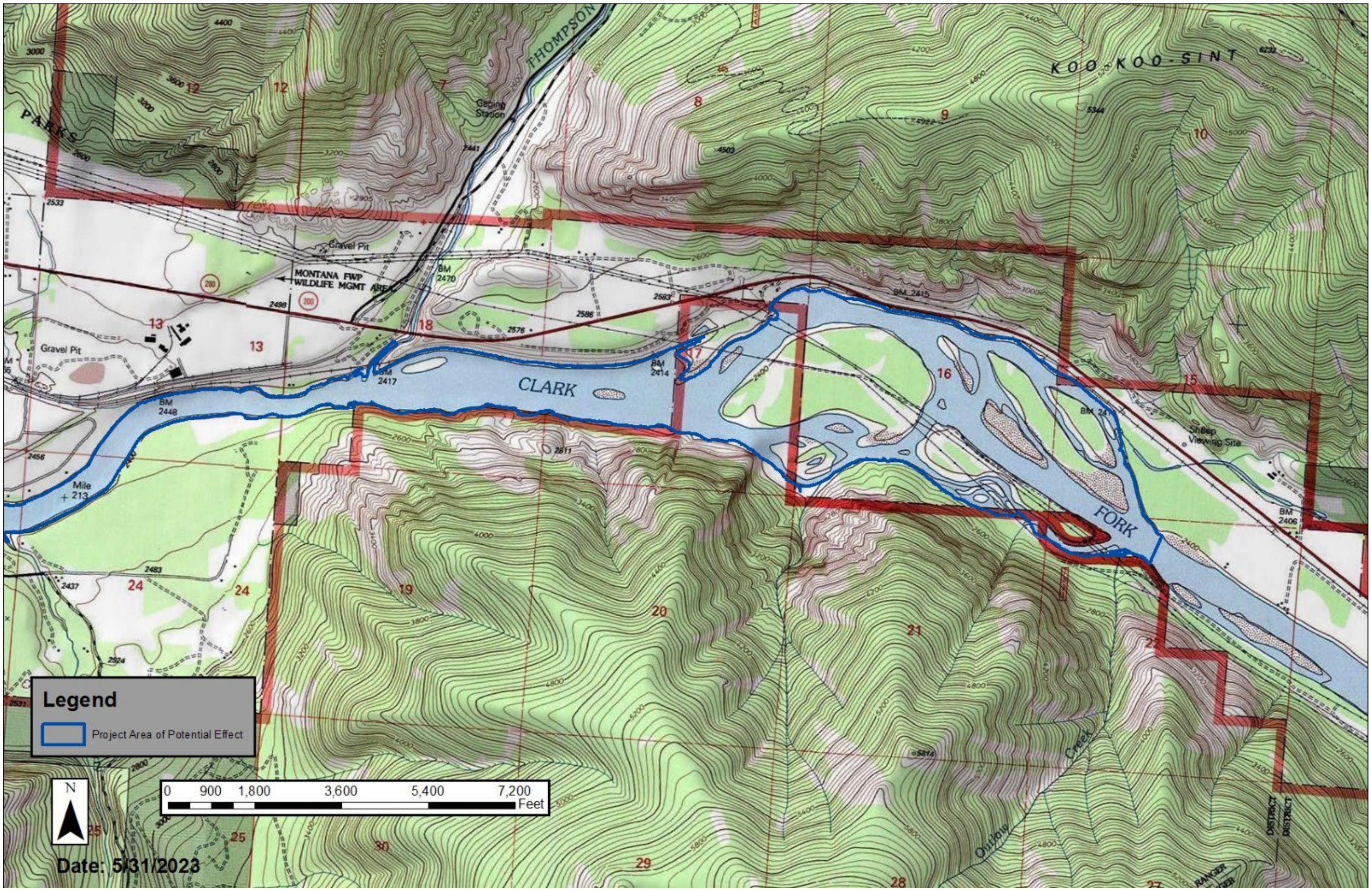


Figure 12-4. Thompson Falls proposed FERC license boundary, east end.



12.1.4 Existing Discovery Measures for Locating, Identifying, and Assessing the Significance of Resources

Discovery measures and assessments previously conducted are listed in **Table 12-1**. Further studies conducted throughout this relicensing are documented in the three Cultural Resources Study Reports (NorthWestern 2022a, NorthWestern 2022b, NorthWestern 2023).

12.2 Tribal Cultural and Economic Interests

NorthWestern knows of no Traditional and Religious Cultural Properties located within the APE or in the immediate vicinity of the Project.

NorthWestern contacted the Tribal Nations recommended by the SHPO of Montana and Idaho as potentially interested in the relicensing. The Tribal Nations recommended by the SHPO in Montana were the Chippewa-Cree of the Rocky Boy's Indian Reservation, Blackfeet, and the Confederated Salish and Kootenai. The Tribal Nations recommended by the Idaho SHPO were the Kootenai, Kalispel, and Coeur d'Alene Tribes. Outreach soliciting Tribal input has continued, most recently regarding the Historic Preservation Management Plan.

12.3 Environmental Measures

12.3.1 Existing Environmental Measures

NorthWestern addresses cultural resources management per license Article 408. NorthWestern undertakes various measures to address potential effects to known cultural properties as a result of developments on the Project. Under consultation with the Montana SHPO, where ground-disturbing actions are proposed, NorthWestern conducts cultural resource inventories and, when necessary, proposes measures to avoid or mitigate adverse effects to any properties listed in or eligible for listing in the NRHP.

12.3.2 Proposed Environmental Measures

NorthWestern has prepared a draft HPMP that proposes a protocol for addressing impacts to National Register-listed or -eligible Historic Properties that result from Project operations. The draft HPMP, was submitted to the Montana SHPO, Tribal entities, and select state and federal agencies on June 8, 2023, with a request for review and comment by July 10, 2023. Comments were received from Montana SHPO on July 3, 2023, and Montana DNRC on June 9, 2023. NorthWestern is currently revising the draft HPMP in response to the comments received. The draft HPMP, is attached to this DLA in Volume VI, being filed as Privileged, not for public distribution. The revised final HPMP will be filed with the FLA.

12.4 Environmental Effects

12.4.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures**, of this Exhibit E would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures**, of this Exhibit E would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations. Under the current license, reservoir water level fluctuations to 4 feet below full pool could occur periodically.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the terms and conditions of the current license, cultural resource inventories are required prior to any Project "construction or development" if the construction or development is not covered by a previous inventory. Effects analysis should consider if such actions would impact Historic Properties and develop impact mitigation measures in cases of an adverse effect.

12.4.2 Applicant's Proposed Alternative

No new construction is proposed as part of the Applicant's proposed alternative so it would have no effects to cultural resources.

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. Based on the findings of the Operations Study (NorthWestern 2022c) no effects would occur to cultural resources as a result of the Applicant's proposed alternative to fluctuate the reservoir.

Additionally, under the proposed alternative, an HPMP would be developed which will provide enhanced clarity and guidance for cultural resource management.

NorthWestern is also proposing modifications to the Project boundary, resulting in a proposed new FERC Project APE (*refer to* **Figures 12-3** and **12-4**). This proposal will also have no effect on cultural resources (*see* **Exhibit E - Sections 12.4.2.1 – Archaeological Properties** and **12.4.2.2 – Historic Architectural & Engineering Properties**).

12.4.2.1 Archaeological Properties

Modifying the Project boundary has no effect on National Register-listed or -eligible archaeological resources because none are known to exist on the lands being removed from the Project boundary. A short segment of a 57-mile-long linear site (24SA756) that is within the upper (east) end of the inventory (existing) APE will be excluded from the new proposed FERC boundary, but neither the segment nor the site as a whole is eligible for National Register listing.

PM&E projects outside the Project APE for fisheries or recreation that may be proposed in the FLA could affect precontact and/or historic archaeological properties. Any such projects will be subject to the procedures proposed in the HPMP for inventory, National Register evaluation, finding of effect, and impact mitigation measures.

12.4.2.2 Historic Architectural & Engineering Properties

The proposed alternative does not anticipate any demolitions during the term of the license, but NorthWestern acknowledges that under either alternative, alterations or modification may be required to maintain Project operation. NorthWestern will follow the protocol established by the final HPMP specific to proposed alterations or modifications to architectural, engineering, and historic archaeological elements that contribute to the district's National Register listing cultural resources. The HPMP will identify required impact mitigation measures should an alteration or modification constitute an adverse effect.

12.5 Unavoidable Adverse Impacts

No new construction is proposed but unavoidable adverse impacts to select elements of the Thompson Falls Hydroelectric Dam Historic District might be expected over the life of the new license. As Project equipment becomes obsolete, available replacements and their modes of operation may not include historically appropriate equivalents. In recognition of the need for continued efficient and safe future facility operation, standard mitigation measures will be employed under the terms of the final HPMP in instances where adverse impacts cannot be avoided. These unavoidable adverse impacts would occur under either the no action alternative or the proposed alternative but would be more effectively mitigated under the proposed alternative by virtue of implementing the HPMP.

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13. Land Use

This Section describes the land use in the Project boundary, and within 0.5 mile of the Project. Lands used for recreation are addressed in more detail in **Exhibit E - Section 11 – Recreation**, of this Exhibit E

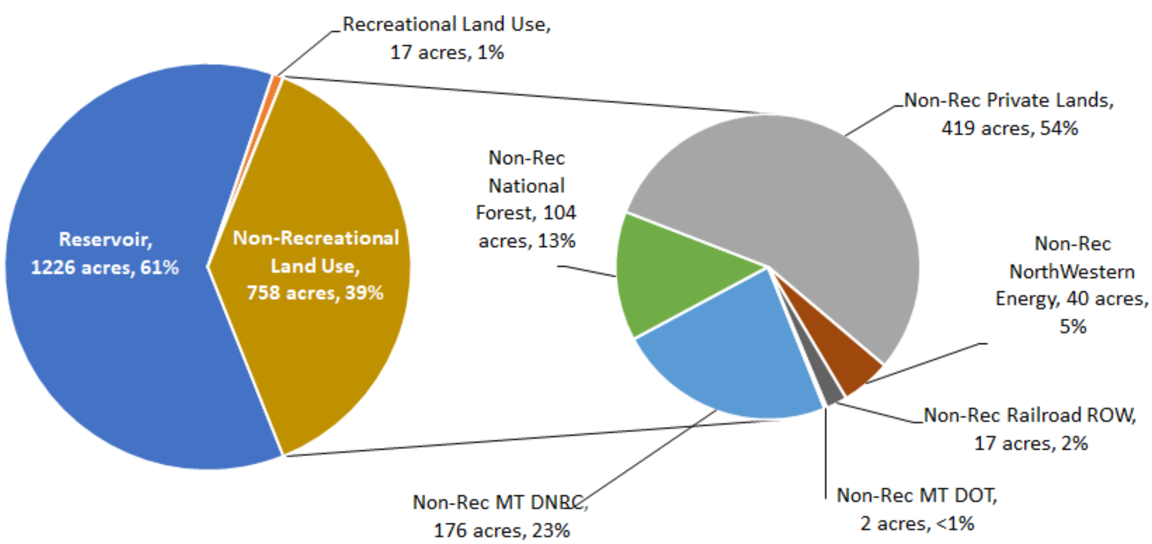
13.1 Affected Environment

Within the 2,001-acre current Project boundary there are 1,226 acres of river and reservoir (surface water) not including the islands, and 775 acres of non-reservoir. Of the 775 acres that are non-reservoir, about 17 acres are associated with recreational land uses, and the remaining 758 acres are associated with non-recreational land use.

13.1.1 Non-recreational Land Use and Management Within the Project

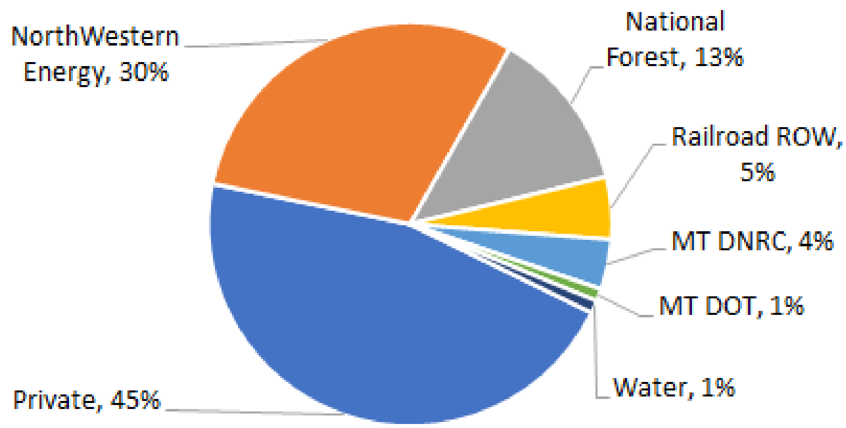
Of the 758 non-recreational acres in the current Project boundary, NorthWestern owns 40 acres, with the majority under and adjacent to the dams and powerhouses used for Project operations, as well as narrow slivers on the edge of the reservoir in various locations. Private lands consisting of a mix of large parcels, subdivision lots, and city lots comprise about 419 acres of non-recreational lands. Many private lands contain residential buildings. The Montana Department of Natural Resources and Conservation manages about 176 acres, which are largely open space. National Forest System Lands include 104 acres which are largely open space forest lands. Railroad right-of-way and state of Montana lands managed by the Montana Department of Transportation as Montana Highway 200 right-of-way comprise the approximate remaining 17 acres and 2 acres, respectively (**Figure 13-1**).

Figure 13-1: Use and ownership of lands within Project.



The Project has a perimeter length of 27 miles, comprised of a mix of public and private lands as shown in **Figure 13-2**.

Figure 13-2: Land use and ownership of Project perimeter.



13.1.2 Recreational and Non-Recreational Land Use and Management Adjacent to the Project

Lands within a 0.5 mile of the Project encompass an area of 8,589 acres. The largest land use category is privately-owned, large rural lots, comprising 3,728 acres (43%). Some of these lots have homes on them and others are vacant. LNF lands comprise the second largest land use category, accounting for 2,000 acres (23%). One specific LNF area – the Mule Pasture – is situated at the north edge of Thompson Falls and is specifically managed for trail-related recreation (walking, day hiking, exercising, etc.).

The third largest land use category is privately-owned, small rural lots, comprising 1,204 acres (14%). Many of these lots exist as reservoir-frontage and reservoir-view lots since much of the private shoreline on the Thompson Falls Reservoir has been subdivided and developed. The Cherry Creek Access Site, a public access site located amidst a shoreline subdivision on the south shoreline and managed by Sanders County, offers small watercraft launching and day use facilities.

The fourth largest land use category is a 474-acre mixed-use area to the east of the Thompson Falls city limits. This mixed-use includes a grocery store, hardware store, commercial buildings, residences, and other uses on large lots. Areas along the north shoreline east of Wild Goose Landing Park (included in the "city" land use category) offer dispersed public access for shoreline fishing.

The fifth largest land use category is the City, consisting of 422 acres (6%). Thompson Falls, county seat of Sanders County, has a population of 1,336 (as of 2020) including restaurants, hotels/motels, municipal buildings, various stores, residences, and professional service offices. Developed recreation opportunities within this land use category include public parking for access to Island Park, day use of Power Park and the picnic pavilion facilities, as well as access to the Powerhouse Loop Trail near the original powerhouse, and the community's Rose Garden Park, which offers playground equipment, benches, and picnic facilities.

The sixth largest land use category is land owned by NorthWestern near the dams and powerhouses, as well as other non-Project utility facilities.

The seventh largest land use category includes Montana School Trust Lands managed by the Montana Department of Natural Resources and Conservation for open space and public access.

The eighth largest land use category contains lands managed by FWP, including the Mount Silcox Wildlife Management Area and a Rocky Mountain bighorn sheep wildlife viewing turnout along Highway 200.

The last three land use categories are an active sawmill comprising 105 acres, the Thompson Falls Airport consisting of 86 acres, and the Clark Fork River downstream of the Project, consisting of 35 acres.

While not broken out as separate acreages, there are other land uses within the 0.5-mile buffer. These include the BNSF Railway (railroad), State Highway 200, the Yellowstone Pipeline, and NorthWestern transmission lines.

13.2 Environmental Measures

13.2.1 Existing Environmental Measures

Shoreline management is guided by NorthWestern's "*Shoreline Standards - Standards for the Design, Construction, Maintenance and Operation of Shoreline Facilities on NorthWestern Hydroelectric Projects*" which was adopted in January 2020 (NorthWestern, 2020). The purpose of this document is to provide general standards such that shoreline facilities are designed, constructed, maintained, and operated in a safe and environmentally friendly manner that protects and/or enhances adjacent recreation, natural and aesthetic resources. Following are some highlights of these standards:

- Standards are required to be implemented on NorthWestern-owned lands and are voluntary on lands not owned by NorthWestern.
- Standards require that on NorthWestern-owned lands that a land use license be entered into with NorthWestern for permissible improvements.
- Establishes the number, size, design, materials and other parameters for the construction of docks.
- Establishes design and shoreline vegetation requirements for bank stabilization projects. These design standards discourage rock rip-rap and encourage bio-engineering methods.

- Requires projects to comply with local, state, and federal permitting requirements.

NorthWestern's shoreline management standards are implemented in coordination with the Green Mountain Conservation District, the entity with jurisdiction to administer Montana's Natural Streambed and Land Preservation Act (also known as the "310 Law"). The purpose of this law is to protect and preserve natural rivers and streams and the lands and property immediately adjacent to them in their natural or existing state, and to prohibit unauthorized projects to minimize soil erosion and sedimentation.

13.2.2 Proposed Environmental Measures

NorthWestern will continue to manage shoreline development using its "*Shoreline Standards - Standards for the Design, Construction, Maintenance and Operation of Shoreline Facilities on NorthWestern Hydroelectric Projects*" (NorthWestern 2020).

13.3 Environmental Effects

13.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2** – **Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the no action alternative, NorthWestern will continue to operate the Project under the terms of the current license and will continue to manage shoreline development using NorthWestern's *"Shoreline Standards - Standards for the Design, Construction, Maintenance and Operation of Shoreline Facilities on NorthWestern Hydroelectric Projects*" (NorthWestern 2020). The no action alternative will have no additional impact on land use in the Project area. The existing land use pattern within and adjacent to the Project has become well-established considering the Project has been present for more than a century. Any changes to land use would be caused by factors unrelated to the Project, such as subdivision and residential development.

13.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser or 6,000 cfs or inflow will be maintained downstream during normal operations.

No new development is proposed so there will be no impact to land use as a result of new construction. NorthWestern's proposed operations to fluctuate the reservoir will not impact land use other than that addressed in **Exhibit E - Section 11 – Recreation**, of this Exhibit E

NorthWestern is proposing to modify the Project boundary. The proposed Project boundary would encompass 1,536 acres. The proposed Project boundary would extend 0.3 miles downstream from the two Thompson Falls dams, and 10 miles upstream. The Thompson River, a major tributary to the Clark Fork River, enters Thompson Falls Reservoir about 6.2 miles upstream of the dam, and the lower 0.2 mile of the Thompson River is included within the proposed Project boundary. The proposed Project boundary incorporates some uplands in the area around the dams and powerhouses, and all of the island between the dams (Island Park).

Modifying the Project boundary results in changes in the acreage of lands within the Project boundary, but no significant changes to the land use in or near the Project, as described below. As shown in **Table 13-1,** the total acreage in the proposed Project boundary is less than the current Project boundary, but the number of acres of recreational lands is greater. This is because the proposed Project boundary has been modified in several locations to encompass existing recreational areas.

The 465-acre reduction in the Project boundary, starting over 10 miles upstream of the Thompson Falls dam, is not needed for Project purposes. In addition, the acreage in the Project boundary decreased when the boundary was adjusted to a contour elevation rather than the current metes and bounds survey. Details about the specific changes proposed to the Project boundary are found in **Exhibit E - Section 2.2.3 – Proposed Project Boundary**.

Table 13-1: Acreage in the current Project boundary and the proposed Project boundary

	Current Project Boundary (acres)	Proposed Project Boundary (acres)	Net Difference in acreage
Surface Water	1,226	1,092	-134
Recreational Lands	17	31	14
Other Land Use	758	413	-345
Total Project Boundary	**2,001**	**1,536**	**465**

The 479 acres being removed from the Project boundary are not needed for Project purposes and would have no impact on land use. The 14 acres being added will benefit recreation as described in **Exhibit E – Section 11 – Recreation**.

13.4 Unavoidable Adverse Impacts

There are no unavoidable adverse impacts to land use.

14. Aesthetic Resources

This Section provides a description of the aesthetics of the Thompson Falls Project, including views of the Project and views from the Project. Additionally, sounds and odors related to or surrounding the Project area are considered, as appropriate, as part of the Project's aesthetic quality.

14.1 Affected Environment

The Project lies in the Lower Clark Fork River valley between the Bitterroot and Cabinet Mountain ranges, adjacent to the City. Distant views are comprised of forested hillsides with occasional towering rock outcrops and grassy meadows. The Clark Fork River is not visible in distant views due to its meandering channel and forested banks.

Near ground views within the Project area include development related to the City, surrounding Thompson Falls Reservoir, and rural subdivision and residential development along Project shorelines. The main reservoir, which is the portion of the reservoir approximately 1.25 miles upstream of the dams, is visible from shorelines within the City as well as from a 1-mile segment of Montana Highway 200 where the highway flanks the northeast shoreline of the main body of the reservoir (**Photographs 14-1** and **14-2**). From the main reservoir upstream to the mouth of Thompson River, the Project reservoir becomes narrower and more riverine in nature, narrowing from roughly 600 yards wide in the main reservoir to about 150 yards wide in the upstream area. The upstream area is not visible from the City area or Highway 200 but can be viewed from adjacent shorelines that are a mixture of privately owned and public land (**Photographs 14-3**). River crossings of the Yellowstone Pipeline and electric transmission lines can be seen in areas upstream of the main reservoir.

The existing dams and powerhouses can be seen from shorelines in the immediate vicinity of the infrastructure but are otherwise screened from view by development. In addition, trees (predominately ponderosa pine and Douglas fir) and shrubs buffer views of Project facilities from the north and south shorelines as well as from Island Park, central to the existing generating facilities. Tree-lined edges at Island Park screen some views of north shore residential development for island visitors; only one privately-owned residence is visible on the south shoreline from Island Park. Waterway views from locations along the north shoreline of Island Park and the Gallatin Street Bridge include the reservoir upstream of the Main and Dry Channel dams as well as the new powerhouse (**Photographs 14-4**). From other shorelines of Island Park spillways and tailraces in downstream river sections of both dams, as well as the original powerhouse, the upstream fish passage facility and south shoreline of the Project are visible (**Photographs 14-5** and **14-6**).

Views from the south shoreline of the main reservoir can be seen from private residences and include the main reservoir body and City development on the north shoreline. Downstream of the Main Dam views from the south shoreline and Historic High Bridge include the Main Dam and Dry Channel Dam, the associated spillways and tailraces, as well as the original powerhouse (**Photographs 14-7**). Views from the north shoreline downstream of the Project facilities include the original powerhouse, tailrace, and timbered south shoreline (**Photographs 14-8**).

Middle ground views include hillside residences within a mile of the north shoreline, traffic along City streets and Montana Highway 200, and the BNSF Railway. Other middle ground areas have limited visibility from the Project area (or vice versa) due to the natural timber screening and topography of the valley floor.

Forested areas surround the Project and provide a backdrop for views. These areas are largely managed by the LNF with some private timber ownership and management. The LNF Plan (USDA 1986) defines Visual Quality Objectives (VQO) for each management unit on the LNF as part of the LNF's recreation plan and timber plan. VQO prescribe desired levels of scenic quality and diversity of natural features on National Forest System Lands. VQO classifications refer to the degree of acceptable alterations of the characteristic landscape but are not applicable to the immediate Project area.

Aesthetic conditions in the Project are affected by a variety of sounds from the surrounding area. Railroad traffic and loud horn blasts at railroad crossings adjacent to the downtown area can be heard from all points in the Project. Highway 200 traffic, including passenger vehicles, large semi-trucks, and emergency vehicles with sirens, can be heard from most places in the Project. The sound of rushing water masks these sounds to some degree near the spillways, and some areas are somewhat sheltered from the sounds of the area's activities, such as internal areas of Island Park. The audible alarm system associated with the Project, which sounds an alarm before any gate movement, opening or spill, can also be heard at areas directly adjacent to Project facilities, Island Park, and downstream of the powerhouse. At the upper end of the Project near the mouth of Thompson River, noise from the Thompson River Lumber sawmill plant is heard during hours of operation.

Olfactory characteristics vary among areas of the Project. Immediately adjacent to the Project waterway and facilities odors are typical of habitats that support fish and waterfowl. At Island Park, the South Shore Dispersed Recreation Area, and many other shoreline areas downstream of the dams, trees and shrubs offer additional smells of nature (pine trees, honeysuckle vines, snowberry shrubs, etc.) while developed shorelines in the City and residential areas may smell of human-based odors (train and vehicle exhaust, commercial kitchen exhaust, campfires, BBQ grills, etc.).

Photographs 14-1: **View of reservoir from the North Shore Dispersed Use Area/former sawmill site (top left) and Wild Goose Landing Park (top right), and view of Highway 200 from Wild Goose Landing Park (bottom photos).**

Photographs 14-2: **View of reservoir and Project facilities from within the City at the North Shore Boat Restraint (top left), near the Gallatin Street Bridge (top right), and upstream (bottom left) and downstream (bottom right) views from Power Park.**

Photographs 14-3: **Views of upstream reservoir area. View of south shoreline behind Steamboat Island just upstream of main reservoir (top left) and the upper reservoir area (top right), and of the north shoreline in the upper reservoir area with a train on the local track and sawmill buildings behind (bottom photos).**

Photographs 14-4: **View of Project facilities upstream and downstream from Gallatin Street Bridge (top photos), the main reservoir from Gallatin Street Bridge (bottom left) and north shoreline residential development from north shore of Island Park (bottom right).**

Photographs 14-5: Upstream fish passage facility and processing station from public viewing platform associated with upstream fish passage facility (top left), Main Dam and reservoir with north shore City area (top right), Historic High Bridge from Island Park (bottom left), and downstream area and South Shore Dispersed Recreation Area from Island Park (bottom right).

Photograph 14-6: Panorama view of Main Channel Dam from Island Park.

Photographs 14-7: **View of downstream area with powerhouse from south end of Historic High Bridge (top left), from South Shore Recreation Area (top right), Dry Channel Dam across the river channel from South Shore Dispersed Recreation Area (bottom left), and upstream view of the Main Dam tailrace from South Shore Dispersed Recreation Area (bottom right).**

Photographs 14-8: **View from north shoreline below Project facilities. Upstream view of original powerhouse (top left) and downstream of Sandy Beach and south shoreline (top right). View from high water route of Powerhouse Loop Trail, overlooking Sandy Beach and south shoreline (bottom left) and upstream of south shoreline and South Shore Dispersed Recreation Area (bottom right).**

14.2 Environmental Measures

14.2.1 Existing Environmental Measures

Requirements of Article 403 of the 1990 license amendment (FERC 1990) stipulated conditions for construction of the new powerhouse to reduce contrast with the surrounding landscape. Specifically, these measures included constructing a low-profile structure with a flat-formed, gray concrete exterior as well as using nonreflective conductors, insulators, and supporting structures on the new transmission line. These requirements were fully implemented in construction of the new powerhouse and will continue to be implemented as any additional structures and improvements are planned for the Project; no new structures or improvements are planned at this time.

14.2.2 Proposed Environmental Measures

No new measures pertaining to aesthetics resources are proposed.

14.3 Environmental Effects

14.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented, including limiting reservoir level fluctuations by only 2.5 feet, to reduce the effects of reservoir fluctuations.

Significant impacts to aesthetics were observed during the 2019 Operations Test, when the reservoir elevation was reduced to 4 feet below full pool. At 4-foot below full pool, shorelines consisted of many linear feet of exposed mud and rock, and in many cases submerged aquatic vegetation was also exposed. These newly exposed banks were unsightly (**Photographs 14-9**) and had strong odors associated with them. In addition, some areas of shallow benches of sediment that exist within the main reservoir body were also exposed, further degrading the viewshed and introducing odors of decaying organic matter.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Photographs 14-9: Shorelines at 4-foot below full pool South shoreline (left), and north shore along City limits (right).

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14.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser of 6,000 cfs or inflow will be maintained downstream during normal operations.

Aesthetic impacts were assessed when the reservoir was drawn down to a maximum of 2.5 feet below full pool. When reservoir elevation fluctuations occur as the Project is operated under flexible capacity generation, aesthetics are impacted to varying degrees as a result of rock and mud becoming exposed along the shoreline. Audible characteristics of the area are also impacted due to the warning signal for gate operations.

The amount and composition of substrate exposed during reservoir elevation reductions varies among shoreline areas. Areas that had up to 10 horizontal feet of shoreline exposed had a faint or moderate odor of decaying organic matter (NorthWestern 2022). As exposed areas increased beyond 10 horizontal feet, odors of decaying organic material became stronger. These odors were most pungent in 2021 when the lower elevations were held for a longer period of time (compared to 2022).

At 2.5 feet below full pool, most areas of the reservoir had 5 to 20 horizontal feet of exposed mud and rock. This was true for areas near the north end of Gallatin Street Bridge, along the north shoreline of the main reservoir adjacent to the City, and along both shorelines upstream of Steamboat Island. In some areas, large mud flats became exposed when the reservoir elevation was reduced to 2.5 feet below full pool, including the north shoreline of Island Park and near Wild Goose Landing Park, where 20 to 60 horizontal feet of mud and rock were exposed, as well as the North Shore Dispersed Use Area, which had up to 100 horizontal feet of mud and rock were exposed (**Photographs 14-10**). These mud flats can be unsightly and smell of decaying organic matter if exposed to summer heat for long periods of time. However, these impacts were less severe than those observed when the reservoir was 4 feet below full pool. Areas of less exposure also had odors that were less pungent than areas of greater exposure.

Since auditory characteristics associated with the Project are largely defined by nearby industry and transportation (trains, cars, emergency sirens, etc.) the impact of the Project has minimal effect on this aesthetic characteristic. One exception to this is the warning siren that is executed when gates will be moved, opened, or additional water is spilled. This siren is clearly (and intended to be) heard in areas adjacent to and downstream of the powerhouse and warns recreationists in and on the water that downstream flows will be changing. Operations under flexible capacity scenarios may require more gate movement and thus more sirens.

Proposed future operations have the potential to affect the aesthetics of the Project to varying degrees during flexible capacity operations that fluctuate the reservoir elevation.

Proposed future operations are not likely to impact LNF VQO's near the Project since the VQO's are prescribed for Forest System Lands that serve primarily as a backdrop to near-ground areas.

Photographs 14-10: Shorelines at 2.5 feet below full pool reservoir elevation. North shoreline of Island Park (top left), Wild Goose Landing Park (top right), Cherry Creek Boat Launch (bottom left), and south shore upstream of Steamboat Island (bottom right).

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14.4 Unavoidable Adverse Impacts

Unavoidable adverse effects to aesthetic resources will be intermittent as they relate to changes in the visual, olfactory, and auditory qualities of the Project when reservoir elevations fluctuate. As generation increases and reservoir elevations recede, shoreline areas will become exposed and have the potential to smell of decaying organic matter. However, proposed operations stipulate fluctuations of 2.5 feet or less rather than 4 feet as currently allowed, and odors of decaying matter are less prominent when less shoreline mud is exposed. Visual impacts may be greater in areas where shallow shorelines with sedimentation expose large mud flats at lowest reservoir elevations, but the majority of shoreline areas within the Project area will have exposures of less than 10 horizontal feet for the duration of the lowest reservoir elevation. Signals warning recreationists of impending water flow and elevation changes may increase in frequency but are a necessary component of public safety.

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15. Socio-Economic Resources

15.1 Affected Environment

15.1.1 Socio-Economic Conditions in the Project Vicinity

Sanders County in northwestern Montana borders the state of Idaho to the west and is defined by the Bitterroot Mountain Range along the southwesterly side and the Cabinet Mountains on the northeasterly side. The Clark Fork River is joined by the Flathead River in the eastern portion of the county and the two rivers – along with Highway 200 and the railroad corridor – divide the county along a northwest-southeast axis. The river valley topography facilitates primary highway access (Highway 200), railroad, residential development, limited cultivated agriculture, and Clark Fork River reservoirs impounded by three dams, of which the Thompson Falls Project is the most upriver hydro facility. The western two-thirds of the 1,733,000-acre county is characterized by steep forested mountain slopes divided by tributaries of the river and are predominantly public lands managed by the USFS or corporate owned timberlands. The eastern third is more open prairie and cultivated agricultural land.

Sanders County is the 18th most populated of Montana's 56 counties with a 2020 population of 12,400 as compared with the 2010 population of 11,413 (U.S. Census Bureau 2020). The Flathead Indian Reservation encompasses approximately the eastern third of the county. The county as a whole has experienced stable, slow growth over the last 20 years, though most of that growth has occurred in outlying areas while populations within municipal boundaries have remained fairly stable. Rural residential development is distributed along the valley floor with concentrations at the county seat of Thompson Falls (1,336 residents), Plains (1,106 residents) and smaller communities such as Trout Creek (277 residents) and Noxon (255 residents) (U.S. Census Bureau 2020).

Thompson Falls, located on Highway 200, is approximately in the middle of the county, about 100 miles northwest of Missoula, Montana, and 125 miles east of Spokane, Washington. Sandpoint, Idaho, is about 80 miles to the west. Highway 200 and a major rail corridor divide the City. The downtown area of the City is located along Main Street/Highway 200 and borders the Project's reservoir. The residential development that is most closely related to the Project area is the city of Thompson Falls as well as those outside of the city limits but within the same zip code (**Figure 15-1**), totaling 3,416 people (U.S. Census Bureau 2020) and accounting for 28 percent of the county's population.

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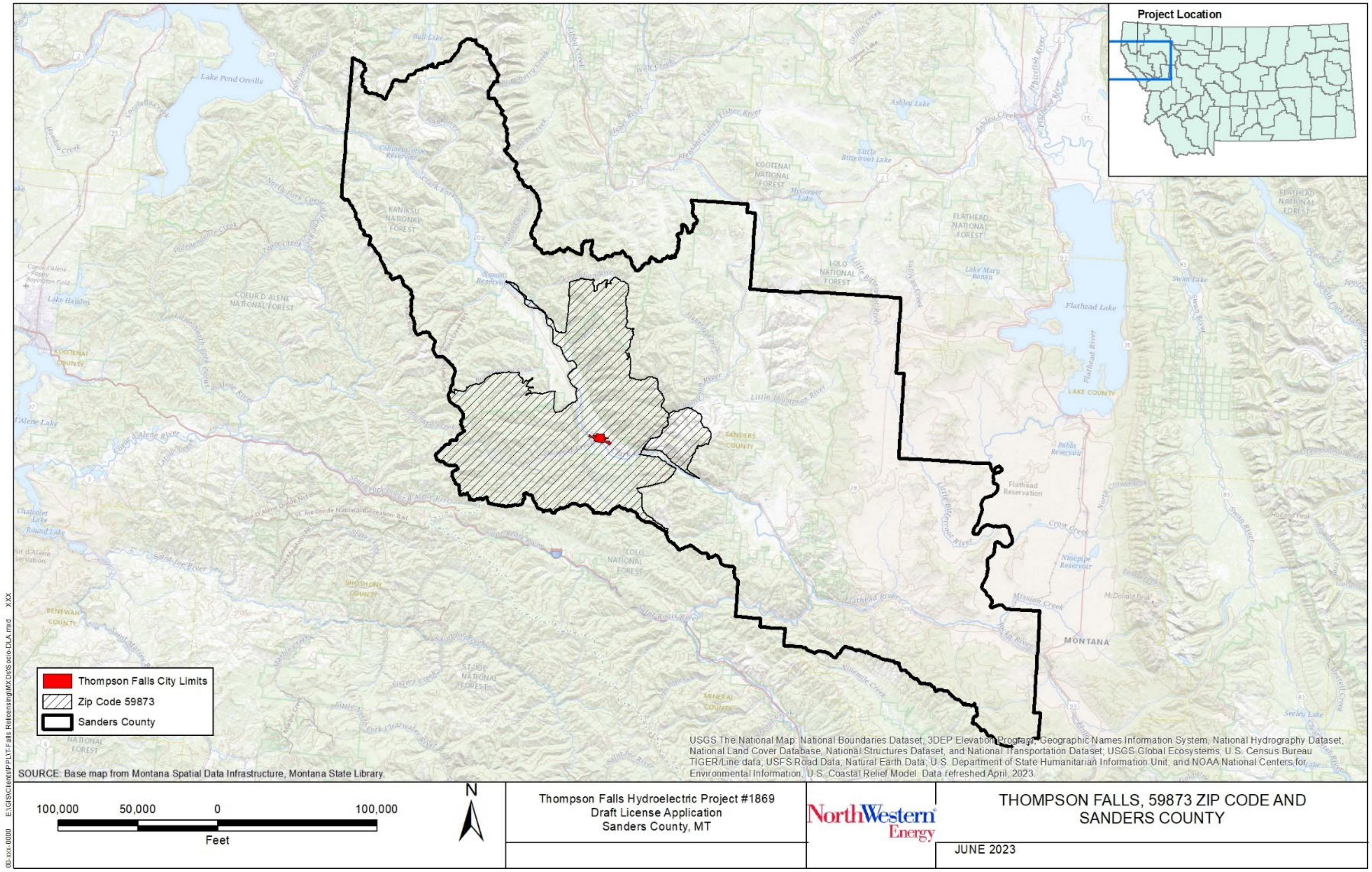
Figure 15-1: Boundaries of Thompson Falls, zip code 59873, and Sanders County, MT.



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The county economy has historically been based on timber harvest and processing. That industry has been in decline. Transition away from this industry amidst the recession of 2008 to 2010 was slow. The economic state that resulted is reflected in Sanders County's Distressed Communities Index[26] rating. The county ranked last in the state, accumulating 91 out of 100 possible points as averaged from 2007 to 2011 giving it a "distressed" ranking. However, that ranking improved for the timeframe 2012 to 2016, when the index fell 28.6 points to 62.4 putting it in the "at risk" ranking, reflecting improved economic conditions. As of June of 2023, there was further improvement with the index dropping to 52.5 points putting it in the "mid-tier" ranking (Economic Innovation Group 2023).

In Sanders County, average earnings per job increased 29.0 percent and per capita income increased 55.7 percent from 2000-2021. During this timeframe, the number of jobs in government decreased 3 percent, while jobs in non-service related and service related industries grew by 3 percent and 36 percent, respectively. Earnings increased in all three industries from 2001 to 2021, with a 58 percent increase in non-service industries, 78 percent increase in service industries, and a 19 percent increase in government jobs. The three industry sectors that added the most earnings from 2001 to 2021were construction ($20.5 million), retail trade ($19.0 million), and health care and social assistance ($33.0 million). In 2021, the per capita income was $45,526 for Sanders County compared with $61,504 for Montana. Since 1990, the annual unemployment rate ranged from a low of 4.3 percent in 2022 to a high of 16.3 percent in 1985. In 2021, people living below the poverty rate in Sanders County was 16.8 percent as compared with 12.5 percent for Montana (Headwaters Economics 2023).

In 2020, the median property value in Sanders County, MT was $251,600, and the homeownership rate was 77.1 percent (Data USA 2023). However, property values have increased dramatically in western Montana since 2020, and Sanders County is no exception. The National Association of Realtors indicates a median home price of $374,165 as of the first quarter of 2023 (National Association of REALTORS® 2023). According to the City's most current Master Plan, there are close to 60 businesses in the City, most of which are locally owned. Primary employment classes are office and professional services (41%, including health care, social assistance, construction, retail trade, and utilities), restaurants (24%), financial (18%), medical (15%) and entertainment (3%) (Land Solutions 2015).

The local economy is based on a variety of sources including agriculture, fishing, hunting, forestry, and mining. Thompson Falls had been a logging community for many years, but reductions in timber harvest coupled with decreased lumber production have reduced logging projects (BBER 2019).

According to 2017 Census of Agriculture data, Sanders County encompasses 642,640 acres of farmland, accounting for 36.4 percent of land area in the county. These lands include nearly 400,000 acres of large-tract woodlands for timber production, while the remaining 240,000 acres

[26] The Distressed Communities Index (DCI) combines seven complementary economic indicators into a single measure of community well-being, ranging from 0 to 100. Scores over 80 are considered distressed.

(approximately) can be considered true farms (USDA National Agricultural Statistics Service, 2019). These smaller farm operations are typically not self-sustaining and use off-farm employment to support them.

The area is popular among Montana residents and nonresident visitors for fishing and hunting. In 2018, the Montana Office of Outdoor Recreation reported that outdoor recreation in Montana generated $7.1 billion in consumer spending in 2018 and supported 71,000 jobs in Montana. Similarly, residents of Montana spent $3.61 billion on outdoor recreation in Montana in 2018 (Montana Office of Outdoor Recreation 2018). Sanders County is no exception to these spending patterns and positive impacts. The FWP statewide angling pressure estimates in 2020 estimated 2,430 angler use days (of Montana residents) on Thompson Falls Reservoir (League and Ball 2020), a significant contribution to the local economy.

Travel-related spending in Sanders County in 2018 is estimated at $54 million. Expenditures by out-of-state visitors are estimated at $17.9 million (ITRR 2018), while Montana resident travel spending totaled $36.1 million in the county (65% on day trips, 35% on overnight trips; Grau 2018). Hunting, fishing, and outdoor recreation are large components of these spending behaviors. Big game hunters spent $12.7 million in Sanders County in 2016; $6.2 million by nonresidents and $6.5 million by Montana residents. Elk hunters accounted for 52 percent of these expenditures, while deer hunters accounted for 48 percent (FWP RMU 2017).

Thompson Falls has one public school system and multiple churches to serve most denominations common to the area.

There is a lighted and surfaced airport approximately 4 miles east of Thompson Falls with a 2,200-foot runway. Regional service centers with commercial air services are located in Missoula and Kalispell (101 and 107 miles, respectively, from Thompson Falls) and Spokane, Washington (125 miles from Thompson Falls). There is no public transportation available. Highway 200 is a secondary travel corridor to Glacier National Park, 141 miles to the northeast.

15.1.2 Economic Benefits of the Thompson Falls Project

Sanders County and the Thompson Falls area benefit directly and indirectly from the Project. Property taxes that support county budgets are paid annually by NorthWestern. The 2022 annual property taxes attributed to the Thompson Falls Project was $2,967,441.

Salaries for five permanent staff are paid and filter through the local economy, as well as out-of-area staff, contractors, and supporting positions such as fisheries biologists with FWP that work at the Thompson Falls Project periodically and provide an economic benefit through their travel and accommodation expenses.

The Project's reservoir draws landowners who desire water frontage more so than inland properties, a feature that increases property values and property taxes paid by private owners.

Finally, providing high-quality, well-managed recreation sites to the public free of charge allows personal disposable income to support recreation trips (food, drinks, boat gas, fishing supplies, etc.) rather than site use fees.

15.2 Environmental Measures

Because NorthWestern has identified no adverse impacts to socioeconomic resources related to operation or maintenance of the Thompson Falls Project, no protection and mitigation measures are currently being implemented or proposed.

15.3 Environmental Effects

15.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E – Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E – Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

NorthWestern has identified no adverse impacts to socioeconomic resources related to operation or maintenance of the Thompson Falls Project under the existing license. Continuing operation of the Project will provide continued economic benefit to the Project area.

15.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser or 6,000 cfs or inflow will be maintained downstream during normal operations.

NorthWestern has identified no adverse impacts to socioeconomic resources related to operation or maintenance of the Thompson Falls Project under NorthWestern's proposed alternative. Future operation of the Project will continue to provide economic benefits to the Project area.

15.4 Unavoidable Adverse Impacts

No unavoidable or adverse impacts to socioeconomic resources are anticipated due to the proposed operations.

16. Environmental Justice

16.1 Affected Environment

In May of 2023, NorthWestern completed an Environmental Justice Study (EJ Study) of the Project (NorthWestern 2023) in accordance with Schedule A of FERC's July 5, 2022, letter with additional staff study requests. The EJ Study followed the methodology of the EPA's *Promising Practices for EJ Methodologies in NEPA Reviews* (2016) in addition to the guidance outlined in Schedule A.

16.1.1 EJ Study Objectives

The goals and objectives of the EJ Study were to determine if any environmental justice communities (EJC) exist in or near the Project, and if so, the potential effects of the Project on those communities.

The EJ Study had five objectives:

1. To identify the presence of EJCs in the vicinity of the Thompson Falls Project and identify outreach strategies to engage the identified EJC in the relicensing process, if present.
2. To identify the presence of non-English-speaking populations that may be affected by the Project and identify outreach strategies to engage non-English-speaking populations in the relicensing process, if present.
3. To discuss effects of relicensing the Project on any identified EJC and identify any effects that are disproportionately high and adverse.
4. To identify mitigation measures to avoid or minimize adverse Project effects, if any, on EJCs.
5. To identify sensitive receptor locations within the Project area and identify potential effects and measures taken to avoid or minimize any adverse effects to such locations, if they are present.

Since the time of the Study Report, NorthWestern has conducted additional outreach, including a tour of the Project and a public meeting in Thompson Falls, both on May 25, 2023. Feedback from these meetings has been considered in developing this DLA, as described below.

16.1.2 Study Area and Methods

The study area is the area within 1 mile of the current Project boundary consistent with FERC methodology for collecting environmental justice data for hydroelectric projects and as specified in FERC's study request (FERC 2022).

The methodology for the identifying the presence of EJ communities in the vicinity of the Project is the methodology FERC adopted for collecting environmental justice data for hydroelectric projects, and is summarized in FERC's July 5, 2022, request for the EJ Study. FERC's study request (FERC 2022) indicates that this methodology has been successfully employed at a number of projects during the licensing process and is consistent with guidance from the EPA (2016). The methodology involves using statistics from the U.S. Census Bureau's American Community Survey 5-year estimates for racial, ethnic, and poverty populations for each state, county, and census block group within the study area. The EJ Final Study Report (NorthWestern 2023) used data from the 2020 American Community Survey. At FERC's request, the data used in this Section is updated to include the most recently collected data from the 2021 American Community Survey as published in 2023 (Census 2023 [American Community Survey]). Those statistics were then analyzed to determine if an EJC exists within the study area by applying the methods included in the guidance from the EPA (2016).

16.1.2.1 Minority Populations

For minority populations, the American Community Survey 5-year estimates from Table B03002 were used for race and ethnicity data. That data was then analyzed to determine if an EJC exists based on the presence of minority populations by the following methods:

i. 50% Analysis Method: Determine whether the total percent minority population of any block group in the affected area exceeds 50%.

ii. Meaningfully Greater Analysis Method: Determine whether the minority population in the effected census block group is 10% greater than the percentage of the minority population in Sanders County.

16.1.2.2 Low-Income Populations

For low-income populations, the American Community Survey 5-year estimates from Table B17017 were used for income information. That data was then analyzed to determine if an EJC exists based on the "Low-income Threshold Criteria Method." An EJC exists if the percent of the population below the poverty level in the identified block group is equal to or greater than the percent of the population below the poverty level in Sanders County.

16.1.2.3 Non-English-Speaking Groups

The EPA's "EJScreen: Environmental Justice Screening and Mapping Tool" (EPA 2022) was used to determine non-English-speaking groups in the study area.

16.1.2.4 New Construction-Sensitive Receptor Location

New construction is not proposed so the identification of sensitive receptor locations (e.g., schools, day care centers, hospitals, etc.) within the study area is not required.

16.1.3 Results

There are five census block groups within the study area. The statistics from these five census block groups were compared to the reference population of Sanders County to determine if any EJCs exist. **Figure 16-1** shows the general location and size of the five census block groups in the Project area, and **Figure 16-2** shows the location of the census block groups and two EJCs within the study area.

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Figure 16-1: Size (in acres) and location of Census blocks groups in the Project area.

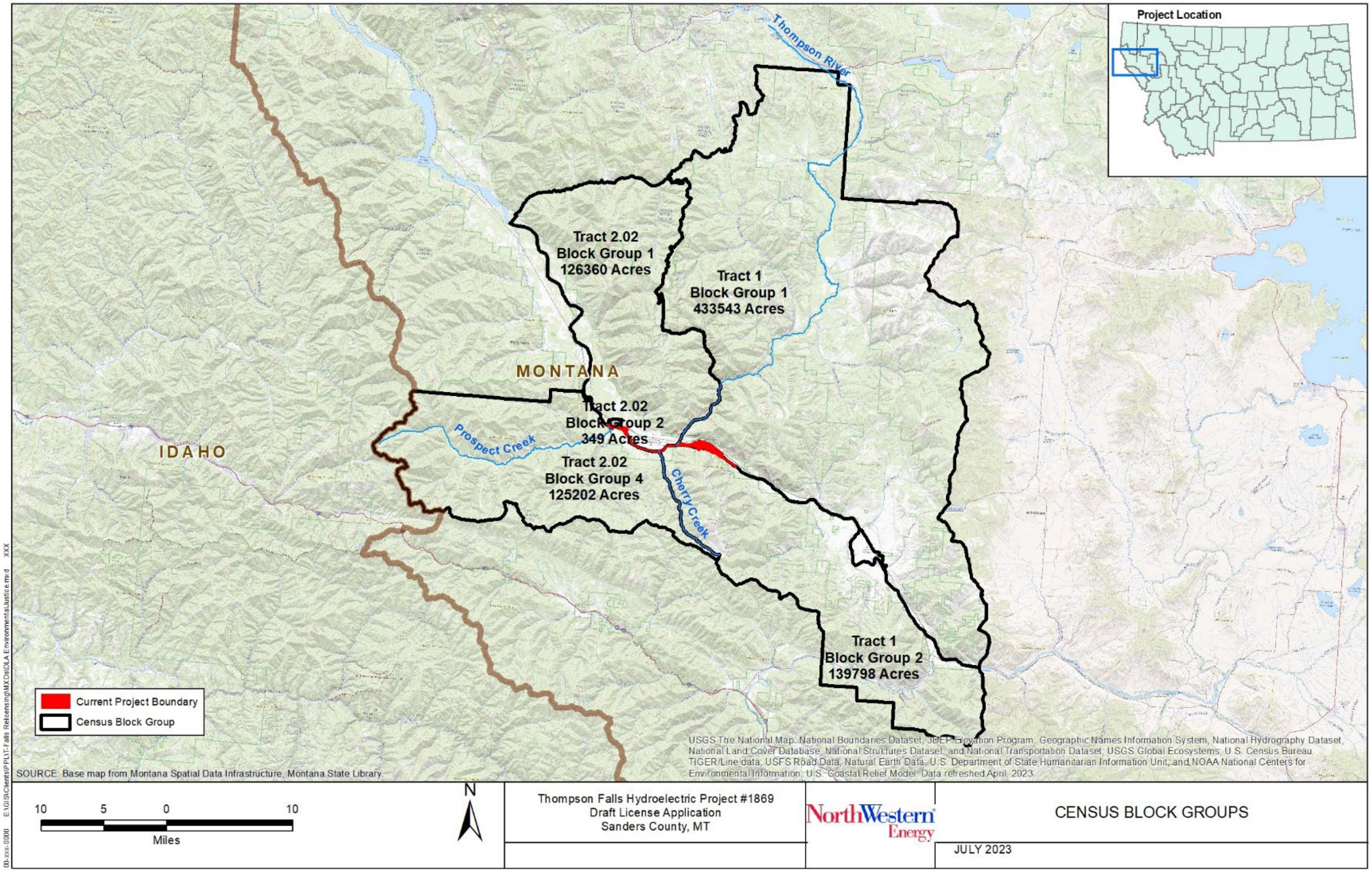
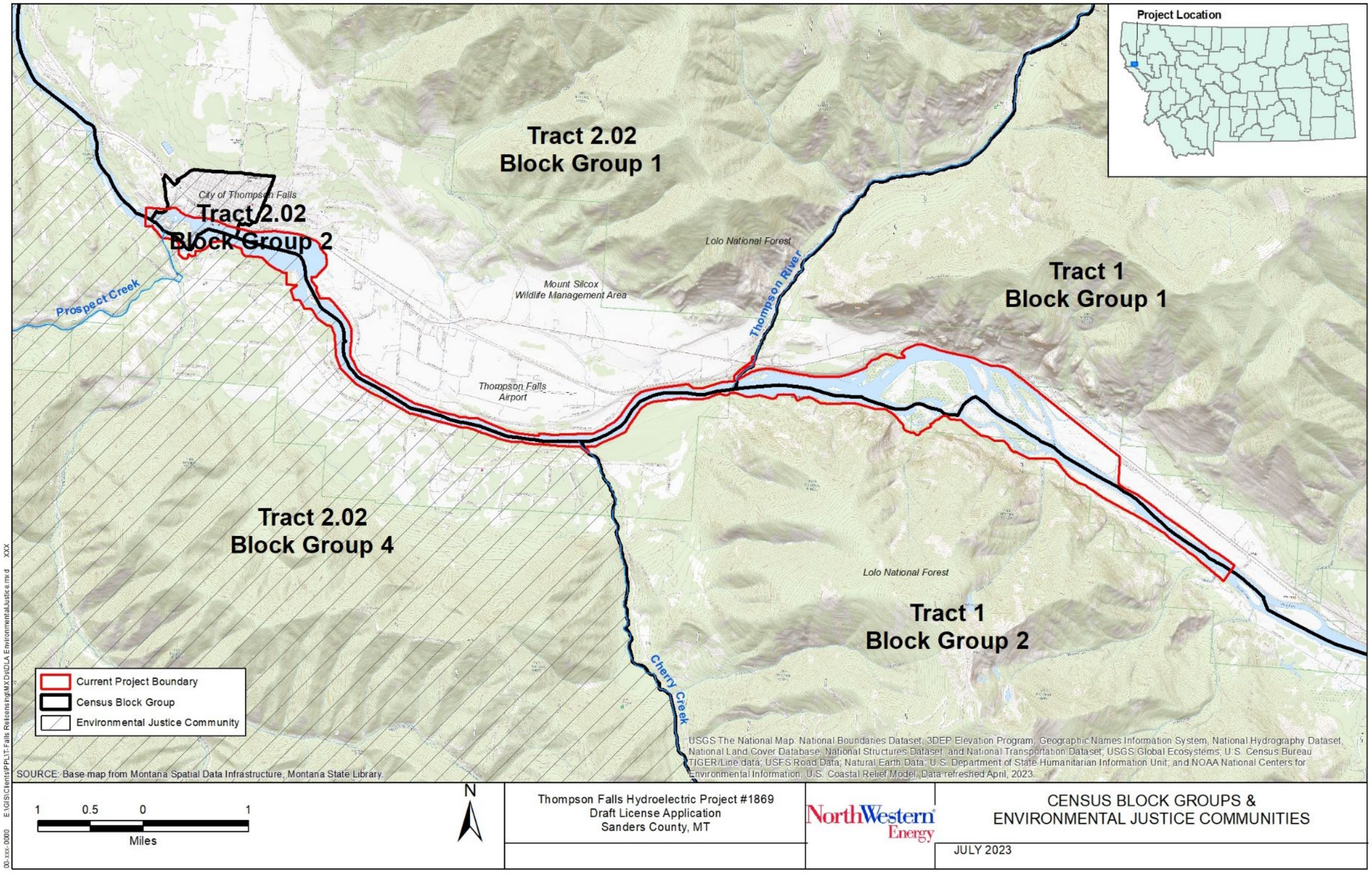


Figure 16-2: Census blocks groups in the Project area.



State, county, and census block group statistics from the American Community Survey 2021 5-year estimates for minority and low-income populations (Census 2023) are shown in **Table 16-1**.

16.1.3.1 Minority Populations

The 50-Percent Analysis Method and the Meaningfully Greater Analysis Method were applied to the statistics shown in Table 16-1 to determine if an EJC exists for the Project based on minority populations:

i. 50% Analysis Method – None of the minority populations exceed 50% of the total population. Thus, an EJC does not exist using this method.

ii. Meaningfully Greater Analysis Method – This method determines if the minority population in the affected census block group is 10% greater than the overall minority population in Sanders County. Sanders County has a minority population of 10.5%. Thus, the threshold to qualify as an EJC using this method would be a minority population in the census block group of 11.6%. None of the 5 census block groups have a minority population that is above 11.6%. Thus, an EJC does not exist using this method.

16.1.3.2 Low-Income Populations

As described in the study methods, the "Low-income Threshold Criteria Method" was applied to the statistics shown in Table 16-1 to determine if an EJC exists. In Sanders County, 16.2 percent of the population is below the poverty level. The percent below the poverty level in two of the five census block groups exceeds 16.2 percent, making these two census block groups EJCs.

In census block group #2 (GEOID #2022) (EJC-1), 19.2 percent of the population is below the poverty level. This census block group is located in the approximate western two-thirds of the City (*refer to* **Figure 16-2**). It is 349 acres in size and is entirely within the EJ Study area. EJC-1 includes the Project's powerhouses and much of the dam infrastructure. It includes many City businesses such as restaurants, stores, banks, and gas stations. It also includes the City's mayoral office and other City administrative offices, and the Sanders County administrative offices (Thompson Falls is the county seat for Sanders County). More information regarding the socio-economic conditions of the City can be found in **Exhibit E – Section 15 – Socio-Economic Resources**.

In census block group #4 (GEOID #2024) (EJC-2), 23.5 percent of the population is below the poverty level. This census block group is 125,202 acres in size, extending south of the Project area to the Idaho border (*refer to* **Figure 16-1**). A small portion of this large census block group is located on the south shore of Thompson Falls Reservoir and the Clark Fork River from Cherry Creek on the upstream end to a point 1 mile downstream of the Project (*refer to* Figure 16-2).

16.1.3.3 Non-English-Speaking Groups

The EPA's "EJScreen: Environmental Justice Screening and Mapping Tool" indicated 0 percent non-English-speaking groups in the study area (EPA 2022).

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Table 16-1: 2021 American Community Survey Data, Census Tract/Block Groups – race, ethnicity, and low-income data.

Geography GEOID (last 4 digits)	RACE AND ETHNICITY DATA										LOW INCOME DATA
	Total Population Count	White Alone Not Hispanic (count)	African American (count)	Native American/ Alaska Native (count)	Asian (count)	Native Hawaiian & Other Pacific Islander (count)	Some Other Race (count)	Two or More Races (count)	Hispanic or Latino (count)	Total Minority (%)	Below Poverty Level (%)
Montana	1,077,978	938,223	6,236	65,452	8,972	581	10,155	48,359	43,877	14.9	12.3
Sanders County	12,298	11,006	37	432	23	10	6	381	403	10.5	16.2
Tract 1 Block Group 1	1,658	1,469	0	33	0	0	0	121	35	11.4	12.4
Tract 1 Block Group 2	1,837	1,713	8	30	3	0	0	35	48	6.8	14.5
Tract 2.02 Block Group 1	1,267	1,147	0	11	3	0	0	51	55	9.5	0.9
Tract 2.02 Block Group 2	1,016	907	0	14	0	0	0	0	95	10.7	19.2
Tract 2.02 Block Group 4	431	431	0	0	0	0	0	0	0	0	23.5

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Socio-Economic conditions in Sanders County are summarized below, with more detail available in **Exhibit E – Section 15- Socio-Economic Resources.** In general, the local economy is based on agriculture, fishing, hunting, forestry, and mining. Thompson Falls had been a logging community for many years, but reductions in timber harvest coupled with decreased lumber production have reduced logging projects (BBER 2019).

The Sanders County Distressed Communities Index[27] rating has been improving over time. The county ranked last in the state from 2007-2011, however, that ranking is improving. As of June of 2023, the county had moved from last in the state to a "mid-tier" ranking (Economic Innovation Group 2023).

In Sanders County, average earnings per job increased 29.0 percent and per capita income increased 55.7 percent from 2000 to 2021. In 2021, the per capita income was $45,526 for Sanders County compared with $61,504 for Montana. Since 1990, the annual unemployment rate ranged from a low of 4.3 percent in 2022 to a high of 16.3 percent in 2009. In 2022, people living below the poverty rate in Sanders County was 16.2 percent as compared with 12.3 percent for Montana (Headwaters Economics 2023).

The National Association of REALTORS® indicates a median home price of $374,165 in Sanders County as of the first quarter of 2023 (National Association of REALTORS®, 2023). According to the City's most current Master Plan, there are close to 60 businesses in the City, most of which are locally owned. Primary employment classes are office and professional services (41%, including health care, social assistance, construction, retail trade, and utilities), restaurants (24%), financial (18%), medical (15%) and entertainment (3%) (Land Solutions 2015).

The EJ Study results indicate the following:

- There are no EJCs within the Project area associated with minority populations.
- Two of the 5 census blocks within the Project area are EJCs associated with low-income populations.
- There are no non-English speaking groups in the Project area.
- Since the Project did not involve new construction, sensitive receptor locations were not identified nor further analyzed.

16.1.3.4 Outreach to EJCs in the Project Area (Meaningful Involvement)

Before filing a FLA with FERC, applicants are required to conduct a rigorous pre-license application filing process that consists of 1) presenting the Project to Relicensing Participants; 2) consulting with those Relicensing Participants; 3) identifying issues; 4) gathering available information; 5) preparing study results and obtaining review of those results from Relicensing

[27] The Distressed Communities Index (DCI) combines 7 complementary economic indicators into a single measure of community well-being, ranging from 0 to 100. Scores over 80 are considered distressed.

Participants; and 6) preparing a DLA and providing an opportunity for Relicensing Participants to review and comment on the DLA.

NorthWestern maintains a website with information about the Thompson Falls Project, including relicensing information, meeting notices and presentations, reports, and other documents.

NorthWestern proactively initiated relicensing outreach discussions with Relicensing Participants in 2018. The first activity was a training program, "FERC 101," was held in Missoula, Montana on September 12, 2018. This program included FERC staff who presented information on the procedures used to relicense hydropower projects under the FERC's jurisdiction. NorthWestern also presented information on the Thompson Falls Project. The goal of the meeting was to inform Relicensing Participants of the relicensing process and schedule for the Thompson Falls Project. Presentations from this meeting, and all other Thompson Falls relicensing meetings, are posted on NorthWestern's website.

Next, prior to the commencement of the formal FERC relicensing process, NorthWestern voluntarily prepared a BED which was a compilation of existing resource information. This document was released for public comment on November 1, 2018 and is available on the website. On December 4, 2018, a workshop was held in Missoula to discuss the BED and identify any data gaps and resource issues. The presentations from that meeting are available on the website.

On October 15, 2019, from 6 to 8 p.m., NorthWestern voluntarily hosted a public meeting in Thompson Falls at the Thompson Falls Community Center. The meeting was held in the evening to avoid conflict with normal work hours with the goal of receiving input from the local community in which the Project infrastructure is located. Notice of the meeting was provided through an advertisement in the local newspaper (the Sanders County Ledger), sending notice of the meeting via email to people who had signed up to be on the email list, and by sending post cards to people who had signed up to be on the mailing list.

The material presented at the meeting included a general description of the relicensing process and the purpose of the recently completed operations test. Forty-four people attended the meeting. Attendees had many comments and questions, with most of them pertaining to the operations test that NorthWestern completed from October 8 to 10, 2019, and the impacts caused by the 4-foot fluctuation in water levels during the test. Further, during the meeting, a recommendation was made that NorthWestern expand its outreach regarding relicensing developments to include seasonal residents. Based on the comments from the October 2019 public meeting, NorthWestern expanded email and mailings to include all landowners adjacent to the Project boundary.

On March 11, 2020, from 6 to 8 p.m., NorthWestern voluntarily hosted a second public meeting at the Thompson Falls Community Center. Once again, the meeting was held in the evening to avoid conflict with normal work hours to maximize attendance. Notice of the meeting was provided through an advertisement in the local newspaper, sending notice of the meeting by email to people who had signed up to be on the email list, and by sending post cards to people who had signed up to be on the mailing list and to landowners adjacent to the Project boundary. Twentytwo people attended the meeting. Based on the comments from the October 2019 public meeting, NorthWestern added all landowners along the reservoir to the mailing list to make sure all landowners were also provided notice of the meeting. The material presented at the meeting included a general description of the relicensing process, the results of the October 2019 operations test including the observed impacts to resources from the 4-foot fluctuation, and of NorthWestern's intention to propose a maximum 2.5-foot fluctuation in water levels under the new license. Attendees had many comments and questions, with most of them pertaining to the operations test that NorthWestern completed from October 8 to 10, 2019, and the impacts caused by the 4-foot fluctuation in water levels during the test.

NorthWestern completed a recreation visitor survey in 2021 (NorthWestern 2022a). Three of the survey sites were in EJC-1 and two of the survey sites were in EJC-2. Of the visitor survey responses, 78 percent came from within the two EJCs, indicating both significant outreach and feedback from respondents that were recreating within the two EJCs.

It is also important to note that elected officials in the City and Sanders County, who represent people in the two EJCs, have been actively involved in NorthWestern's consultation process. Further, consultation with tribes is described in **Exhibit E - Section 12.2 – Tribal Cultural and Economic Interests** and **Exhibit E - Section 19 – Consultation Documentation**.

On April 28, 2023, NorthWestern staff and consultants met with the three Sanders County Commissioners, the Mayor of the City, a City Council Member who also happens to be the Sanders County Planner, and the Recreation and Outreach Coordinator for the Kaniksu Land Trust. One of the purposes of the April 28, 2023 meeting was to receive input specific to the two local EJCs.

On May 24, 2023, NorthWestern held a daytime meeting to review the Updated Study Reports. This meeting was attended by tribes, agencies, and local residents. Additionally, NorthWestern held a site tour and a public meeting on the evening of May 25, 2023 at the Sanders County Courthouse, which is located within EJC-1. The presentation included a summary of the Updated Study Reports, including the EJ Study. Approximately ten members of the public attended the meeting. This provided another opportunity for residents of the two EJC's to provide comment on the Project prior to the filing of the DLA.

16.2 Environmental Measures

16.2.1 Existing Environmental Measures

Under the current license, and as described in more detail below, NorthWestern provides an extensive network of public recreation resources. NorthWestern operates and maintains these facilities, with no admission or other cost, for use by members of the surrounding community, including the two EJCs. Based on surveys of users of the recreational resources, these are of tremendous value to the surrounding communities, including the EJCs.

NorthWestern provides opportunities for members of the surrounding communities, including the two EJCs, to provide feedback and input regarding the recreational resources and the operation of the Project itself. NorthWestern maintains a website that provides details regarding the Project and its operation. The website includes contact information for NorthWestern staff. NorthWestern also regularly surveys the users of the recreational resources for feedback.

Additionally, hydropower is a renewable energy source that produces reliable, low-cost energy (DOE 2023; NHA 2023). Given the fact that the two identified EJCs are EJCs because they meet the low-income criteria, low energy costs are an important benefit.

16.2.2 Proposed Environmental Measures

The primary concern raised by citizens during the public outreach to date relates to impacts caused by fluctuations in the reservoir resulting from Project operation. Based in part on this feedback, NorthWestern is proposing to limit the reservoir fluctuations to 2.5 feet instead of the currently authorized 4 feet. Based on studies conducted by NorthWestern, reducing the fluctuations to 2.5 feet will reduce those impacts.

Additionally, NorthWestern will continue to maintain the Island Park, Power Park, and the Wild Goose Landing recreation facilities, and the South Shore Dispersed Recreation Area. Details about these resources are found in **Section 11-Recreation**, of this Exhibit E. NorthWestern will also develop and implement a Recreation Management Plan that includes these listed sites. These recreational amenities are a benefit to the EJC communities in the Project area.

NorthWestern will continue to conduct recreational resource surveys and its website and respond to questions and concerns raised by members of the surrounding community, including the two EJCs.

Finally, generation from the Project will continue to provide low-cost, reliable energy from a renewable source with no greenhouse gas emissions.

16.3 Environmental Effects

16.3.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented.

However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

The Project primarily has positive environmental, economic, recreation, and community effects on EJC-1 and EJC-2. Hydropower is a renewable energy source that produces reliable, low-cost energy (DOE 2023; NHA 2023). Hydropower plays a key role in addressing climate change and provides benefits beyond electricity generation such as flood control, irrigation support, and recreational resources (DOE 2023; NHA 2023).

There are no greenhouse gas emissions or other air emission-related impacts associated with electrical generation from hydropower. This stands in contrast to other energy sources, particularly those involving production of energy from fossil fuels. Because renewable energy projects have minor, if any, greenhouse gas emissions, a detailed analysis of such impacts is not necessary or appropriate (Council on Environmental Quality 2023).

The Project employs five full-time and one seasonal employee with a combined annual income/benefit value of about $650,000. NorthWestern also contracts with companies that provide services to NorthWestern at the Project, and average contract payments over the last 5 years total approximately $1,300,000 per year. It is presumed that these employees and contractors spend some of that money in the local area, and since many of the businesses (e.g., gas stations, restaurants, lodging, hardware store, etc.) within the City are located within EJC-1, it is reasonable to conclude a positive economic impact is provided by the Project in EJC-1.

NorthWestern provides important recreation facilities that serve both EJCs. Island Park and Power Park are both located in EJC-1.

Island Park is located on NorthWestern-owned property and is operated and maintained by NorthWestern. The site offers trail-based recreation with views of the waterway and Project facilities. To better accommodate public access to the island from the north shoreline, the Licensee purchased three undeveloped City lots 100 feet from the Gallatin Street Bridge and developed them to provide a public parking area. Designated ADA parking is available directly adjacent to the bridge. The parking area accommodates 17 vehicles, and the Gallatin Street Bridge provides walk-in / ADA access to the island.

Benches, picnic tables, and an ADA-accessible restroom are provided along trails on the island. The upstream fish passage facility public viewing platform, constructed in 2012 on the eastern edge of the island, offers views of the Main Channel Dam and the fish passage facility. Interpretive information regarding operation of the fish passage facility and fish species of interest was placed at the viewing platform as well. Interpretation throughout Island Park includes historical information related to building of the Thompson Falls Project, the Prospect Plant, and other geographically and culturally significant topics. The island is linked to the south shore by the Historic High Bridge.

Power Park is located on NorthWestern-owned property and is operated and maintained by NorthWestern. Power Park is an ADA-accessible City Park along the north shoreline, just above the original powerhouse with parking available for 10 vehicles. Until 2021, Power Park offered a group use pavilion with power, running water, and plumbed restrooms, as well as multiple picnic tables, and benches. The pavilion was destroyed in an arson fire in 2021. NorthWestern voluntarily reconstructed and upgraded facilities at Power Park beginning in 2022. Currently, the park contains an information sign related to the hydroelectric generating capacity of the Project (the FERC-required Part 8 signage), as well as an information kiosk which directs visitors to public recreation opportunities in and near Thompson Falls. The park also serves as a parking area for visitors that seek to access the Powerhouse Loop Trail by following sidewalks within the park to trail segments linked by the Powerhouse access road. The park is a popular venue for numerous outdoor events each year.

Wild Goose Landing is not located within EJC-1, but is less than 1,000 feet away, within easy walking distance. Wild Goose Landing provides open space, picnic facilities, plumbed restrooms, a boat launch and dock, a separate swimming dock, and shoreline fishing. Designated parking adjacent to the restroom facility accommodates 10 vehicles, including one ADA-designated parking space, while about 10 more vehicles may park in dispersed areas along the access road adjacent to the boat launch.

There are also non-Project recreation amenities within these two EJCs. The Cherry Creek Boat Launch is located in EJC-2, as well as a parking area that provides access to Island Park from the south shoreline. The Historic High Bridge, restored in 2010 to 2011, is within both EJC-1 and EJC-2, and provides a non-motorized transportation corridor that links EJC-1 to EJC-2. The Powerhouse Loop Trail is not located within EJC-1, but is less than 1,000 feet away, within easy walking distance. All of these public recreational amenities are open to the public free of charge and maintained for public use by NorthWestern and other partners.

Based on visitor studies (NorthWestern 2022a), these Project recreation sites and the other recreational amenities are repeatedly enjoyed by local residents including residents of the two EJCs. Survey results indicate that local residents are satisfied with the opportunities and amenities available, and they feel uncrowded as they participate in recreation activities to maintain a healthy mind and body. Power Park also provides opportunities for get-togethers such as family picnics and community events such as the Trick-or-Treat Move Your Feet fun run and the annual Chicken Jamboree. The recreation facilities are also enjoyed by people that live outside the area, and presumably those people are having a positive economic impact to EJC-1 by spending money at businesses within EJC-1.

In addition, NorthWestern supports local groups and events, such as decorating in the City at Christmas time, sponsoring ads in the local paper for local high school teams and booster club sponsorship, accommodating tours of the hydro facilities for local school groups, being a member of the Chamber of Commerce, donating to the local foodbank, etc.

Potential negative Project impacts to public boat launches and docks may result from intermittent use of the top 4 feet of the reservoir to accommodate flexible capacity generation. However, these impacts are not disproportionately high or adverse to EJC-1 or EJC-2.

16.3.2 Applicant's Proposed Alternative

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of the lesser of 6,000 cfs or inflow will be maintained downstream during normal operations.

Impacts to EJCs under NorthWestern's proposed alternative will be the same as the no action alternative, with the exception that the proposed change in the Project boundary will result in additional recreation lands being incorporated into the Project, a benefit to EJCs. Similarly, the fluctuation of the reservoir will be limited to 2.5 feet (instead of the currently allowed 4 feet), reducing the impact of Project operations.

Citizens have raised concerns about the reservoir fluctuations. Potential negative Project impacts may result from intermittent use of the top 2.5 feet of the reservoir to accommodate flexible capacity generation. However, this is less than the drawdowns under the no action alternative, which could have drawdowns as much as 4 feet, at least occasionally.

Even limiting the fluctuation levels to 2.5 feet could have impacts. Based on results from the Operations Studies (NorthWestern 2022b, 2023), flexible generation could adversely affect some private boat docks and some private boat launches that were not constructed to account for fluctuating water levels. With respect to public recreation facilities, the impacts of the 2.5-foot fluctuations are minor and not disproportionately high or adverse to EJC-1 or EJC-2 because they are experienced throughout the Project reservoir area. Impacts associated with reservoir fluctuation under the proposed alternative are less than the impacts associated with the larger fluctuations allowed under the current license.

16.4 Unavoidable Adverse Impacts

Based on the results of the EJ Study, there are no unavoidable adverse impacts to EJCs.

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17. Developmental Analysis

This section analyzes the cost of continued operation and maintenance of the Thompson Falls Project under the no action alternative and NorthWestern's proposed alternative. Costs are associated with the operation and maintenance of the Project's facilities, as well as the cost of providing proposed PM&E measures.

17.1 Power and Economic Benefits of the Project

The Thompson Falls Project is currently operated to maximize production from available baseflows while providing flexible capacity with available reservoir volume.

The Project has a maximum hydraulic capacity of 23,320 cfs for a maximum production of 94 MW of actual electric production. The Thompson Falls Project has averaged 475,379 MWh of net energy production annually for the 5-year time period of 2018-2022. Through that time the plant attained a capacity factor of 57.2 percent and an Equivalent Availability Factor of 84.36 percent, showing good availability and reliability.

River flows not passing through the plant are passed through the spillgates or over the spillway of the dam. The Project has a minimum flow requirement of 6,000 cfs downstream of the facility that must be maintained at all times, unless inflows drop below 6,000 cfs. The Project's current FERC license allows for use of the top 4 feet of the reservoir for flexible capacity operation.

The Project currently provides flexible capacity by increasing or decreasing generation through the plant while maintaining normal operating elevations of the reservoir. Availability of flexible capacity is dynamic and based on Project baseflows, available unit(s), current production, and reservoir elevation.

The normal maximum reservoir level of El. 2,396.5 results in active storage of approximately 15,000 acre-feet between El. 2,396 and 2,380. The Project is generally operated to provide both baseload generation and flexible capacity (as unit availability, river flow, and reservoir conditions are appropriate). Unit availability to provide flexible capacity either through an increase or decrease in generation changes as the baseflows of the river change through the seasons.

Absent the Thompson Falls Project, NorthWestern would be required to build another generation project or purchase energy on the open market to serve customer load. The Project has provided an average $21 million annually in avoided cost value and is projected to provide $30 million annually going forward based on future market rates for electricity at the Mid-Columbia hub. Flexible capacity provides value above and beyond baseload energy production. The value of flexible capacity was estimated using comparable alternatives of battery projects. The current estimated value of flexible capacity using the top 4 feet of reservoir (per the current license) is $4.1 million annually.

17.2 Comparison of Alternatives

The only operational difference between the alternatives is the change in reservoir storage. The no action alternative has the top 4 feet of reservoir allowed for flexible storage, while the proposed action alternative reduces the flexible reservoir storage to the top 2.5 feet. Baseload annual generation, Project capacity, and production cost remain the same for both alternatives (**Table 17-1**). The quantity of flexible storage is reduced by 60 MWh from the no action alternative to the proposed action alternative due to the decreased flexible storage in the reservoir.

Table 17-1: Comparison of alternatives

Alternatives	Generation*	Capacity	Production Cost**	Flexible Storage
	(MWh)	(MW)	($/yr)	(MWh)
No Action Alternative	475000	92.6	$29,456,671	160
Proposed Action	475000	92.6	$29,456,671	100

Notes: * estimate from past production; ** annual revenue requirement; MW = megawatt; MWh =megawatt-hours

The basic formula for determining a revenue requirement is:

$R = B \bullet r + E + d + T$

where:

R = revenue requirement,
B = ratebase, which is the amount of capital or assets the utility dedicates to providing its regulated services
r = allowed rate of return, which is the cost the utility incurs to finance its rate base, including both debt and equity,
E = operating expenses, which are the costs of items such as supplies, labor (not used for plant construction), and items for resale that are consumed by the business in a short period of time (less than 1 year),
d = annual depreciation expense, which is the annual accounting charge for wear, tear, and obsolescence of plant, and
T = all taxes not counted as operating expenses and not directly charged to customers.

17.2.1 No Action Alternative

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations.

In addition, the FERC Project boundary would not be adjusted under the No Action Alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the no action alternative, the annual production of baseload generation (475,000 MW-hrs) would not change and has an avoided cost value of approximately $30M/yr based on the Mid-Columbia hub index. Flexible capacity under the current license provides for 160 MW-hrs of storage. For more information *see* **Exhibit D- Section 9 – Power Generation from Changes in Operations**.

17.2.2 Proposed Action

Under the Proposed Alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations.

Under the proposed alternative, the annual production of baseload generation (475,000 MW-hrs) would not change and has an avoided cost value of approximately $30M/yr based on the Mid-Columbia hub index. Flexible capacity under the proposed action provides 100 MW-hrs of flexible storage. For more information *see* **Exhibit D – Section 9 – Power Generation from Changes in Operations**.

17.3 Cost of Environmental Measures

The estimated cost of environmental measures will be provided in the FLA.

17.4 Air Quality

No new construction is proposed for the Project. As such, an effects analysis of air quality is not required.

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18. Conclusions and Recommendations

18.1 Comparison of Alternatives

Under the no action alternative, the Project would continue to operate as it has in the past. The Project would continue to operate as authorized under the existing license. The license allows for baseload and flexible generation including peaking such that when electrical demand is high, the Project would be operated at or near full load; when electrical demand is low, generation would be reduced. NorthWestern would have the option of using the top 4 feet of the reservoir from full pool for these purposes.

Also under the no action alternative, the ongoing environmental measures described in **Exhibit E - Section 2.1.4.2 – Ongoing Environmental Measures** would continue to be implemented. However, the proposed new environmental measures described in **Exhibit E - Section 2.2.4 – Proposed Environmental Measures** would not be implemented, including limiting reservoir level fluctuations by only 2.5 feet to reduce the effects of reservoir fluctuations, and therefore no benefits to public resources that would result from implementation of the new NorthWestern-proposed PM&E measures would be realized.

In addition, the FERC Project boundary would not be adjusted under the no action alternative which would limit NorthWestern's and FERC's ability to manage lands and waters that are needed for Project purposes.

Under the proposed alternative, the Project will continue to be operated to provide baseload and flexible generation, limited to the top 2.5 feet of the reservoir from full pool, under normal operations. A minimum flow of 6,000 cfs or inflow whichever is less will be maintained downstream during normal operations.

Under the no action alternative, reservoir water level fluctuations to 4 feet below full pool could occur periodically. Reservoir fluctuations at this level have been shown to have adverse effects on shoreline erosion, recreation, aesthetics, and fisheries. Limiting reservoir operations to the top 2.5 feet reduces the impact on these resources.

18.2 Unavoidable Adverse Effects

No unavoidable adverse impacts to wildlife, botanical resources, land use, socio-economic resources, or EJ are anticipated. Unavoidable adverse impacts to other resources are described in the following sections of Exhibit E:

- Section 5.6 – Geology, Topography, and Soil Resources - unavoidable adverse impacts
- Section 6.10 – Water Quality and Quantity - unavoidable adverse impacts

- Section 7.4 – Fisheries and Aquatic Resources - unavoidable adverse impacts
- Section 9.4 – Wetland, riparian, and littoral habitats - unavoidable adverse impacts
- Section 10.4 – Threatened and endangered species - unavoidable adverse impacts
- Section 12.5 – Cultural resources - unavoidable adverse impacts
- Section 11.4 – Recreation - unavoidable adverse impacts
- Section 14.4 – Aesthetics - unavoidable adverse impacts

18.3 Recommendations of Fish and Wildlife Agencies

No recommendations from fish and wildlife agencies have been received. FERC will solicit these recommendations from agencies once the FLA is ready for environmental analysis, and FERC's NEPA document will analyze these recommendations.

18.4 Land Management Agencies' Section 4(e) Conditions

No section 4(e) conditions from the USFS have been received. FERC will solicit these conditions from the USFS once the FLA is ready for environmental analysis, and FERC's NEPA document will analyze these conditions.

18.5 Consistency with Comprehensive Plans

18 CFR Section 5.18(b)(5)(ii)(F) requires that license applications "identify relevant comprehensive plans and explain how and why the proposed Project would, would not, or should not comply with such plans, and a description of any relevant resource agency or Indian tribe determination regarding the consistency of the Project with any such comprehensive plan." On April 27, 1988, FERC issued Order No. 481-A, revising Order No. 481, issued October 26, 1987, establishing that FERC will accord FPA Section 10(a)(2)(A) comprehensive plan status to any federal or state plan that: 1) is a comprehensive study of one or more of the beneficial uses of a waterway or waterways; 2) specifies the standards, the data, and the methodology used; and 3) is filed with the Secretary of the Commission. FERC publishes a list of filed documents which satisfy their criteria as a comprehensive plan (FERC 2022).

NorthWestern reviewed the List of Comprehensive Plans (FERC 2022) in Montana, published August 2022, to identify and review relevant comprehensive plans to determine if the Project would comply with these plans.

The plans that were found to be relevant to Project are listed in **Table 18-1**. In some cases, the comprehensive plans on the FERC list have been revised since their original publication. In that case, NorthWestern reviewed the updated plan. The Project's continued operation and the associated environmental protection, mitigation or enhancement measures proposed and analyzed herein would ensure continued consistency with the uses outlined in the plans listed in **Table 18-1**.

Table 18-1. FERC approved comprehensive plans reviewed

Document Name	Updates, if any
USFS. 1986. Lolo National Forest plan. Department of Agriculture, Missoula, Montana. February 1986.	Plan revisions will be initiated in 2023 and are expected to take several years. NorthWestern reviewed the 1986 plan. https://www.fs.usda.gov/main/lolo/landmanagement/planning
Montana Department of Environmental Quality. 2004. Montana water quality integrated report for Montana (305(b)/303(d)). Helena, Montana. November 24, 2004.	Montana Department of Environmental Quality. 2021. Montana Final 2020 Water Quality Integrated Report https://deq.mt.gov/files/Water/WQPB/CWAIC/Reports/IRs/2020/MT_2020_IR_Final.pdf
Montana Department of Environmental Quality. 2001. Montana non-point source management plan. Helena, Montana. November 19, 2001.	Watershed Protection Section. 2017. Montana Nonpoint Source Management Plan. Helena, MT: Montana Dept. of Environmental Quality. https://deq.mt.gov/files/Water/WPB/Nonpoint/Publications/Annual%20Reports/2017NPSManagementPlanFinal.pdf
Montana Department of Environmental Quality. Montana's State water plan: 1987-1999. Part I: Background and Evaluation. Part II: Plan Sections - Agricultural Water Use Efficiency; Instream Flow Protection; Federal Hydropower Licensing and State Water Rights; Water Information System; Water Storage; Drought Management; Integrated Water Quality and Quantity Management; Clark Fork Basin Watershed Management Plan; Upper Clark Fork River Basin Water Management Plan; and Montana Groundwater Plan. Helena, Montana	Montana Department of Environmental Quality. 2015. Montana's State Water Plan. A Watershed Approach to the 2015 Montana State Water Plan, December 5, 2014. http://dnrc.mt.gov/divisions/water/management/docs/state-water-plan/2015_water_plan_executive_summary.pdf
Montana Department of Fish, Wildlife, and Parks. Montana Statewide Comprehensive Outdoor Recreation Plan (SCORP): 2003-2007. Helena, Montana. March 2003.	Montana Department of Fish, Wildlife, and Parks. Montana SCORP: 2020-2024. Helena, Montana. https://leg.mt.gov/content/Committees/Interim/2019-2020/EQC/Meetings/Jan-2020/scorp-2020-2024.pdf
Montana Department of Fish, Wildlife and Parks. 1993. Water rights filings under S.B.76. Helena, Montana. February 8, 1993.	Water Rights in Montana https://leg.mt.gov/content/Publications/Environmental/2018-water-rights-handbook-final.pdf
Montana Department of Fish, Wildlife and Parks. 1997. Montana warm water fisheries management. Helena, Montana. March 1997. Available: https://archive.org/details/montanawarmwater1997mont/page/n33	FWP has updated fisheries management plans since the 1997 document focused specifically on warm water fisheries. The current management plan focus on statewide management for warm and cold water species and are posted on FWP's website. The current plan is: 2019-2027 Montana Statewide Fisheries Management Program and Guide, Montana Fish Wildlife and Parks. Available: https://fwp.mt.gov/conservation/fisheries-management/statewide-fisheries-management
Montana State Legislature. 1997. House Bill Number 546. Total Maximum Daily Load. Helena, Montana. https://leg.mt.gov/bills/1997/Bills/HOUSE/HB0546_02.htm	This 1997 legislation (HB 546) was codified, as Mont. Code Ann. §§ 75-5-103, 75-5-702, 75-5-703, 75-5-704 and 75-5-705. These sections each have been amended by the Montana Legislature several times since 1997, with the exceptions of Mont. Code Ann §§ 75-5-704 and 75-5-705.

National Park Service. The Nationwide Rivers Inventory. Department of the Interior, Washington, D.C. 1993. Source: https://www.nps.gov/subjects/rivers/montana.htm	No updates found.
Northwest Power and Conservation Council. 2014. Columbia River Basin Fish and Wildlife Program. Portland, Oregon. Council Document 2014-12. October 2014. https://www.nwcouncil.org/media/7148624/2014-12.pdf	No updates found.
Northwest Power and Conservation Council 2020. 2020 Addendum to the 2014 Columbia River Basin Fish and Wildlife Program. Portland, Oregon. Council Document 2020-9. October 2020. https://www.nwcouncil.org/media/filer_public/2e/0b/2e0b888c-8854-4495-ba0d-fa19e5667676/2020-9.pdf	No updates found.
Northwest Power and Conservation Council. 2022. The 2021 Northwest Power Plan. Portland, Oregon. Council Document 2022-03. February 2022. https://www.nwcouncil.org/media/filer_public/4b/68/4b681860-f663-4728-987e-7f02cd09ef9c/2021powerplan_2022-3.pdf	No updates found.
Northwest Power and Conservation Council. 1988. Protected areas amendments and response to comments. Portland, Oregon. Council Document 88-22. September 14, 1988. https://www.nwcouncil.org/media/63794/88_22.pdf	The Northwest Power and Conservation Council amended the protected areas in 1990 and1992, however, no changes from the 1988 list were made to the protected areas in Montana. Protected areas designations basically apply to new hydroelectric projects only. Dams in existence or licensed as of August 10, 1988 are not covered by the protected areas rule.
U.S. Fish and Wildlife Service. n.d. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 1989: https://www.fws.gov/policy/a1npi89_25.pdf	No updates found.
U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986. https://nawmp.org/sites/default/files/2018-01/1986%20OriginalNAWMP.pdf	Department of the Interior. Environment Canada. Environment and Natural Resources Mexico. 2018. North American waterfowl management plan. Connecting People, Waterfowl, and Wetlands. https://nawmp.org/sites/default/files/2018-12/6056%202018%20NAWMP%20Update_EN16.pdf

Some of the plans on the FERC (2022) list do not apply to the Thompson Falls Project as they address geographic areas, species, or habitats, not found in or near the Thompson Falls Project area. These not relevant plans are listed in **Table 18-2**.

Table 18-2. FERC approved comprehensive plans not relevant to the Thompson Falls Hydroelectric Project

Document Name	Reason for Exclusion from Detailed Review
Bureau of Land Management. 1983. Billings resource area management plan. Department of the Interior, Miles City, Montana. November 1983.	Outside geographic scope of Thompson Falls Project area
Bureau of Land Management. 1984. Powder River resource area management plan. Department of the Interior, Miles City, Montana. December 1984.	Outside geographic scope of Thompson Falls Project area
Bureau of Land Management. 2015. Record of Decision and Approved Resource Management Plan for the Great Basin Region, Including the Greater Sage- Grouse Sub-Regions of Idaho and Southwestern Montana, Nevada and Northeastern California, Oregon, and Utah. Washington, D.C. September 2015.	Outside geographic scope of Thompson Falls Project area
USFS. 1985. Flathead National Forest land and resource management plan. Department of Agriculture, Kalispell, Montana. December 1985.	Outside geographic scope of Thompson Falls Project area
USFS. 2009. Beaverhead-Deerlodge National Forest land and resource management plan. Department of Agriculture, Missoula, Montana. January 2009.	Outside geographic scope of Thompson Falls Project area
USFS. 1986. Lewis and Clark National Forest plan. Department of Agriculture, Great Falls, Montana. June 4, 1986.	Outside geographic scope of Thompson Falls Project area
USFS. 1986. Custer National Forest and National Grasslands land and resource management plan. Department of Agriculture, Billings, Montana. October 1986.	Outside geographic scope of Thompson Falls Project area
USFS. 1986. Helena National Forest land and resource management plan. Department of Agriculture, Helena, Montana. April 1986.	Outside geographic scope of Thompson Falls Project area
USFS. 1987. Gallatin National Forest plan. Department of Agriculture, Bozeman, Montana. September 23, 1987.	Outside geographic scope of Thompson Falls Project area
USFS. 1987. Kootenai National Forest plan. Department of Agriculture, Libby, Montana. September 1987.	Outside geographic scope of Thompson Falls Project area
USFS. 1987. Bitterroot National Forest plan. Department of Agriculture, Hamilton, Montana. September 1987.	Outside geographic scope of Thompson Falls Project area
Montana Department of Fish, Wildlife and Parks. 1989. Hauser Reservoir fisheries management plan, September 1989-1994. Helena, Montana. September 1989.	Outside geographic scope of Thompson Falls Project area
Montana Department of Fish, Wildlife and Parks. 1990. Missouri River management plan: Holter Dam to Great Falls, 1990-1994. Helena, Montana. May 1990.	Outside geographic scope of Thompson Falls Project area
Montana Department of Fish, Wildlife and Parks. 1992. Canyon Ferry Reservoir fisheries management plan, 1992-1997. Helena, Montana. July 1992.	Outside geographic scope of Thompson Falls Project area
Montana Department of Natural Resources and Conservation. 1977. Yellowstone River Basin final environmental impact statement for water reservation applications. Helena, Montana. February 1977. 194 pp and draft addendum, dated June 1977.	Outside geographic scope of Thompson Falls Project area
U.S. Fish and Wildlife Service. 1985. Final environmental impact statement for the management of Charles M. Russell National Wildlife Refuge. Department of the Interior, Denver, Colorado. August 1985.	Outside geographic scope of Thompson Falls Project area
U.S. Fish and Wildlife Service. 1980. Protecting instream flows in Montana: Yellowstone River reservation case study. Cooperative	Outside geographic scope of Thompson Falls Project area

Document Name	Reason for Exclusion from Detailed Review
Instream Flow Service Group. Fort Collins, Colorado. FWS/OBS-79-36. September 1980.	
U.S. Fish and Wildlife Service. 1995. U.S. Prairie Pothole joint venture implementation plan - update. Department of the Interior, Denver, Colorado. January 1995.	Outside geographic scope of Thompson Falls Project area
U.S. Fish and Wildlife Service. 1986. Whooping Crane Recovery Plan. Department of the Interior, Albuquerque, New Mexico. December 23, 1986.	Species not present in Thompson Falls Project area
U.S. Fish and Wildlife Service. 1988. Great Lake and Northern Great Plains Piping Plover Recovery Plan. Department of the Interior, Twin Cities, Minnesota. May 12, 1988.	Species not present in Thompson Falls Project area
Montana Board of Natural Resources and Conservation. 1992. Final order establishing water reservations above Fort Peck Dam. Helena, Montana. July 1992.	Outside geographic scope of Thompson Falls Project area
Montana Board of Natural Resources and Conservation. n.d. Order of the Board of Natural Resources establishing water reservations. Helena, Montana. http://dnrc.mt.gov/divisions/water/water-rights/docs/yellowstone-final-order-pd.pdf	Outside geographic scope of Thompson Falls Project area
U.S. Fish and Wildlife Service. 2013. Greater Sage-grouse (Centrocercus urophasianus) Conservation Objectives: Final Report. Denver, Colorado. February 2013.	Species not present in Thompson Falls Project area

19. Consultation Documentation

A list containing the name and address of Federal, state, and interstate resource agencies, Tribes, or members of the public with which the applicant consulted in preparation of the Environmental Exhibit is included in the Distribution List attached to the cover letter for this DLA.

19.1 Voluntary Pre-Relicensing Efforts

Before filing a FLA with FERC, applicants are required to conduct a pre-license application filing process that consists of 1) presenting the Project to Relicensing Participants[28]; 2) consulting with those Relicensing Participants; 3) identifying issues; and 4) gathering available information.

NorthWestern maintains a website with information about the Thompson Falls Project[29]. Relicensing information, including meeting notices and presentations, reports, and other documents are available on this website.

NorthWestern proactively initiated relicensing outreach discussions with Relicensing Participants in 2018 (**Table 19-1**). The first activity was a training program, "FERC 101," which was held in Missoula, Montana on September 12, 2018. This program included FERC staff who presented information on the procedures used to relicense hydropower projects under the Commission's jurisdiction. NorthWestern also presented information on the Thompson Falls Project. The goal of the meeting was to inform Relicensing Participants of the relicensing process and schedule for the Thompson Falls Project. Representatives from Montana DEQ, Montana Department of Natural Resources and Conservation, USFS, Coeur d'Alene Tribe, FWP, the City, Sanders County, Sanders County Development Corporation, Avista, FWP, CSKT, and Bureau of Land Management (BLM) were in attendance. Presentations from this meeting, and all other Thompson Falls relicensing meetings, are posted on NorthWestern's Project website.

Next, NorthWestern voluntarily prepared a BED which was a compilation of existing resource information. This document was released for public comment on November 1, 2018 and is available on the Project website. A workshop was held in Missoula to discuss the BED and identify any data gaps and resource issues on December 4, 2018 (**Table 20-1**). The presentations from that meeting are available on the Project website. NorthWestern received written comments on the BED from FWP and Montana DEQ.

The Project is operated to provide baseload and flexible generation within the reservoir elevation and minimum flow requirements of the license. During flexible generation operations[30], the

[28] Local, state, and federal governmental agencies, Native American Indian Tribes, local landowners, non-governmental organizations, and other interested parties.

[29] http://www.northwesternenergy.com/environment/thompson-falls-project

[30] Flexible generation supports grid reliability by providing spinning reserve and load balancing as river and reservoir conditions allow, by lowering the reservoir to increase generation and raising the reservoir to reduce generation.

Licensee may use the top 4 feet of the reservoir from full pool while maintaining minimum flows. For several reasons, the full 4 feet typically have not been regularly used in recent years. In order to assess the effects using the Project's full operational flexibility, an operational test was conducted in October 2019. Details of the operational test and observations made during the test are described in Section 14 of the PAD.

In October 2019, NorthWestern hosted a public meeting in Thompson Falls to further inform Relicensing Participants about the relicensing process and provide an update on an operational test and resource studies NorthWestern had conducted.

In March 2020, NorthWestern hosted a second public meeting in Thompson Falls to inform the Relicensing Participants of observations made during the October 2019 operational test, and to describe proposed NorthWestern Project operations. The meeting also included further information on the relicensing process.

All of these activities, summarized in **Table 19-1**, were done voluntarily by NorthWestern to engage the Relicensing Participants in advance of initiating the ILP. The goals of these extra efforts were to learn about potential concerns or gaps in data and to establish a common understanding among interested parties as to what is involved with relicensing a hydroelectric project.

Table 19-1: Thompson Falls voluntary outreach and other pre-ILP activities

Thompson Falls Relicensing Outreach and Other Activities	Comment	Date
FERC 101 Relicensing Outreach Training, Missoula. Public invited.	FERC training on the procedures used to relicense hydropower projects.	Sept 12, 2018
Notified Relicensing Participants of availability of BED.	The BED described the Project and available fish, wildlife, water quality, cultural and recreation, operational and other Project specific information.	Nov 1, 2018
Workshop to discuss the relicensing (ILP) process and BED and identify data gaps and resource issues.	Workshop included small group breakout sessions to discuss fisheries, water resources and recreation/cultural issues.	Dec 4, 2018
Pre-relicensing data collection.	Included operations, water quality, fisheries, and recreation use data.	2018-2020
Public meeting in Thompson Falls for Relicensing Participants.	Included updates on studies and the relicensing process.	Oct. 15, 2019
Public meeting in Thompson Falls for Relicensing Participants.	Included observations made during the operational test and information on data collection for the PAD.	March 11, 2020

In addition to the outreach efforts, NorthWestern accelerated the schedule to conduct certain resource studies so the information would be available to inform relicensing. Specifically, NorthWestern prepared a water quality monitoring plan which was implemented in 2019 to address data gaps that were noted during the preparation of the BED. The results of that study were submitted in the PAD, filed with FERC on July 1, 2020, and available on the Project website.

A Recreation Visitor Survey was conducted during the 2018 peak recreation season (Memorial Day weekend – Labor Day). In addition, the volume of use at five local area recreation sites was monitored during the 2019 peak recreation season using automatic traffic and trail counters. The results of that study were submitted in the PAD, filed with FERC on July 1, 2020, and available on the Project website.

19.2 Implementation of the Biological Opinion

The 2008 BO issued by the FWS for the Project included a requirement for the Licensee to conduct Phase 2 fish passage evaluation studies from 2010 to 2020. At the end of the Phase 2 evaluation period, the Licensee was required to prepare a comprehensive 10-year report for filing with the Commission.

The BO specified that the comprehensive report be completed by December 31, 2020. NorthWestern reviewed the relicensing schedule and found that some adjustments in the compliance reporting schedule could better align the compliance schedule with the relicensing schedule. Specifically, NorthWestern requested, and FWS concurred, that the comprehensive report described in the BO would be submitted a year early. The Comprehensive Phase 2 Fish Passage Report was prepared with guidance from the TAC and filed with FERC on December 20, 2019. The Comprehensive Phase 2 Fish Passage Report summarizes the results of fish passage studies at the Project, conducted in compliance with the BO.

The BO also required that the Licensee conduct a scientific review to determine if the Thompson Falls Project upstream fish passage facility was functioning as intended, and whether operational or structural modifications were needed. The review was to also include a set of recommendations to be submitted to the FWS. The scientific review convened in January 2020, with the formation of the Scientific Panel. The Scientific Panel included representatives from the FWS, FWP, and Water & Environmental Technologies, an environmental and engineering consulting firm. On March 27, 2020, the Scientific Panel issued a memo summarizing its evaluation of the upstream fish passage facility and providing recommendations on how to better evaluate the facility in the future. On April 16, 2020, NorthWestern received written confirmation from the FWS that the requirement for a scientific review, as expressed in TC1-h in the BO, had been met with the submittal of the memo summarizing the Scientific Panel's findings. The recommendations from the scientific review were considered in the development of NorthWestern's list of preliminary issues and studies, found in Section 14 of the PAD.

19.3 Preparation of the Pre-Application Document

Under FERC regulations, NorthWestern was required to submit a PAD 5 to 5.5 years prior to the expiration of the current license (December 31, 2025). NorthWestern filed the PAD July 1, 2020. The PAD is a document that describes the Project proposal and existing, relevant information that can be used to assess potential Project effects on natural, cultural, recreational, and Tribal resources. The PAD was prepared by NorthWestern, taking into consideration information in the

BED, additional information collected through post-BED Relicensing Participant outreach (**Table 19-1**), review of federal and state comprehensive plans filed with FERC and listed on FERC's website (Appendix A of the PAD), and additional data gathering.

An applicant is not required to conduct studies to generate information for the PAD but is expected to exercise due diligence to gather existing information. This includes consulting Relicensing Participants for information relevant to the Project, the local area environment, and potential Project effects. NorthWestern significantly exceeded these requirements with its voluntary development and distribution of the BED and subsequent Relicensing Participant outreach, as described above.

19.4 Scoping

FERC initiated the scoping process with the issuance of SD1 on August 28, 2020. FERC solicited comments and suggestions on the preliminary list of issues and alternatives to be addressed in the Environmental Assessment which will be prepared by FERC. Due to the proclamation declaring a National Emergency concerning COVID-19, issued by the President on March 13, 2020, FERC waived section 5.8(b)(viii) of the Commission's regulations and did not conduct a public scoping meeting and site visit in this case. Instead, they solicited written comments, recommendations, and information, on the SD1. Comments on SD1 were submitted by FWP, FWS, the U.S. Bureau of Reclamation, EPA, USFS, and NorthWestern.

Based on the submission of written comments, FERC updated SD1 to reflect their current view of issues and alternatives to be considered in the NEPA document on December 9, 2020.

19.5 Preparation of Study Plan and Study Plan Determination

In the PAD, NorthWestern identified preliminary issues and potential studies based on existing and relevant information, baseline conditions, and current and proposed future operations. NorthWestern identified eight potential studies in the PAD.

In response to requests for studies submitted by the USFS and FWP, NorthWestern's PSP (filed with FERC December 11, 2020) proposed one additional study to the eight proposed in the PAD, a study of Westslope Cutthroat Trout Genetics.

In accordance with 18 CFR § 5.11, NorthWestern held a study plan meeting on January 6, 2021, which was open to any interested party. At the meeting, NorthWestern presented its proposed studies and provided opportunities for participants to provide input and ask questions. The meetings were attended by representatives of FERC, FWS, FWP, USFS, SHPO, CSKT, Montana DEQ, GMCD, Sanders County Commissioners, Montana Trout Unlimited, EPA, the City, and local residents.

Subsequent to the Study Plan Meeting, requests for studies were submitted by USFS and FWP. During the public comment period, NorthWestern met, sometimes multiple times, with representatives of FWP, FWS, USFS, and Montana DEQ, to discuss the PSP, attempt to resolve any differences over study requests, and inform NorthWestern's development of the RSP.

The public comment period on the PSP closed on March 11, 2021. The comments from FWP and USFS, and NorthWestern's responses, were included in the RSP, filed with FERC April 12, 2021. In response to requests for studies submitted by FWP, NorthWestern added one additional study to the nine proposed in the PSP, Study #10 – Updated Literature Review of Downstream Fish Passage. In addition, in response to various comments by Relicensing Participants, NorthWestern modified several of the study plans in the PSP.

On May 10, 2021, FERC issued a Study Plan Determination on studies to be conducted. The FERC Study Plan Determination directed NorthWestern to conduct seven of the studies proposed in the RSP. The Study Plan Determination did not require NorthWestern to conduct the Water Quality Study, Downstream Transport of Bull Trout Study, Westslope Cutthroat Genetics Study, study of Distribution and Status of Westslope Cutthroat Trout, or the study of Heavy Metals and Organic Compounds in Thompson Falls Reservoir.

19.6 Conduct of Studies

The seven studies included in the May 2021 FERC Study Plan Determination were:

1. Operations Study: A study of operational scenarios to provide flexible capacity and the potential impact of those operational scenarios on Project resources in the Project reservoir and below the powerhouses.
2. TDG: A study of TDG in the Project reservoir, below the Main Channel Dam, and at the Birdland Bay Bridge.
3. Hydraulic Conditions: A hydraulics study to characterize a depth-averaged velocity field and water depths between the Main Channel Dam and the High Bridge (below the Main Channel Dam).
4. Fish Behavior: Radio telemetry study of salmonids to evaluate movement paths/rates and behavior in response to hydraulic conditions, from downstream of the powerhouses to the Main Channel Dam.
5. Visitor Use Survey: A study surveying recreationists at 10 recreation sites on or near the reservoir and the Clark Fork River below the dams.
6. Cultural Resources: A study to update the inventory of the H-A&E and to identify areas where there is a high probability for the occurrence of prehistoric or historic archaeological properties within the proposed APE[31].

[31] The Interim Study Report to identify areas where there is a high probability for the occurrence of prehistoric or historic archaeological properties within the proposed Area of Potential Effect was filed with FERC on January 26, 2022. The updated inventory of the H-A&E is included in this Initial Study Report.

7. Updated Literature Review of Downstream Fish Passage: A literature review of information in the scientific literature published since 2007, regarding downstream passage survival of various size classes of fish, with respect to current Project configuration and operations.

Study reports on each of the seven studies were filed with FERC in an ISR on April 28, 2022. The reports are also available on the Project website and through the FERC eLibrary. The Visitor Use Survey and the Updated Literature Review of Downstream Fish Passage studies were 1-year studies, and thus the ISR contained the final reports for those two studies. The remainder of the studies were multi-year studies, so the ISR contained the results of the data collected in the first year.

NorthWestern held its ISR Meeting on May 5, 2022; and filed its ISR Meeting Summary on June 9, 2022. Attendees at the ISR Meeting included representatives of FERC, USFS, FWP, SHPO, FWS, Montana DEQ, EPA, CSKT, Kaniksu Land Trust, Avista Corp., City, BLM, Sanders County Commission, Trout Unlimited, and Montana State University Extension. Section 5.15(c)(4) of the Commission's regulations, 18 CFR § 5.15(c)(4), provides that any participant or Commission staff may file disagreements concerning the applicant's study report meeting summary, modifications to ongoing studies, or propose new studies within 30 days of the study report meeting summary being filed (i.e., by July 9, 2022). NorthWestern received comments from FERC staff, the USFS, FWS, FWP, and the CSKT, including proposed modifications to ongoing studies and proposed new studies.

On August 8, 2022, NorthWestern filed a response to the comments received on the ISR, proposing to conduct one additional study and modify one study. NorthWestern proposed to conduct an Environmental Justice Study to provide information that FERC staff stated they needed to assess Project effects. In addition, NorthWestern proposed to modify the Fish Behavior Study to extend the study into a third study season.

On September 1, 2022, FERC issued its determination on requests for study modifications. Modifications to Study 4 (Hydraulic Conditions), which were requested by agencies, were not approved. FERC notified NorthWestern that they approved the proposed Environmental Justice study and the proposed modifications to the Fish Behavior Study.

On May 5, 2023, pursuant to 18 CFR § 5.15(f), NorthWestern filed the USR for the relicensing of the Project. In accordance with Commission staff's September 1, 2022 Determination on Requests for Study Modifications,[32] the USR reported on the following:

1. Operations Study: A study of operational scenarios to provide flexible capacity and the potential impact of those operational scenarios on Project resources in the Project reservoir and below the powerhouses.

[32] Letter from John Wood, FERC, to Mary Gail Sullivan, NorthWestern, Project No. 1869-060, Accession No. 20220901-3052 (issued Sept. 1, 2022).

2. TDG: A study of TDG in the Project reservoir, below the Main Channel Dam, and at the Birdland Bay Bridge.
3. Hydraulic Conditions: A three-dimensional hydraulics study to characterize water velocities and water depths between the Main Channel Dam and the High Bridge (below the Main Channel Dam).
4. Fish Behavior: Radio telemetry study of salmonids to evaluate movement paths/rates and behavior in response to hydraulic conditions, from downstream of the powerhouses to the Main Channel Dam.
5. Cultural Resources: Results of a field inventory of cultural resources in the Project's Area of Potential Effect.
6. Environmental Justice: An evaluation to determine the presence of impacts of environmental justice communities in the surrounding community, and an assessment of whether those impacts would be disproportionately high and adverse for minority and low-income populations.

The USR included an Executive Summary, described the six studies approved in the Commission staff's September 1, 2022 Determination on Requests for Study Modifications, identified minor variances from the approved Study Plan Determination, and presented results of the second season of studies (2022). With the filing of the USR, the studies required by the Commission-approved study plan for the relicensing of the Project is complete—except for the Fish Behavior Study, which is continuing in 2023.[33] Except for the remaining work on the Fish Behavior Study, the USR contains a complete reporting of all studies and study plan modifications required by the Commission in this relicensing effort, including in its original May 10, 2021 Study Plan Determination,[34] as well as its September 1, 2022 Determination on Requests for Study Modifications referenced above.

Relicensing participants were notified of the filing and provided a link and the address for the Project website where the USR is posted as well as instructions for accessing the reports through FERC's eLibrary. In addition, the notification invited Relicensing Participants to a USR meeting, as required under FERC's ILP regulations (18 C.F.R. §§ 5.15(f), (c)(2)). NorthWestern hosted two USR meetings, one on Wednesday, May 24, 2023 at NorthWestern's Missoula, MT office, from 9:00 AM until 2:00 PM Mountain Time and another on May 25, 2023, from 6:00 PM to 8:00 PM (Mountain Time), at the Sanders County Courthouse. Both meetings were accessible remotely via Zoom. The daytime meeting was attended by representatives of FERC, USFS, FWP, SHPO, FWS, Montana DEQ, EPA, CSKT, BIA as well as two local residents. The evening meeting was attended

[33] Final results of the Fish Behavior Study will be included in the Final License Application for the Project, which will be filed with the Commission no later than December 31, 2023.
[34] Letter from Terry L. Turpin, FERC, to Mary Gail Sullivan, NorthWestern, Project No. 1869-060, Accession No. 20210510-3034 (issued May 10, 2021).

by representatives of FERC, the Kaniksu Land Trust, the Trails Group, the Sanders County Ledger (newspaper), Avista Corp., a member of the State legislature, and six local residents.

NorthWestern also sent separate notifications to Relicensing Participants inviting them to participate in a voluntarily provided Project tour on the afternoon of May 25, 2023. Although attendance was not recorded, approximately 20 people attended the tour including resource agencies representatives, Commission staff, and local residents.

As required under FERC's ILP regulations (18 C.F.R. §§ 5.15(f), (c)(3)) and the Commission's Process Plan and Schedule, NorthWestern filed a summary of the USR meeting on June 8, 2023. The meeting summary included the meeting agendas, attendee lists, and copies of the presentations given at the USR meetings. Comments on the USR were due by July 9, 2023(18 C.F.R. § 5.15(c)(4)). NorthWestern received comments from 25 local landowners and residents, BIA, CSKT, FWP, FWS, GMCD and SHPO.

Following an opportunity for NorthWestern to respond to any comments by August 8, 2023, Commission staff is expected to issue a Determination on Disagreements/Amendments by September 7, 2023 (18 C.F.R. § 5.15(c)(6)).

19.7 Preparation of Draft License Application

Beyond the regulatory consultations described above, during the 5-year pre-filing stage of the relicensing process, NorthWestern engaged with the entities listed in **Table 19-2**.

Table 19-2: Additional pre-filing agency consultation meetings

Agency	Meeting Subject	Date
FWP	Initial relicensing discussion FWP headquarters	11/25/2019
	Study plan proposals	1/15/2021, 1/29/2021, 2/19/2021, 2/26/2021
	Fish telemetry options (FWS, FWP, USFS)	2/25/2021
	Relicensing update	5/31/2022
	Relicensing updates FWP	10/14/2022
	Settlement discussions	1/13/2023, 3/10/2023, 6/23/2023
FWS	Virtual relicensing introduction	2/04/2019
	Started relicensing monthly conference calls	Started 3/19/2019, ongoing
	Discuss Proposed Study Plans	2/19/2021
	Fish telemetry options (FWS, FWP, USFS)	2/25/2021
	Discuss study plans	5/13/2021
	Settlement discussions	7/21/2022, 02/13/2023, 06/22/2023
Montana DEQ	Relicensing introduction meeting	8/17/2018
	Water Quality monitoring	1/8/2019
	Relicensing updates	3/11/2021
	Water quality updates	3/16/2022
	Settlement discussion	5/31/2023
Sanders County Commissioners and City officials	Relicensing updates	4/28/2023
USFS	Relicensing introduction meeting at USFS office	7/16/2019
	Virtual meeting	12/04/2020
	Study Plan meeting	2/22/2021
	Settlement discussion	3/03/2023

19.8 Additional Tribal Consultation

When NorthWestern began relicensing efforts in 2018, NorthWestern contacted the Tribal Nations recommended by the SHPO of Montana and Idaho as potentially interested in the relicensing. The Tribal Nations recommended by the SHPO in Montana were the Chippewa-Cree of the Rocky Boy's Indian Reservation, Blackfeet, and the Confederated Salish and Kootenai. The Tribal Nations recommended by the Idaho SHPO were the Kootenai, Kalispel, and Coeur d'Alene Tribes. These Tribes were contacted by NorthWestern in April 2018 to make them aware of the relicensing, inquiring if they wanted to be added to the list of interested Tribal Nations for "Nation-to-Nation" consultation to be sent to FERC, and inviting them to share information important to protecting Tribal resources.

The CSKT have been actively engaged in fish passage planning and implementation at the Project for approximately 20 years. The CSKT is a signatory of the MOU for the fish passage Project and is a voting member of the TAC.

On July 17, 2020, FERC sent a letter to the above listed Tribes and invited them to participate in the Project relicensing and offered to meet with them individually. On August 12, 2020, the CSKT replied that they were interested in meeting with FERC to discuss the Tribes interest in the relicensing.

NorthWestern has included the Tribes on the mailing list for all the meeting announcements and comments periods described in **Exhibit E - Sections 19.1 through 19.7**. The CSKT has been a regular participant in the relicensing proceedings, attending meetings and commenting on study plans and reports.

In addition, the Tribes were also invited to comment on the draft Interim Cultural Resources Report and Predictive Model and the draft HPMP prior to finalization. The CSKT submitted comments on the Interim Cultural Resources Report, which were adopted in the finalization of that report. In the CSKT comments, they noted that they had information from oral histories and the CSKT Site Registry database that would help to inform the relicensing proceeding. On December 21, 2021, NorthWestern responded to CSKT requesting that they share relevant information.

Comments on the HPMP are pending at the time of this writing and will be addressed in the FLA.

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Appendix A- Water Quality Monitoring Report 2019 - 2021

Thompson Falls Project No. 1869 Water Quality Monitoring Report

2019-2021

Final Version – July 2022

NorthWestern Energy

Delivering a Bright Future

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Abbreviations and Acronyms

<	less than
BED	Baseline Environmental Document
DO	dissolved oxygen
EPT species	*Ephemeroptera*, *Plecoptera*, and *Tricoptera*
FERC	Federal Energy Regulatory Commission
mg/L	milligrams per liter
Montana DEQ	Montana Department of Environmental Quality
Montana FWP	Montana Fish Wildlife and Parks
ng/kg	nanograms per kilogram
NO_3+NO_2	Nitrate+Nitrite
NorthWestern Energy	NorthWestern Corporation, a Delaware corporation, d/b/a NorthWestern Energy
NTU	nephelometric turbidity unit
PCB	Polychlorinated Biphenyl
Project	Thompson Falls Hydroelectric Project
QA/QC	quality assurance and quality control
SKQ	Seli'š Ksanka Qlispe'
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	total equivalence
Thompson Falls Project	Thompson Falls Hydroelectric Project
TN	Total Nitrogen
TP	Total Phosphorus
U.S.	United States
USGS	U.S. Geological Survey

Section 1.0 – Background

The Thompson Falls Hydroelectric Project (Thompson Falls Project or Project) is located on the Clark Fork River in Sanders County, Montana. Preliminary development of the Thompson Falls 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 Project has been operating continuously since 1915.

Non-federal hydropower projects in the United States (U.S.) are regulated by the Federal Energy Regulatory Commission (FERC) under the authority of the Federal Power Act. Montana Power Company acquired the Thompson Falls Project in 1929. The original license for the Thompson Falls Project was issued effective January 1, 1938 and expired on December 31, 1975. The current FERC License was issued to the Montana Power Company in 1979. The Project was purchased by (and FERC License transferred to) PPL Montana in 1999 and then purchased by (and FERC License transferred to) NorthWestern Corporation, a Delaware corporation, d/b/a NorthWestern Energy (NorthWestern) in 2014. An order amending the License was issued in 1990 allowing for construction of an additional powerhouse and generating unit, which was subsequently completed in 1995. With the addition of this new (second) powerhouse, the Project has a total generating capacity of 92.6 megawatts. The current FERC License is scheduled to expire December 31, 2025.

In preparation for renewal of the FERC License for the Project, NorthWestern developed a plan to collect baseline water quality data on the Project (NorthWestern, 2019, 2020, 2021). This resulting data will serve as a water quality baseline for the new FERC license period and enable NorthWestern to track water quality trends over time. The Project is located in the lower portion of the Clark Fork watershed (**Figure 1-1**) with two dams upstream of the Project on the Flathead River, a major tributary of the Clark Fork River, and two dams downstream of the Project on the Clark Fork River. The Flathead River is a regulated system with the flow regime being manipulated by the operations of Hungry Horse and Seli'š Ksanka Qlispe' (SKQ) Dams. The Clark Fork River upstream of the confluence with the Flathead River is not regulated by dams, and therefore is more representative of a natural river system in regard to its hydrograph. The Clark Fork River downstream of Thompson Falls Dam runs for approximately 3.2 miles (5.1 km) before it reaches the impounded area of Noxon Rapids Dam.

In 2018, a Baseline Environmental Document (BED) was developed for the Project to describe existing and relevant information about Project hydro facilities and operation, area water quantity and quality, fisheries, wildlife, vegetative, aesthetic, socioeconomic, cultural and public recreation resources (NorthWestern, 2018). Water quality data gaps were identified in the BED, and subsequent water quality data collected in 2019, 2020, and 2021 to fill data gaps and provide an overall picture of existing water quality conditions.

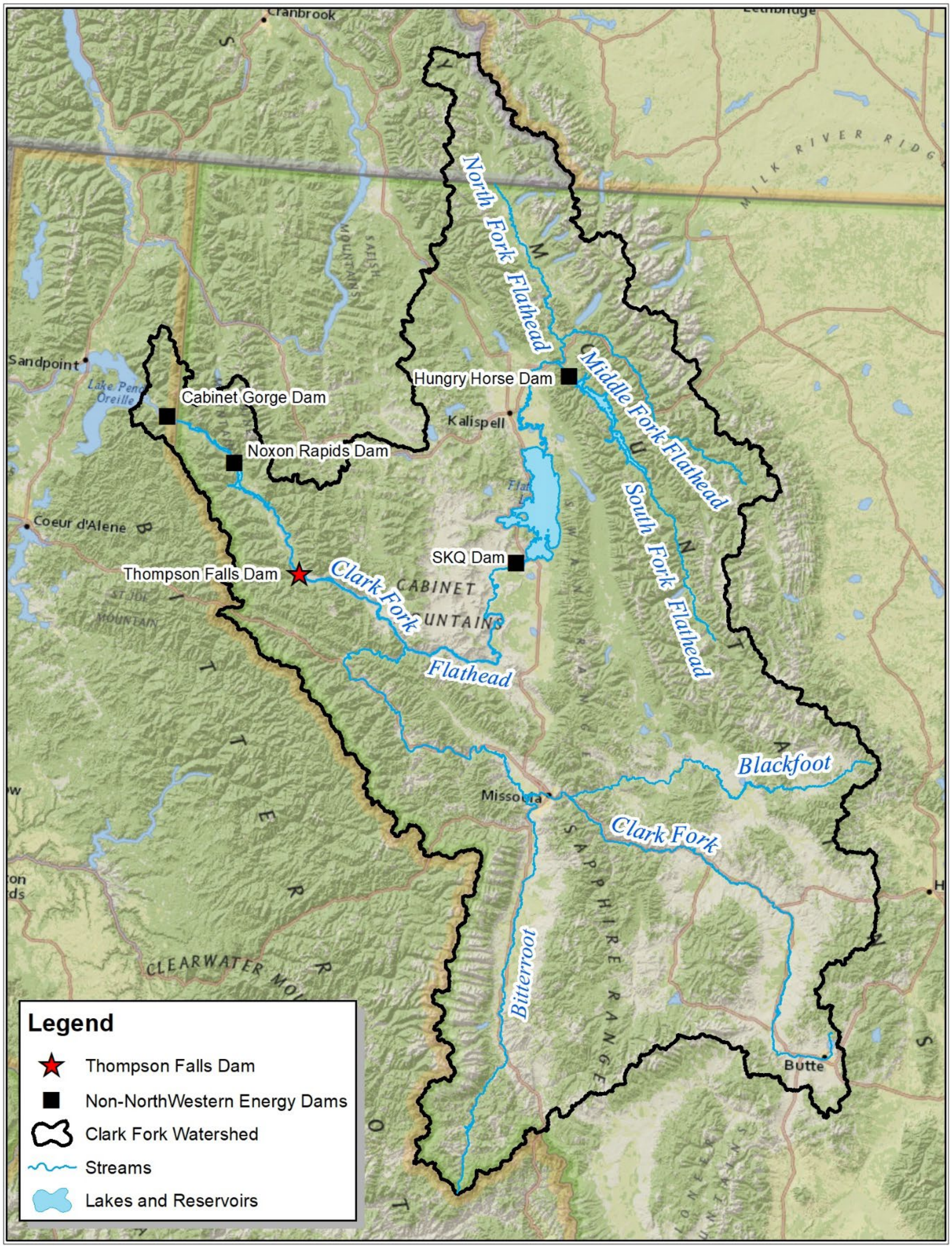


Figure 1-1. Map showing the location of Thompson Falls Dam in the Clark Fork River watershed.

Thompson Falls Reservoir is approximately 12 miles (19.3 km) long with a maximum width of about 1,800 feet. The shoreline length of the reservoir is approximately 25 miles (40.2 km). Active storage capacity of Thompson Falls Reservoir is approximately 15,000 acre-feet between crest El. 2,380 feet and normal full pool El. 2,396 feet, 1 foot below the Project boundary El. of 2397 feet. At the normal full pool reservoir El. 2,396 feet, the reservoir surface area is approximately 1,446 acres. Thompson Falls Reservoir has a maximum depth in excess of 45 feet (Montana Power Company, 1982). At full powerhouse flow (23,000 cfs) the available storage (15,000 acre-feet) can be discharged in about 8 hours.

The monthly fluctuation of average residence time (flushing rate) for Thompson Falls Reservoir is displayed in **Figure 1-2**. The results indicate that water residence time in Thompson Falls Reservoir is very short, particularly in the spring when residence time is, on average, less than 4 hours. The residence time ranges from less than 4 hours (June) to approximately 17 hours (September). It is not uncommon for residence times in lakes to range from months to years.

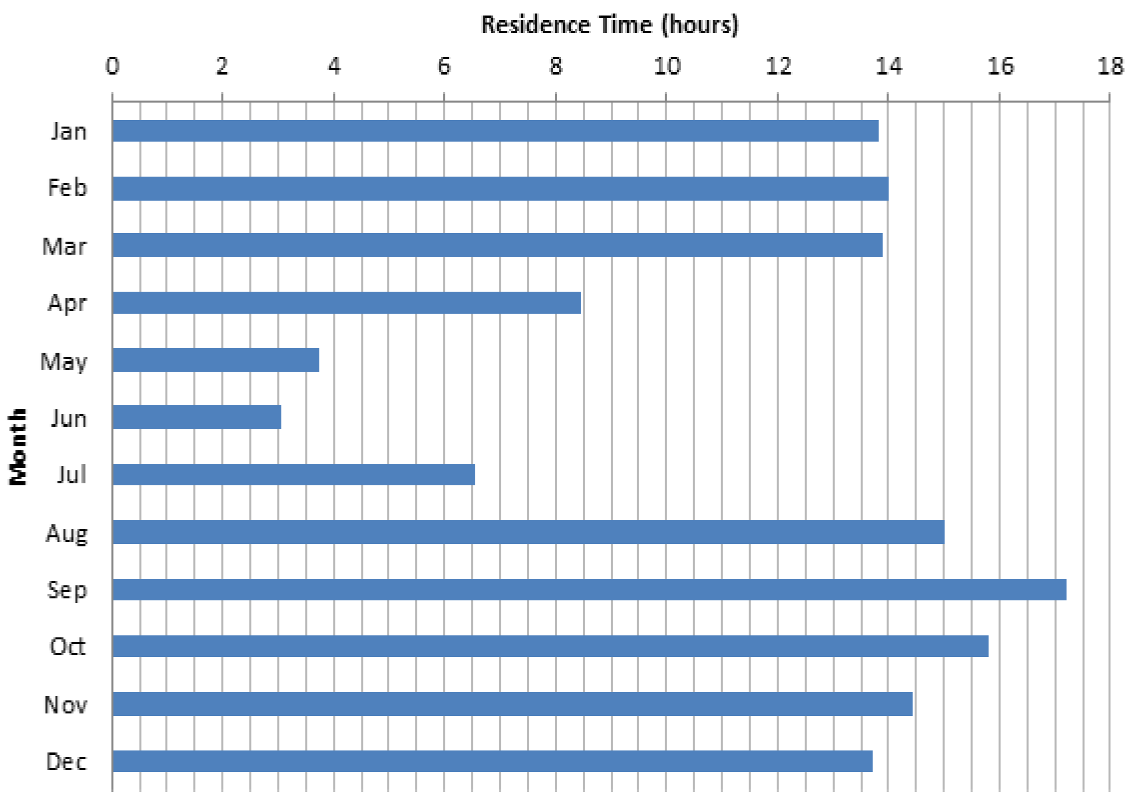


Figure 1-2. Estimated average monthly residence time in Thompson Falls Reservoir.

Flows in the Clark Fork River are gaged near Plains, MT, which is approximately 30 miles (48 km) upstream of the Thompson Falls Project. There is only one tributary with significant flow between the Plains gage station and the Project, the Thompson River. The Thompson River joins the Clark Fork River approximately 6 miles (9.7 km) upstream of the dams and contributes on average 2.0 percent of the flow in the Clark Fork River with a range of 0.7 percent up to 5.4 percent. The U.S. Geological Survey (USGS) also maintains a gage on the Thompson River. Therefore, the most accurate available flow statistics were derived by combining USGS gages on Clark Fork River at Plains, Montana (USGS gage 12389000) with the Thompson River near Thompson Falls (USGS gage 12389500), to calculate streamflow in Clark Fork River at the Project (**Figure 1-3**).

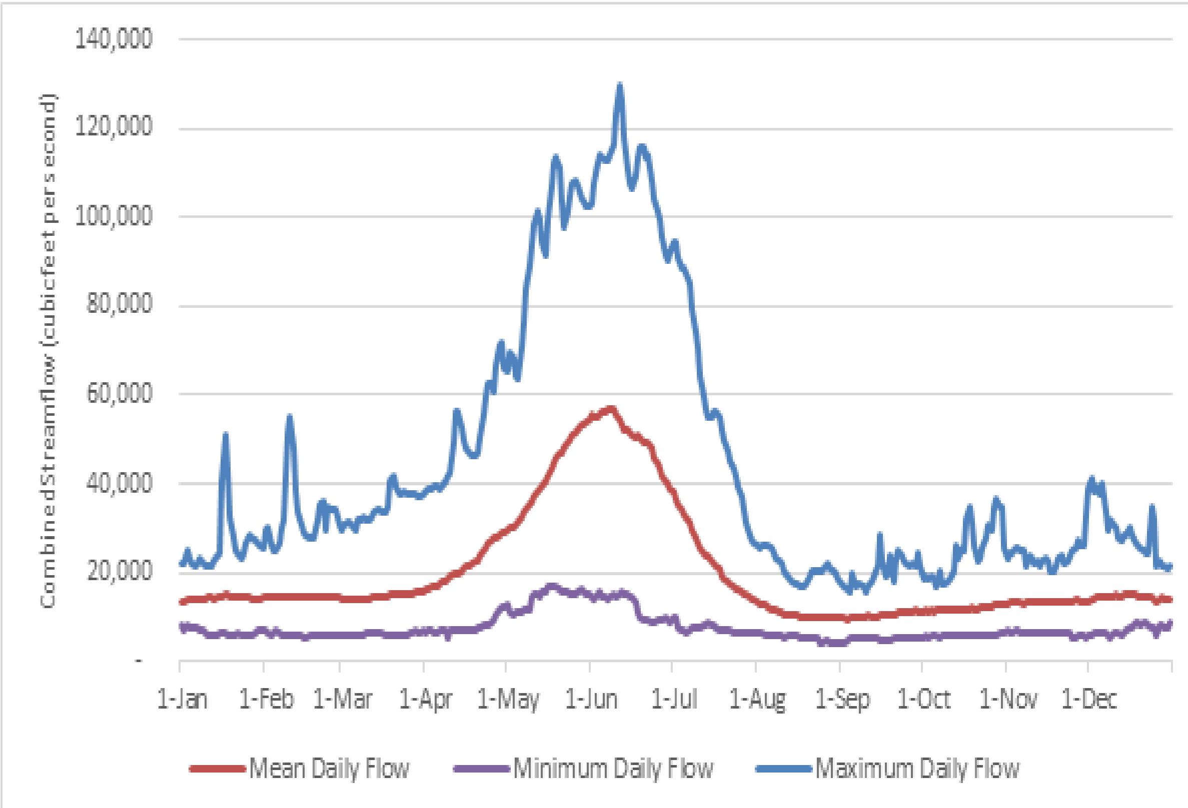


Figure 1-3. Daily minimum, maximum, and mean streamflow at Thompson Falls Project from April 1, 1956 to present.

Mean daily streamflow data were recorded at the USGS gage on the Clark Fork River at Plains from October 1, 1910 to present. The Thompson River near Thompson Falls flow data were recorded from March 1 to September 29, 1911 and from April 1, 1956 to present. To ensure that the hydrograph is representative of current conditions, **Figure 1-3** represents the minimum, maximum, and mean daily flows from April 1, 1956 to present. This period of record allows complete datasets for both USGS gages (Clark Fork River at Plains and Thompson River near Thompson Falls) to be analyzed and, also, provides representative data of upstream flows since the construction of upstream dams on the Flathead River. The ascending limb of the hydrograph begins between mid- and late March, peaks between late May and mid-June, and descends to base flow levels around mid-August (**Figure 1-3**).

Section 2.0 – Water Quality Monitoring

Water quality monitoring was conducted at the Thompson Falls Project in 2019, 2020, and 2021. Data collected provide a characterization of existing water quality conditions at the Project, and include water chemistry and field parameters, sediment chemistry, and biological data. **Figure 2-1** is a map showing the location of the water quality monitoring sites and **Table 2-1** provides a description of each monitoring site.

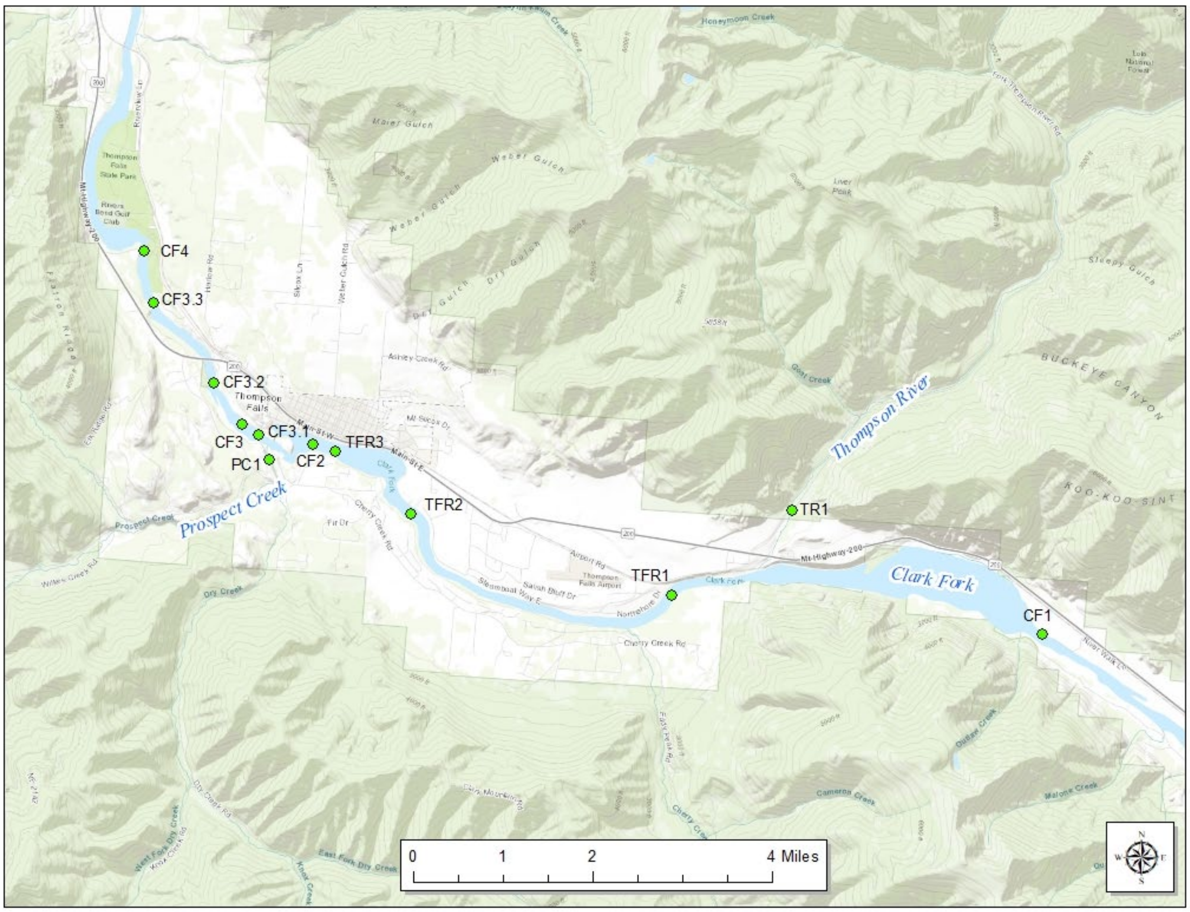


Figure 2-1. Map showing the location of the 2019-2021 Thompson Falls water quality monitoring sites.

Each monitoring site was chosen to provide spatial representation throughout the Project, bracket powerhouse infrastructure, and provide information on significant tributaries. Data collected at the monitoring sites listed in **Table 2-1** and shown in **Figure 2-1** differed from site to site depending on the purpose a particular site was selected.

Table 2-1. Descriptions and locations of biological and water quality monitoring sites.

Site Name	Site Description	Latitude	Longitude
CF1	Clark Fork River upstream of Thompson Falls Reservoir	47.569187	-115.167518
CF1*	*Biological sampling location for CF1	47.569904	-115.175776
CF2	Clark Fork River upstream of dam in Thompson Falls Reservoir	47.593502	-115.353699
CF3	Clark Fork River downstream of old powerhouse	47.594303	-115.362777
CF3*	*Biological sampling location for CF3	47.594984	-115.365869
CF3.1	Clark Fork River downstream of new powerhouse	47.592967	-115.358745
CF3.2	Clark Fork River near HWY 200 Bridge	47.601154	-115.372673
CF3.3	Clark Fork River near Thompson Falls State Park	47.612526	-115.388294
CF4	Clark Fork River at Birdland Bay Bridge	47.621436	-115.391592
TR1	Thompson River near mouth	47.587434	-115.232969
PC1	Prospect Creek near mouth	47.590124	-115.358559
TFR1	Thompson Falls Reservoir, upper	47.572973	-115.259564
TFR2	Thompson Falls Reservoir, mid-reservoir	47.578977	-115.320398
TFR3	Thompson Falls Reservoir, lower	47.591410	-115.344833

Note:
*Biological sampling sites were not in the same, exact location as the correlating water quality monitoring sites.

Section 2.1 – Water Chemistry and Field Parameters

Water chemistry was sampled at multiple monitoring sites around the Project to characterize the incoming water quality from the Clark Fork River and the outgoing water quality downstream of the Project. Parameter groups analyzed included nutrients, metals, inorganics, and physical properties. Field parameters collected in-situ were also measured.

Section 2.1.1 – Monitoring Sites and Methods

Water chemistry was monitored at nine sites in and around the Project from 2019 through 2021 (**Table 2-2**). These nine sites included four recurring monitoring sites on the Clark Fork River, three additional sites downstream of Project infrastructure for source assessment purposes, and two tributary sites. The tributary monitoring sites were located on the Thompson River, which enters Thompson Falls Reservoir near the upstream end of the Project, and Prospect Creek, which enters the Clark Fork River downstream of Project infrastructure.

The water quality sampling consisted of the collection of either single point depth integrated samples, or depth integrated equal width increment composites at each monitoring location. Grab samples were collected from the bank in a well-mixed portion of the river, or from a bridge at equal width increments and composited in a Teflon churn splitter. The sampling methodology described above conforms to current standard operating procedures used by the Montana Department of Environmental Quality (Montana DEQ) (Makarowski, 2019). A list of analytes monitored are shown in **Table A-1** in **Appendix A**.

Chlorophyll-*a* samples were collected in 2019 using the whole-rock method. Six replicate transects were conducted at each chlorophyll-*a* monitoring site, with each transect containing five to six rocks per sample. The rocks were then placed in a cooler on ice and transported to the laboratory for chlorophyll-*a* analysis of the sample.

Field parameters were collected at each sampling site using a laboratory calibrated Hydrolab HL7 sonde. A list of field parameters monitored in this study can be found in **Table A-2** in **Appendix A**. Continuous water temperature monitoring also occurred at various locations across the Project in 2019 and 2021.

Table 2-2. Description of purpose, methods, and parameters measured at water chemistry monitoring sites.

Site Name	Site Purpose	Sampling Method	Analyte Groups
CF1	Incoming water quality to the Project	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature, Chlorophyll-*a*
CF2	Water quality leaving the reservoir, upstream of the powerhouses	Equal width increment composite sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature
CF3	Water quality downstream of the old powerhouse	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature, Chlorophyll-*a*
CF3.1	Water quality downstream of the new powerhouse (Metals source assessment)	Single point grab sample	Metals
CF3.2	Water quality near the HWY 200 bridge (Metals source assessment)	Single point grab sample	Metals
CF3.3	Water quality near Thompson Falls State Park (Metals source assessment)	Single point grab sample	Metals
CF4	Water quality leaving the Project	Equal width increment composite sample, Hydrolab HL7 Sonde	Nutrients, Metals, Physical Properties, Inorganics, Field

Site Name	Site Purpose	Sampling Method	Analyte Groups
			Parameters, Temperature
TR1	Water quality of the Thompson River	Single point grab sample, Hydrolab HL7 Sonde, Onset Thermograph	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters, Temperature
PC1	Water quality of Prospect Creek	Single point grab sample, Hydrolab HL7 Sonde	Nutrients, Metals, Physical Properties, Inorganics, Field Parameters

Data quality assurance and quality control (QA/QC) were accomplished using methods described in the standard operating procedures used by the Montana DEQ (Makarowski, 2019). These methods include:

1. Validation: reviewing analytical laboratory techniques including lab duplicate, matrix spikes, blanks, and surrogate recoveries to determine if the methods are within acceptable limits.
2. Replicates: each sampling event will include the collection of one replicate sample. Replicate variability will be analyzed using standard methods with objective of obtaining Relative Percent Differences (also known as RPDs) within 10% for values greater than 5 times the method detection limit.
3. Splits: Splits will be collected using a churn splitter to achieve equal aliquots, and samples will be analyzed for the full suite of parameters.
4. Field methodology: field blanks will be collected for each water quality event to monitor field methodology. Methods and field sampling forms will be reviewed to assure consistency.
5. Individual data which fails to achieve QA/QC objectives will be flagged with appropriate qualifiers in the database.
6. If QA/QC review suggests widespread problems with QA/QC for a sampling run, the sampling run (or individual samples) may be repeated at the discretion of the project manager.

Quality control measures were also employed for any statistical analyses. These measures included:

1. Testing the data for normality and adjusting for seasonal and flow effects.
2. For water quality, assigning one-half the detection limit to non-detect values and evaluating the methodology/detection limits to assure the analyses are valid.
3. Addressing missing values and trend analyses in a consistent manner that avoids biasing the results.

Section 2.1.2 - Water Chemistry and Field Parameter Results

Section 2.1.2.1 - Nutrients

Nutrients within the Thompson Falls Project are generally low in concentration, which is reflected in both the water chemistry data as well as the biological data. Water chemistry samples were collected throughout the year, so nutrient concentrations may reflect conditions outside of the summertime window of July 1 through September 1 when most of the biological growth is occurring in the waterbody. Outside of this summertime window, nutrient concentrations in the water column are typically higher because they are not being consumed by biological growth as readily.

Total Nitrogen

Total nitrogen (TN) concentrations remained consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), but were lower at the two tributary monitoring sites (PC1 and TR1) (**Figure 2-2**). There are relatively few nitrogen inputs between the upstream end of the Project boundary (CF1) and the upstream end of Noxon Reservoir (CF4), which is reflected in the data.

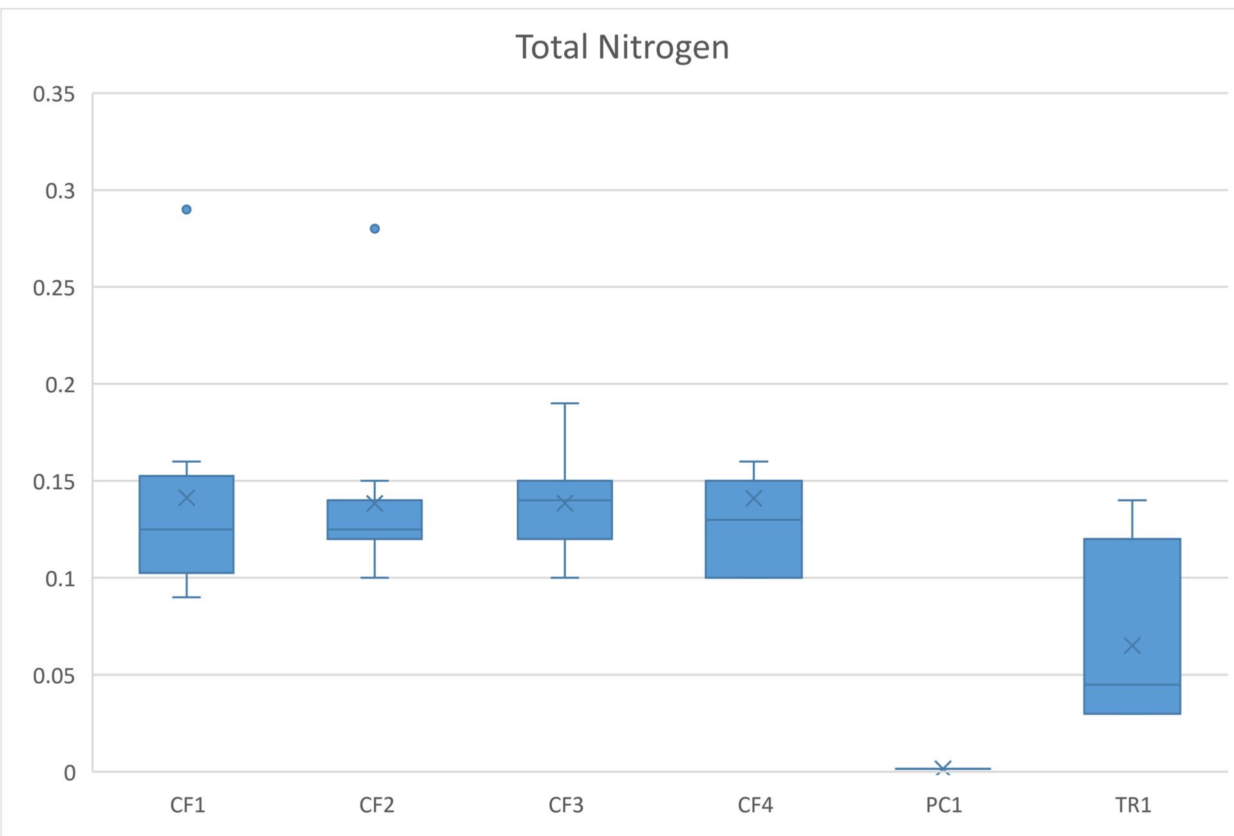


Figure 2-2. Total nitrogen concentrations across all water quality monitoring sites (**in mg/L**).

Nitrate+Nitrite

Nitrate+Nitrite (NO_3+NO_2) concentrations show a similar pattern to TN concentrations, with little to no change across the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4). As with TN, the tributary sites (PC1 and TR1) also showed lower concentrations of NO_3+NO_2. **Figure 2-3** below shows the NO_3+NO_2 concentrations across all monitoring sites.

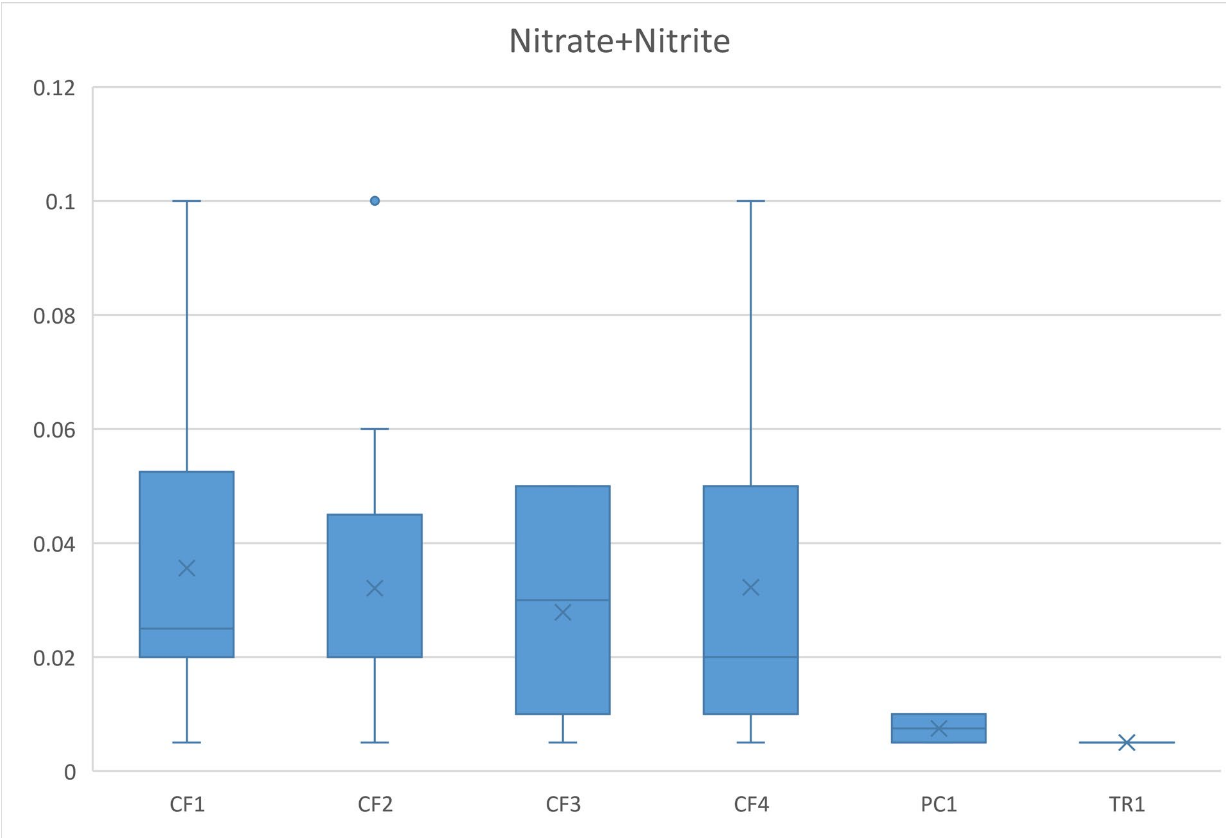


Figure 2-3. Nitrate+Nitrite concentrations across all water quality monitoring sites (in mg/L).

Total Phosphorus

Total phosphorus (TP) concentrations follow a similar pattern to TN and NO_3+NO_2 concentrations across the Project. The lowest TP concentrations on the Clark Fork sites (CF1, CF2, CF3, and CF4) were found at sites CF2 and CF3, which are located just upstream and downstream of the dams and powerhouses respectively (**Figure 2-4**). Phosphorus has a tendency to bind tightly to soil particles, many of which settle out in the reservoir and are consumed by biological growth in the reservoir, which would explain the slightly lower TP concentrations found at sites CF2 and CF3 as compared to site CF1, which is located at the upstream end of the reservoir. As with TN and NO_3+NO_2, the concentrations of TP were found to be lower at the tributary sites (PC1 and TR1) than at the Clark Fork sites.

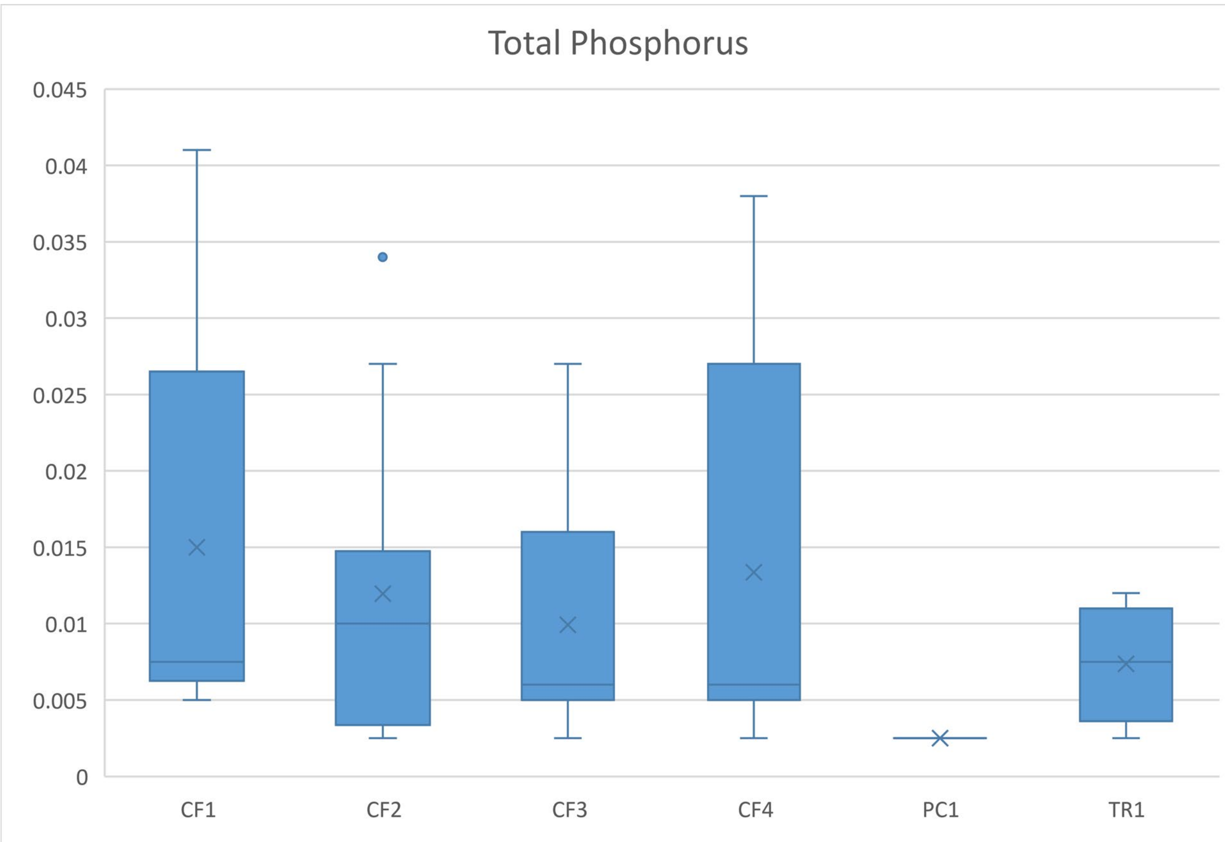


Figure 2-4. Total phosphorus concentrations across all water quality monitoring sites (**in mg/L**).

Chlorophyll-a

Chlorophyll-*a* samples were collected at two locations in 2019; site CF1 to represent conditions upstream of Thompson Falls Reservoir and site CF3 to represent conditions downstream of Thompson Falls Reservoir. Upstream chlorophyll-*a* concentrations were found to be higher at site CF1 versus the downstream chlorophyll-*a* concentrations at site CF3 (**Figure 2-5**). This likely indicates that some nutrient uptake and attenuation is occurring in Thompson Falls Reservoir, and therefore less nutrients are available downstream to be consumed by phytoplankton.

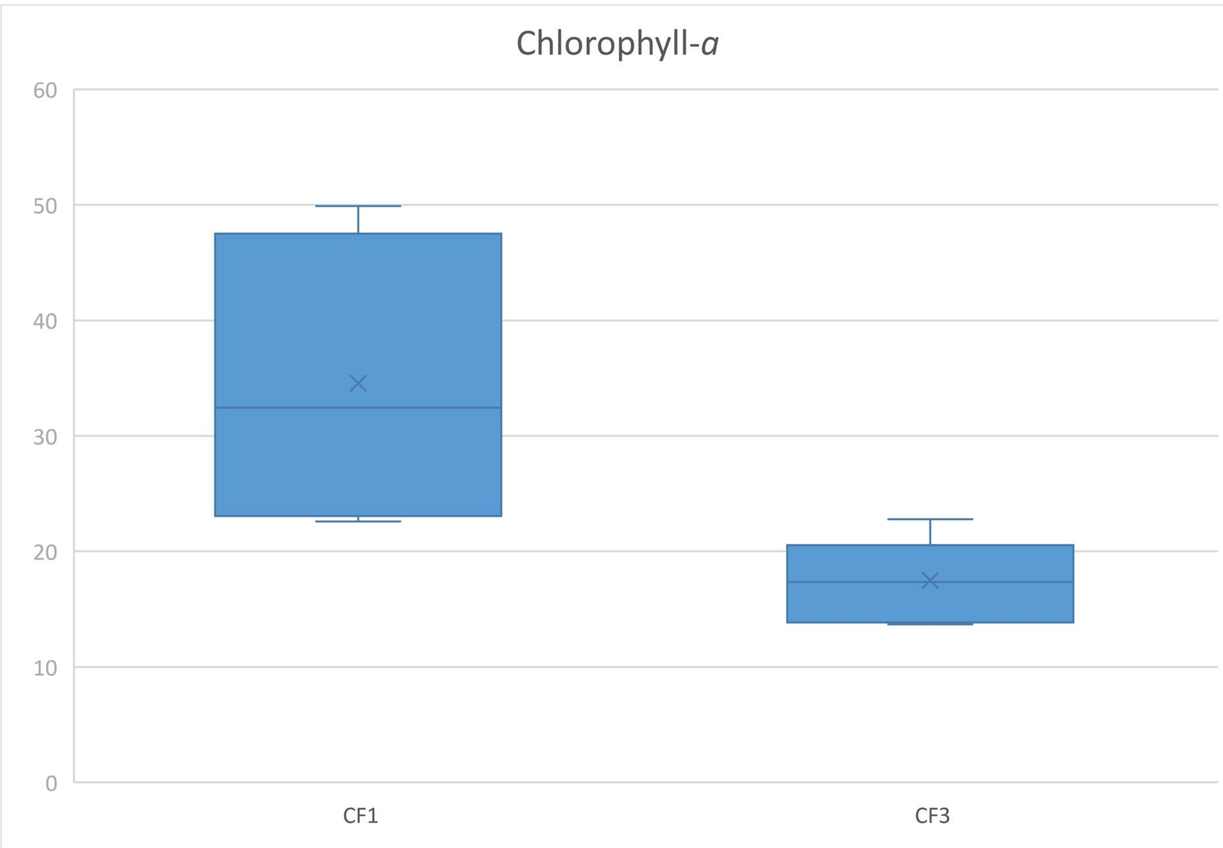


Figure 2-5. Chlorophyll-*a* concentrations upstream and downstream of Thompson Falls Reservoir (in mg/m^2).

Section 2.1.2.2 - Metals

Generally, aqueous metal concentrations within the Project are meeting water quality standards at all sites with the exception of three samples from Birdland Bay Bridge (site CF4) which showed lead levels exceeding the water quality standard for chronic aquatic life. Site CF4 is located downstream of the Project and is used to characterize the water quality as it enters Noxon Reservoir. These three samples were collected during both high and low flow periods, and the source of the lead is unknown because all other sites had low or non-detectable concentrations of lead. Additional source assessment sampling for lead was conducted in the fall of 2020 and detailed in this section below. All other metals analyzed were found to be at concentrations below water quality standards.

Arsenic

Arsenic concentrations at all sites were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), with a greater variation in sample concentrations found at sites CF1 and CF4 (**Figure 2-6**). Tributary site (PC1 and TR1) arsenic concentrations were found to be at non-detectable levels.

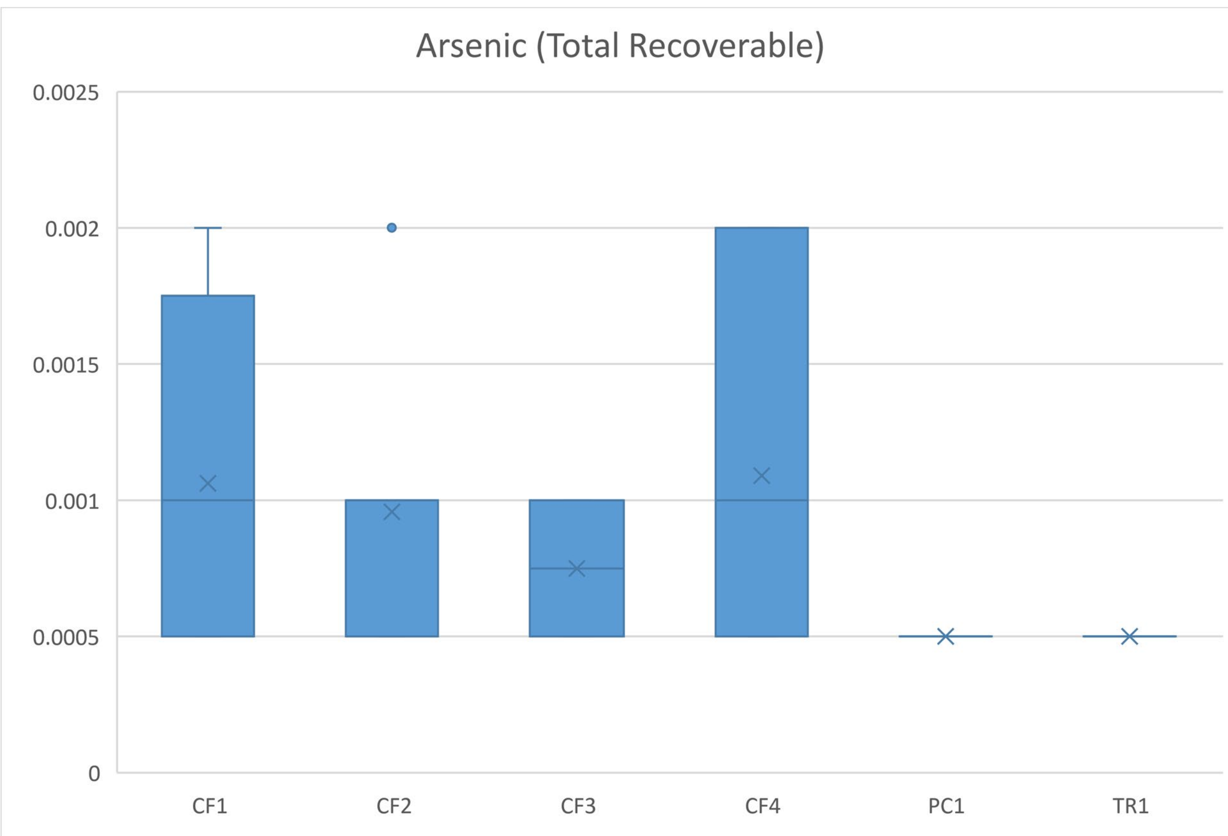


Figure 2-6. Arsenic concentrations across all water quality monitoring sites (in mg/L).

Cadmium

Cadmium concentrations at all Clark Fork sites (CF1, CF2, CF3, and CF4) were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites. All of the Clark Fork samples, with the exception of two samples at site CF2, were found to be at non-detectable concentrations of cadmium (**Figure 2-7**). Cadmium toxicity is dependent on water hardness, and when the hardness of the Clark Fork River is factored in, the two cadmium detections at site CF2 were below water quality standards for aquatic life.

Cadmium concentrations in the Thompson River were non-detectable, but cadmium concentrations in Prospect Creek exceeded the water quality standard for chronic aquatic life when the water hardness of Prospect Creek is factored in. Prospect Creek has a history of mining in the watershed, so mining activity is a potential source of cadmium in Prospect Creek. Prospect Creek enters the Clark Fork River downstream of the Main Channel Dam, and therefore has no influence on the water quality of Thompson Falls Reservoir.

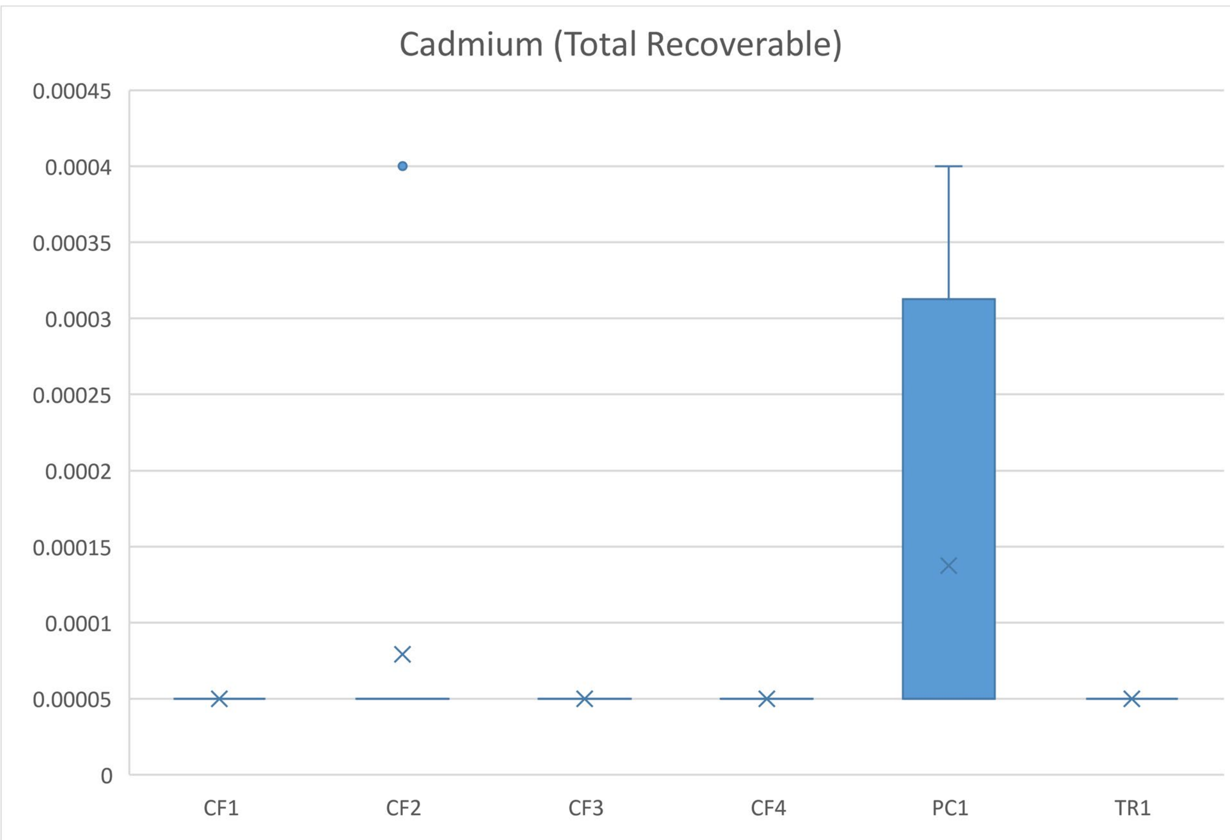


Figure 2-7. Cadmium concentrations across all water quality monitoring sites (in mg/L).

Copper

Copper concentrations remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4), with the lowest concentrations found at site CF3, downstream of the old powerhouse (**Figure 2-8**). Copper toxicity is dependent on water hardness, and when the hardness is factored in, the copper concentrations at all sites were below water quality standards for aquatic life. Tributary site (PC1 and TR1) copper concentrations were found to be at non-detectable levels.

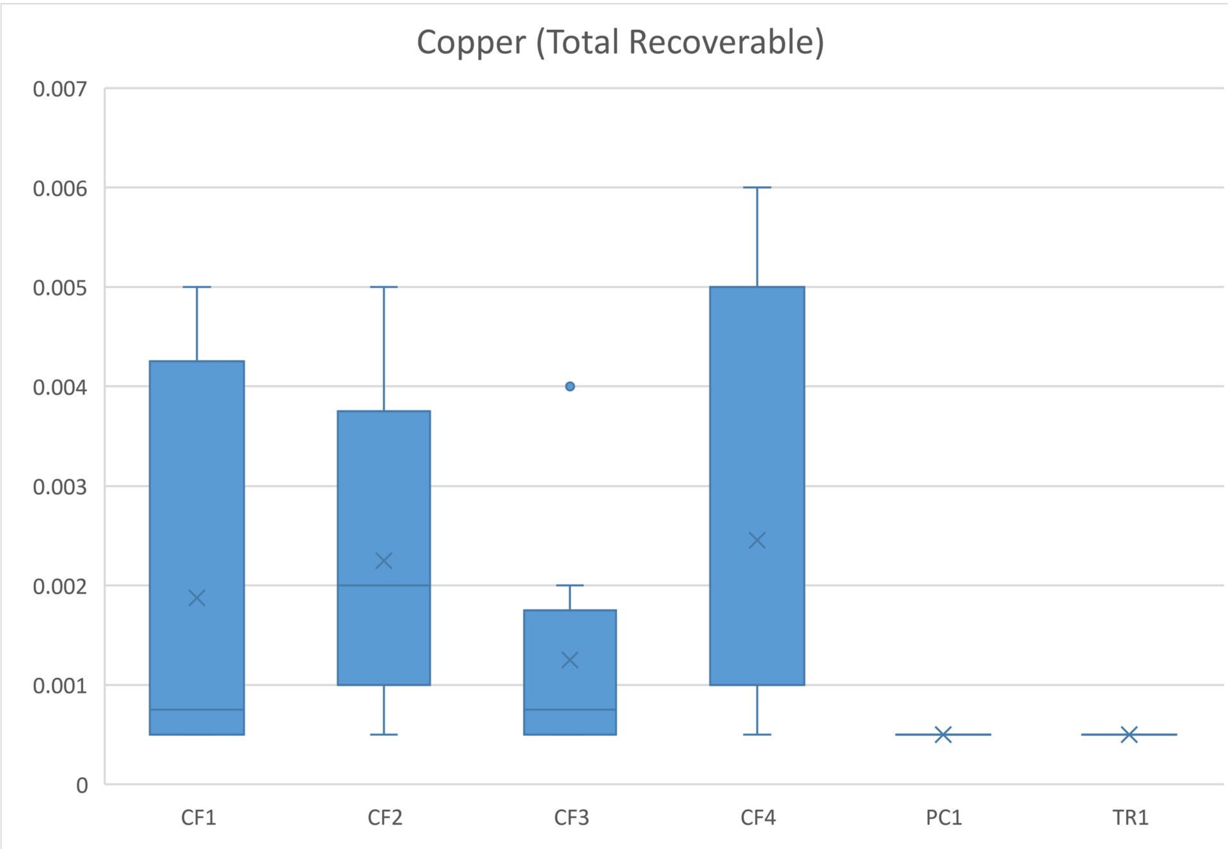


Figure 2-8. Copper concentrations across all water quality monitoring sites (in mg/L).

Iron

Iron concentrations at all sites were below water quality standards and remain fairly consistent throughout the Clark Fork monitoring sites (CF1, CF2, CF3, and CF4) (**Figure 2-9**). Tributary site (PC1 and TR1) iron concentrations were also found to be at low levels, with the Thompson River having slightly higher concentrations of iron than Prospect Creek.

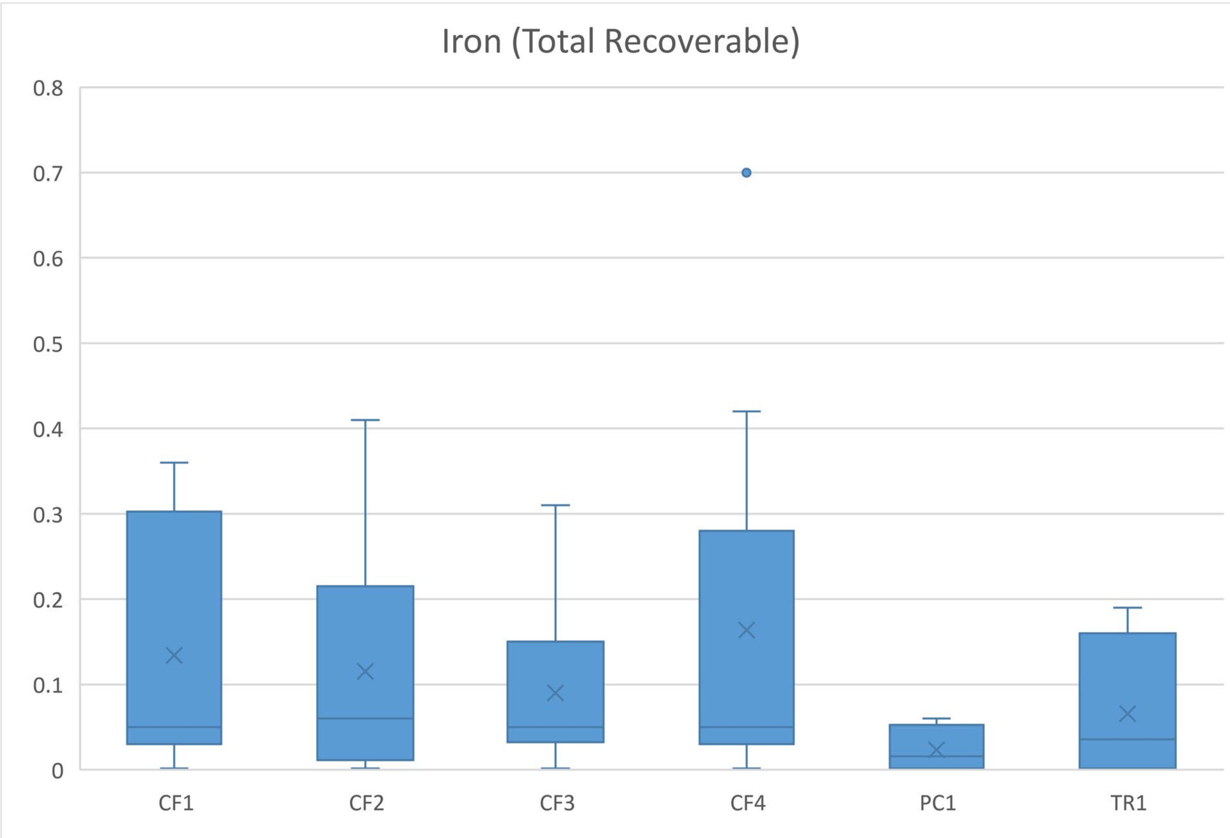


Figure 2-9. Iron concentrations across all water quality monitoring sites (in mg/L).

Lead

Lead concentrations were at low to non-detectable levels at all sites except site CF4 (**Figure 2-10**). Lead toxicity is dependent on water hardness, and when the hardness of the Clark Fork River is factored in, three lead samples at site CF4 were above water quality standards for chronic aquatic life. Site CF4 is downstream of the Project.

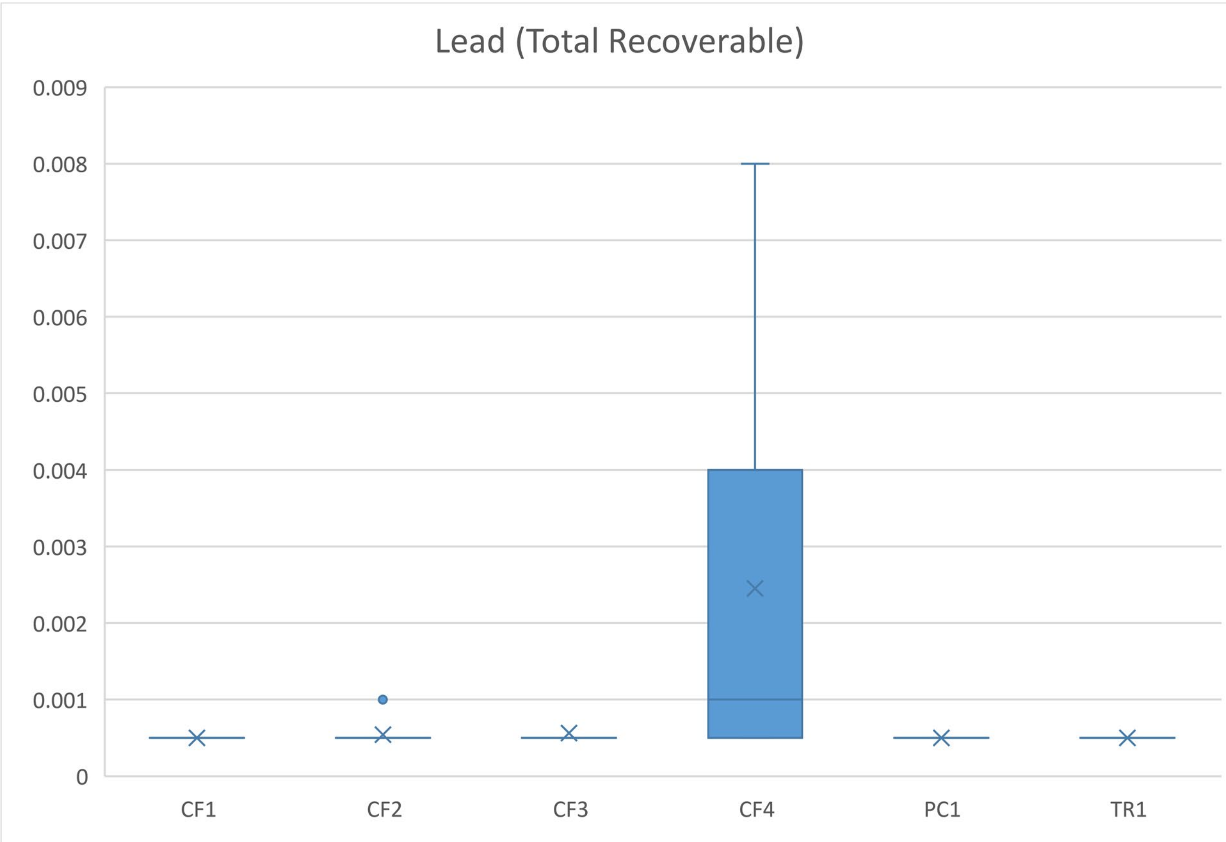


Figure 2-10. Lead concentrations across all water quality monitoring sites (in mg/L).

In response to the initial lead detection in 2019, additional monitoring sites were added at Prospect Creek (PC1) and downstream of the old powerhouse (CF3) for the 2020 monitoring season. With continued lead detections at site CF4 in 2020, and no clarity on potential lead sources, a synoptic monitoring event was conducted in October 2020 to provide information for a more detailed source assessment. This monitoring event included samples at site CF2 (above the dam), site PC1 (Prospect Creek), site CF3 (below the old powerhouse), site CF3.1 (below the new powerhouse), site C3.2 (near the Highway 200 bridge), site CF3.3 (near Thompson Falls State Park), and site CF4 (Birdland Bay Bridge). The results of this monitoring event showed that lead was found at non-detectable concentrations at all sites except site CF4 (**Figure 2-11**). The potential source of lead at site CF4 still remains unknown but has been isolated to the area between Birdland Bay Bridge and upstream 0.65 mile. This source area is located outside of the Project, and the source of lead at site CF4 is not related to the Project or Project operations.

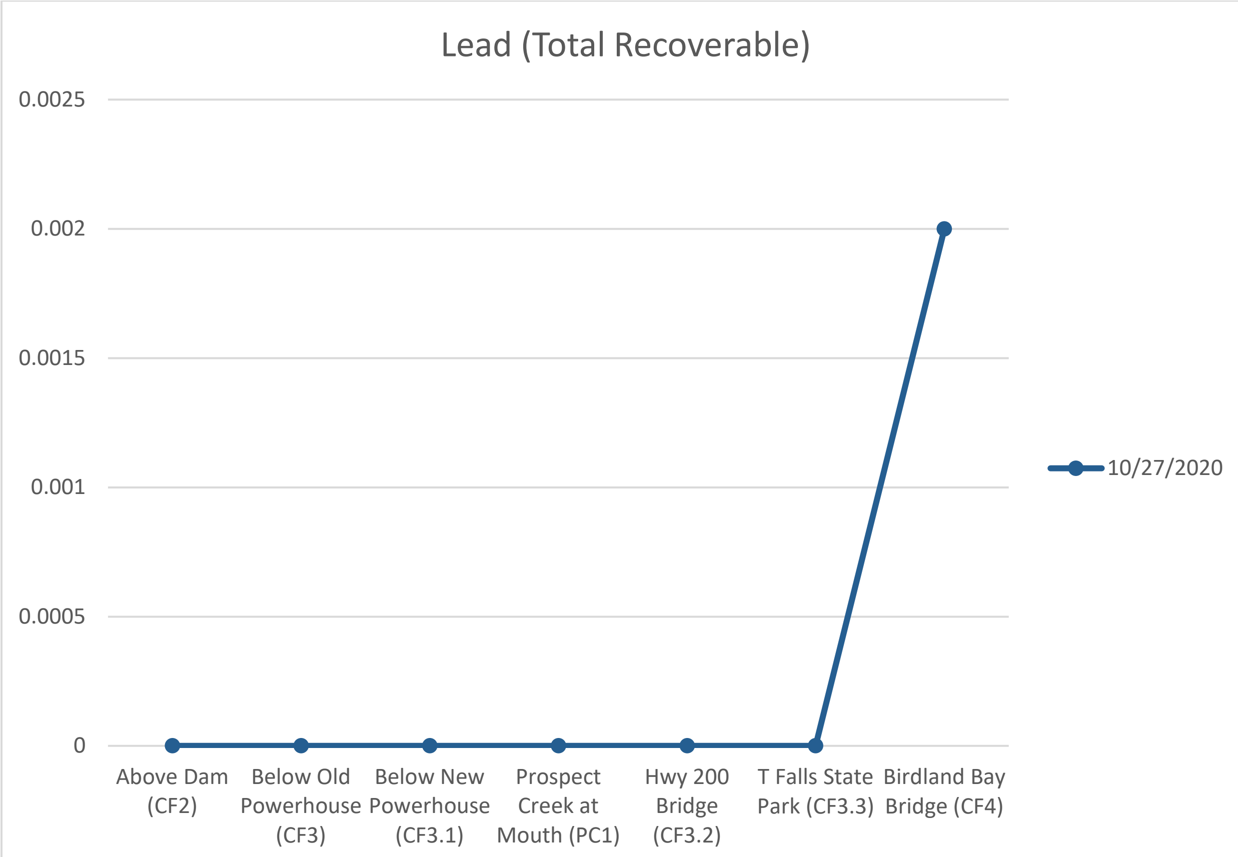


Figure 2-11. Lead concentrations from an upstream to downstream orientation for the synoptic monitoring event on October 27, 2020 (in mg/L).

Zinc

Zinc concentrations in the Project were at low to non-detectable levels at all monitoring sites (**Figure 2-12**). Zinc toxicity is dependent on water hardness, and when the hardness is factored in, all samples containing detectable concentrations of zinc were below water quality standards for aquatic life.

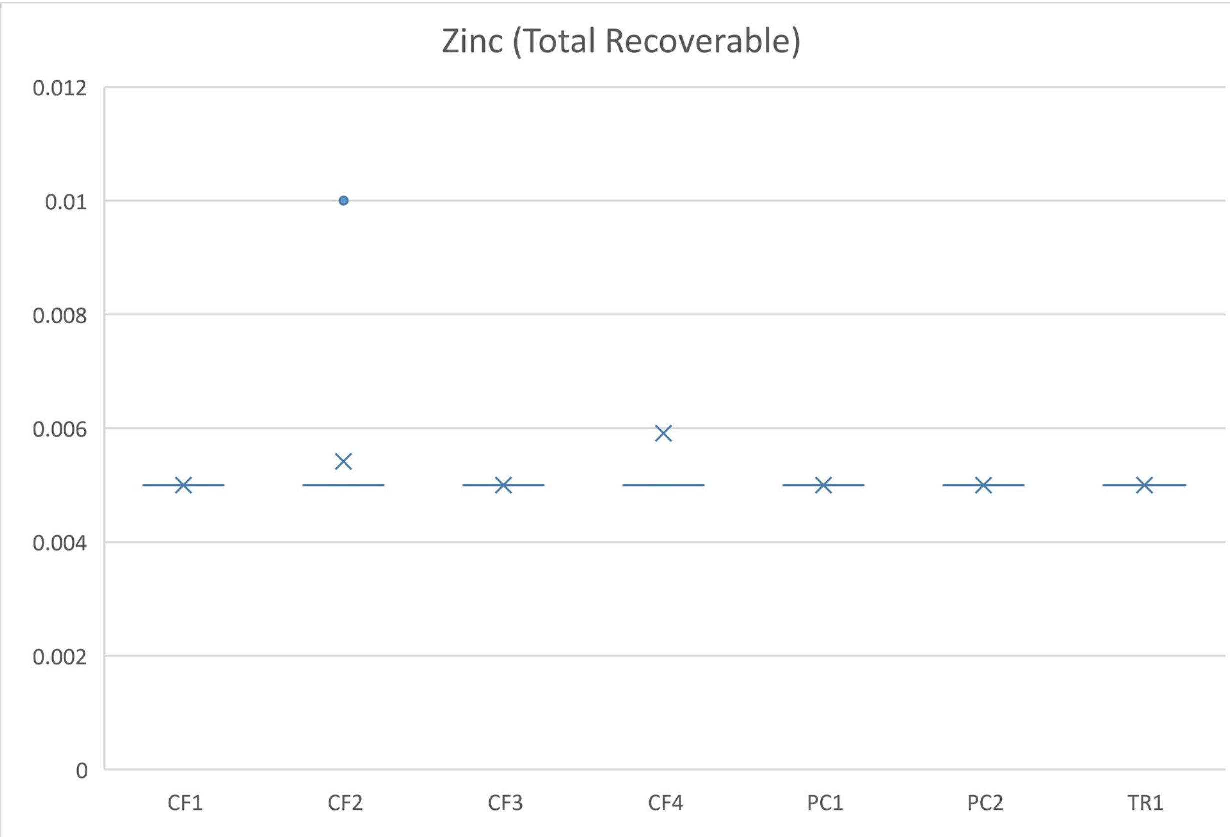


Figure 2-12. Zinc concentrations across all water quality monitoring sites (**in mg/L**).

Section 2.1.2.3 – Field Parameters

Field parameters were collected during each water chemistry monitoring event using a Hydrolab HL7 sonde as a part of the overall site characterization. Parameters measured included depth, water temperature, specific conductivity, pH, turbidity, and dissolved oxygen. The Hydrolab sonde was laboratory calibrated prior to each monitoring event to ensure instrument accuracy. Total dissolved gas (TDG) monitoring was also conducted in 2021 as a separate FERC approved study. The results of the 2021 TDG study can be found in the Initial Study Report, Total Dissolved Gas Study that was submitted to FERC in April 2022 (NorthWestern, 2022).

Specific Conductivity

Specific conductivity changed very little across the Clark Fork sites (CF1, CF2, CF3, and CF4) (**Figure 2-13**), but was significantly lower at the tributary sites (PC1 and TR1). Prospect Creek had the lowest conductivity values of all sites, and the conductivity of the Thompson River was slightly lower than the Clark Fork sites.

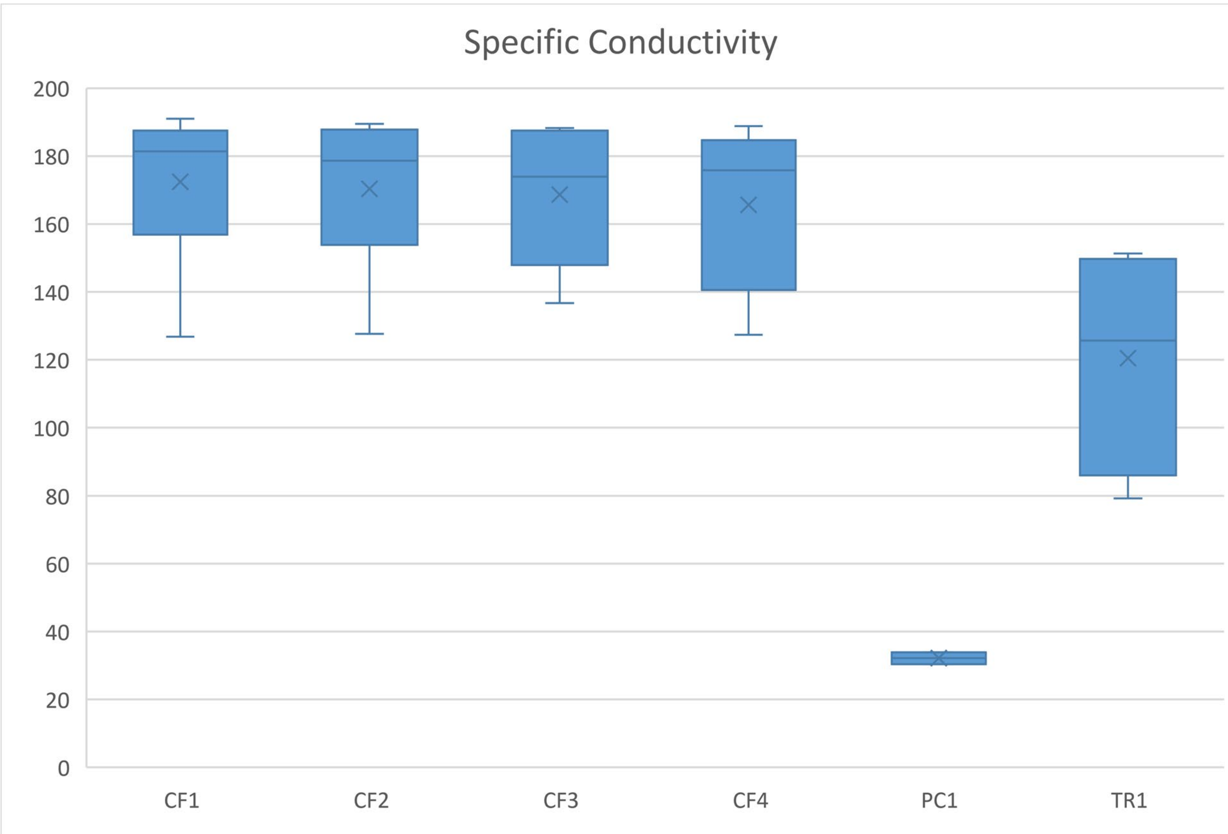


Figure 2-13. Specific conductivity across all water quality monitoring sites (in µS/cm).

pH

The measurement of pH at the Clark Fork sites (CF1, CF2, CF3, and CF4) showed relatively little change in pH from site to site, but the pH of Prospect Creek was significantly lower than the Clark Fork sites, and the pH of the Thompson River was more similar to the pH of the Clark Fork sites (**Figure 2-14**). The pH of Prospect Creek is closer to a neutral pH of 7, whereas all other sites have a high pH generally falling in the 8-8.5 range.

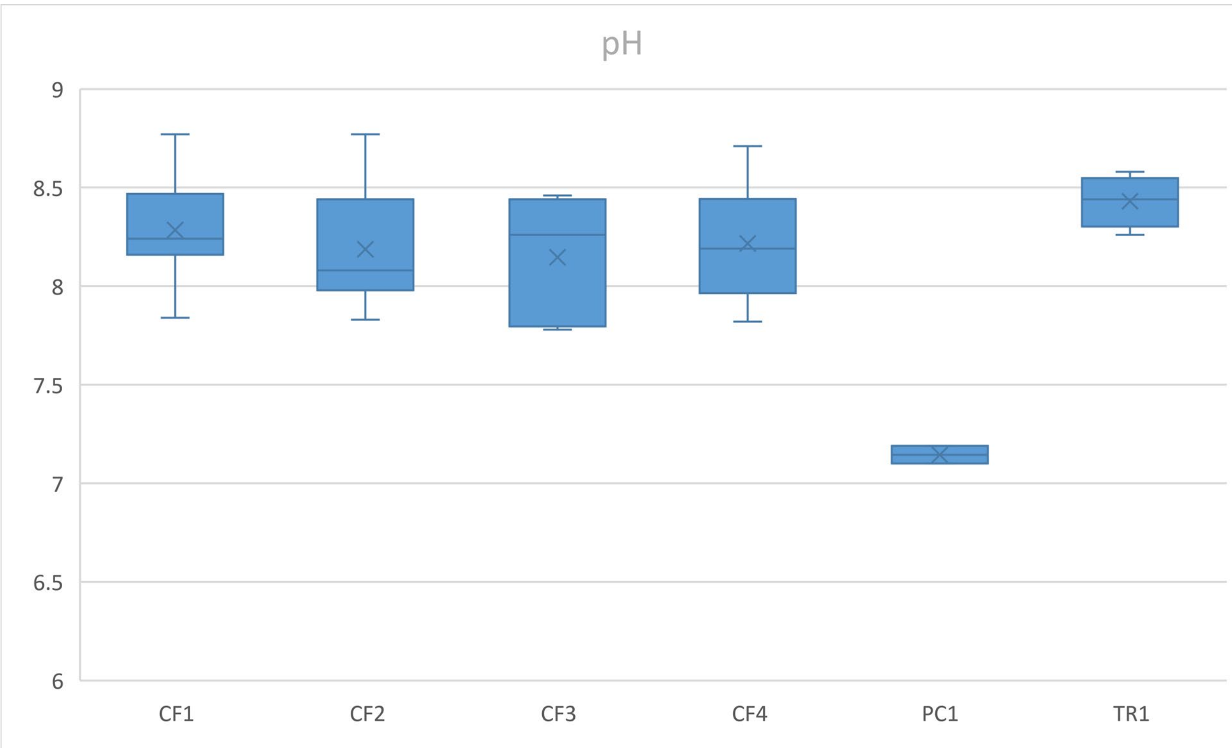


Figure 2-14. pH measurement across all water quality monitoring sites (**in units**).

Turbidity

Turbidity, or the measure of relative clarity in water, remained fairly consistent throughout the Clark Fork sites (CF1, CF2, CF3, and CF4) with elevated turbidity (~20 nephelometric turbidity unit [NTU]) occurring during the spring runoff period, and low to no turbidity (<1 NTU) occurring throughout the rest of the year (**Figure 2-15**). Turbidity measurements in Prospect Creek and the Thompson River remained low (<5 NTU) throughout the entire monitoring period.

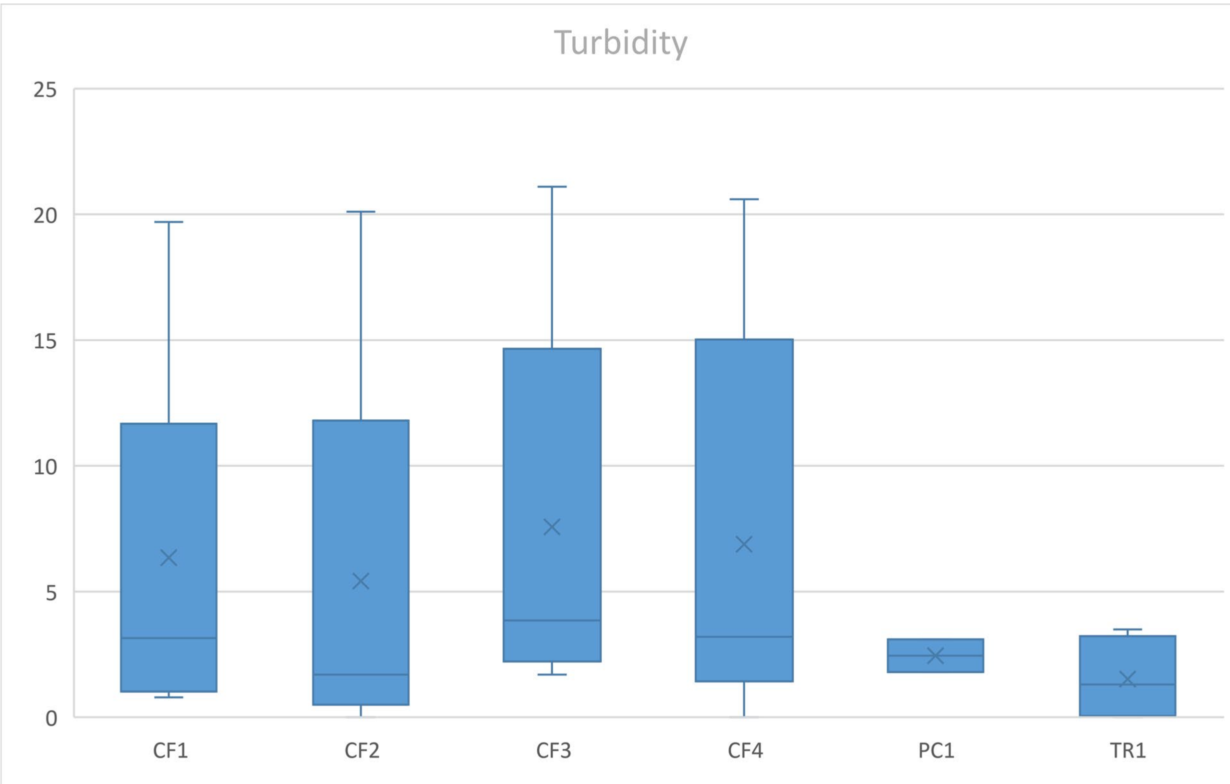


Figure 2-15. Turbidity measurement across all water quality monitoring sites (**in NTU**).

Dissolved Oxygen

Dissolved oxygen (DO) is measurement of the amount of oxygen that is present in water and can be represented as a concentration (in milligrams per liter [mg/L]) or as a saturation percentage. Concentrations of DO showed little change across the Clark Fork sites (CF1, CF2, CF3, and CF4), while DO concentrations in the Thompson River were slightly higher than the other sites, and Prospect Creek DO concentrations were similar to those of the Clark Fork sites (**Figure 2-16**). DO percent saturation values showed a similar pattern to the measured DO concentrations except the range of DO percent saturation at site CF4 was much greater than the other sites (**Figure 2-17**). This is likely due to the influence of spillway water during periods of high flow.

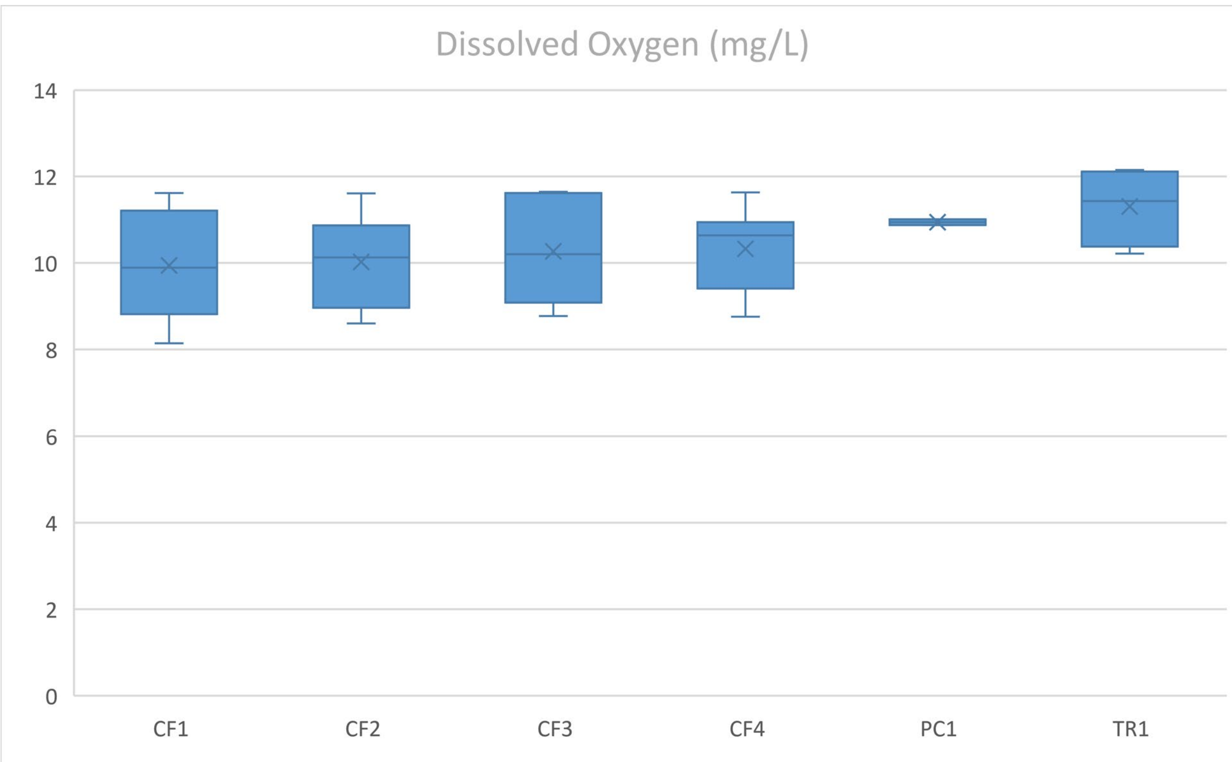


Figure 2-16. Dissolved oxygen concentration across all water quality monitoring sites (in mg/L).

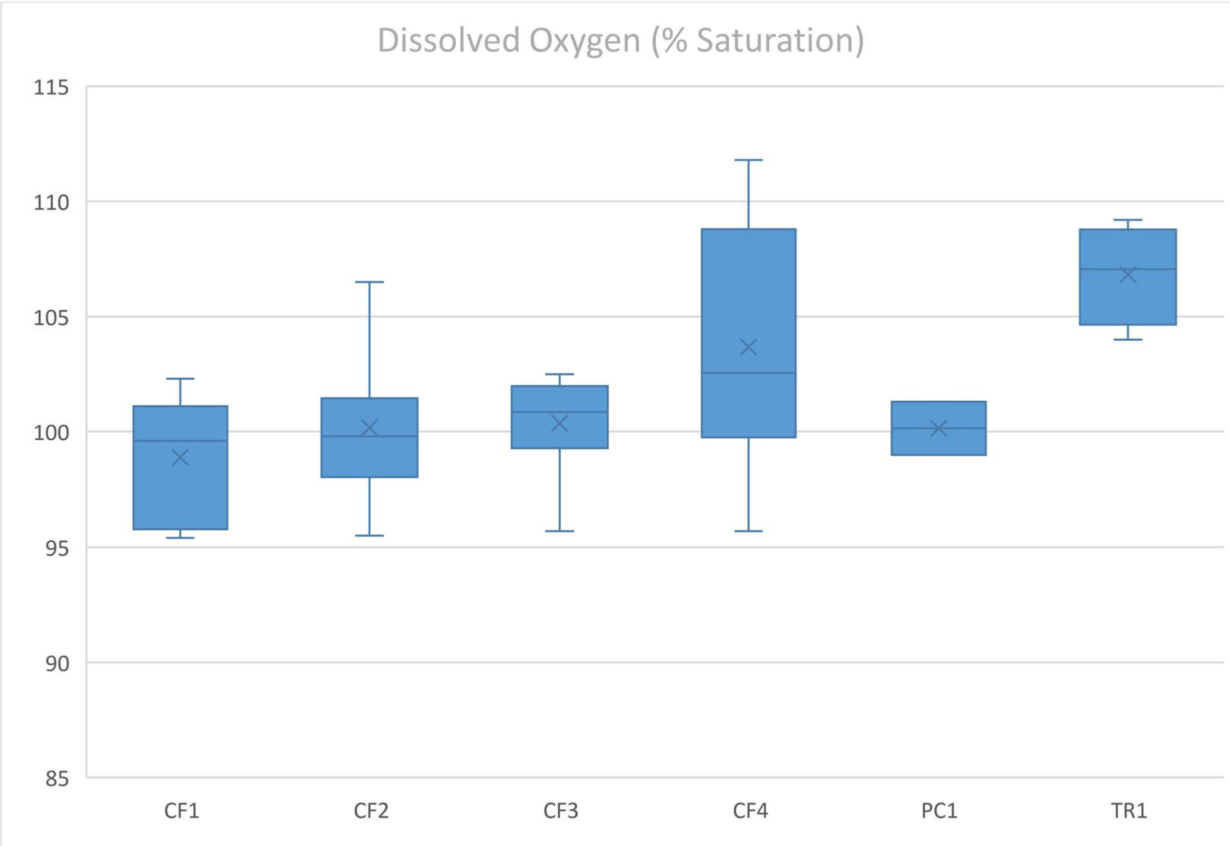


Figure 2-17. Dissolved oxygen percent saturation across all water quality monitoring sites (in %).

Section 2.1.2.4 – Water Temperature

In 2019 and 2021, water temperature data were collected at multiple locations throughout the Project to characterize the existing thermal regime of the reservoir, its inputs and outputs. After high river flows receded, thermographs were placed at four locations in 2019 (**Table 2-3**) and seven locations in 2021 (**Table 2-4**) across the Project and monitored water temperature at 15-minute intervals throughout the summer months. Instantaneous maximum water temperatures were reported as the warmest instantaneous measurement for the dataset. 7-Day maximum water temperatures were calculated and reported as an average of the daily maximum temperatures for the seven warmest consecutive days.

The instantaneous and 7-day maximum water temperatures in the Clark Fork River upstream of Thompson Falls Reservoir were just slightly higher than the comparable measurements collected downstream of the Project at the Birdland Bay Bridge (**Table 2-3, Figures 2-18 and 2-19**). Water temperature in the Thompson River is cooler than water temperature in the Clark Fork River, with the 7-day maximum water temperature being significantly lower than the comparable measurement in the Clark Fork River (**Table 2-3**). This pattern was consistent throughout the summer of 2019, with the Thompson River being cooler than the Clark Fork River from late June until early October (**Figure 2-18**). In addition, the three measurement sites on the Clark Fork River all had very similar water temperature from late June until early October

(**Figure 2-18**). These data support the conclusion that water temperature is consistent from upstream to downstream of the Project.

Monitoring in 2021 included the same sites as 2019, but data were also collected at additional sites as a part of the FERC approved Thompson Falls Relicensing Operations Study. The additional monitoring sites included a site at the furthest upstream extent of the Project boundary, a site located in the island complex downstream of site CF1, and site CF3, which is located directly downstream of the old powerhouse (**Table 2-4**). Similar to 2019, water temperatures remained relatively stable throughout the Clark Fork monitoring sites and the Thompson River was significantly cooler than the Clark Fork River (**Table 2-4, Figures 2-20 and 2-21**).

Table 2-3. Summary of 2019 water temperature data.

Site Name	Site Description	Date of Sample	Variable	Temperature (°F)	Temperature (°C)
CF1	Clark Fork River upstream of Thompson Falls Reservoir	8/8/19	Instantaneous Maximum Temperature	74.79	23.77
		8/3/19-8/9/19	7-Day Maximum	73.93	23.29
CF2	Clark Fork River upstream of dam in Thompson Falls Reservoir	8/9/19	Instantaneous Maximum Temperature	73.75	23.19
		8/3/19-8/9/19	7-Day Maximum	73.33	22.96
CF4	Clark Fork River at Birdland Bay Bridge	8/7/19	Instantaneous Maximum Temperature	73.47	23.04
		8/3/19-8/9/19	7-Day Maximum	73.15	22.86
TR1	Thompson River at mouth	8/3/19	Instantaneous Maximum Temperature	65.85	18.81
		8/1/19-8/7/19	7-Day Maximum	65.00	18.33

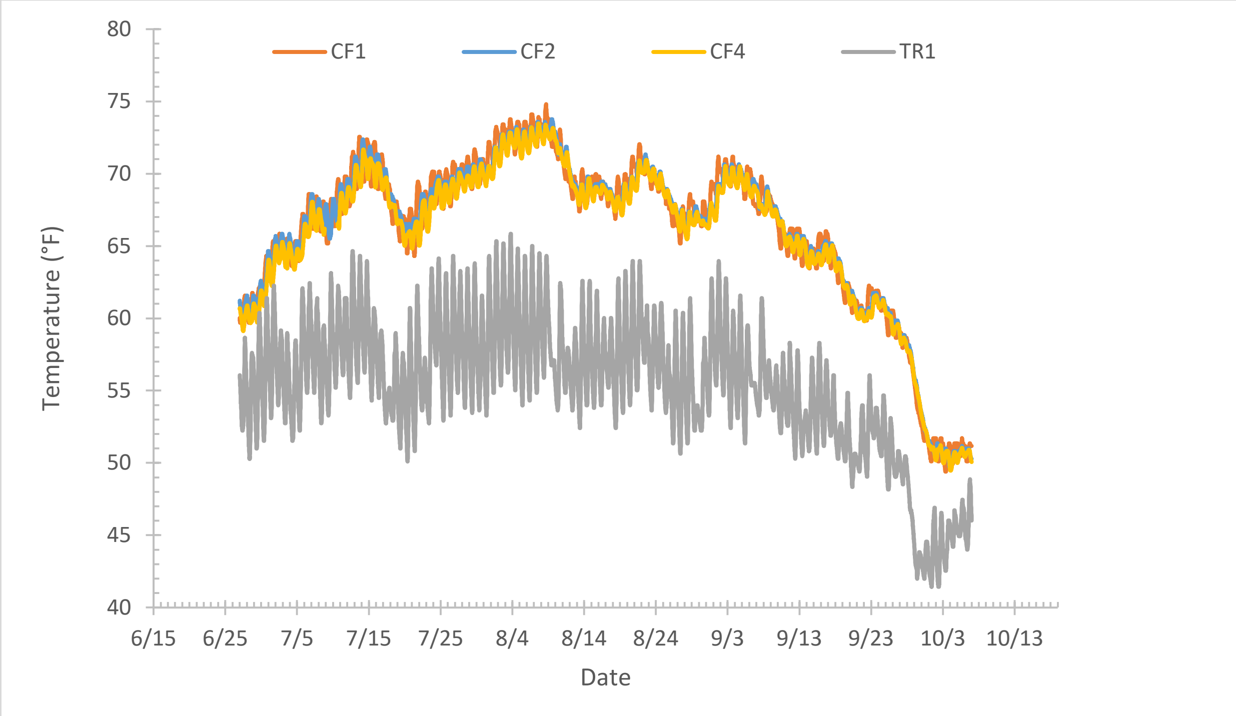


Figure 2-18. Thompson Falls Project water temperatures from June 27 through October 6, 2019.

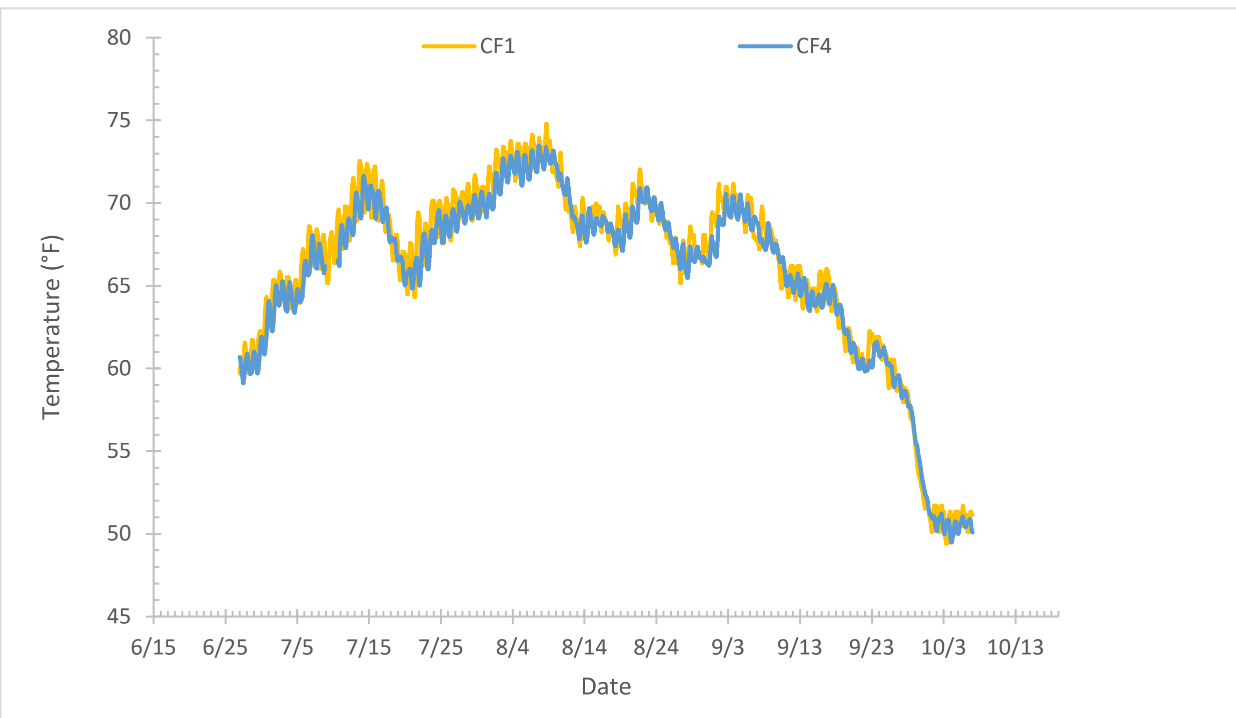


Figure 2-19. Upstream and downstream water temperature comparison from June 27 through October 6, 2019.

Table 2-4. Summary of 2021 water temperature data.

Site Name	Site Description	Date of Sample	Variable	Temperature (°F)	Temperature (°C)
Upstream Project Boundary	Clark Fork River at the edge of the upstream Project boundary	7/31/21	Instantaneous Maximum Temperature	77.28	25.16
		7/29/21-8/4/21	7-Day Maximum	76.53	24.74
CF1	Clark Fork River upstream of Thompson Falls Reservoir	7/31/21	Instantaneous Maximum Temperature	77.28	25.16
		7/29/21-8/4/21	7-Day Maximum	76.28	24.60
Island Complex	Clark Fork River in the Island complex downstream of CF1	7/31/21	Instantaneous Maximum Temperature	77.10	25.06
		7/29/21-8/4/21	7-Day Maximum	76.20	24.56
CF2	Clark Fork River upstream of dam in Thompson Falls Reservoir	8/1/21	Instantaneous Maximum Temperature	76.88	24.93
		7/30/21-8/5/21	7-Day Maximum	75.93	24.41
CF3	Clark Fork River downstream of old powerhouse	7/31/21	Instantaneous Maximum Temperature	77.28	25.16
		7/29/21-8/4/21	7-Day Maximum	76.28	24.60
CF4	Clark Fork River at Birdland Bay Bridge	8/1/21	Instantaneous Maximum Temperature	76.40	24.67
		7/30/21-8/5/21	7-Day Maximum	75.51	24.17
TR1	Thompson River at mouth	7/29/21	Instantaneous Maximum Temperature	65.55	18.64
		7/29/21-8/4/21	7-Day Maximum	63.78	17.66

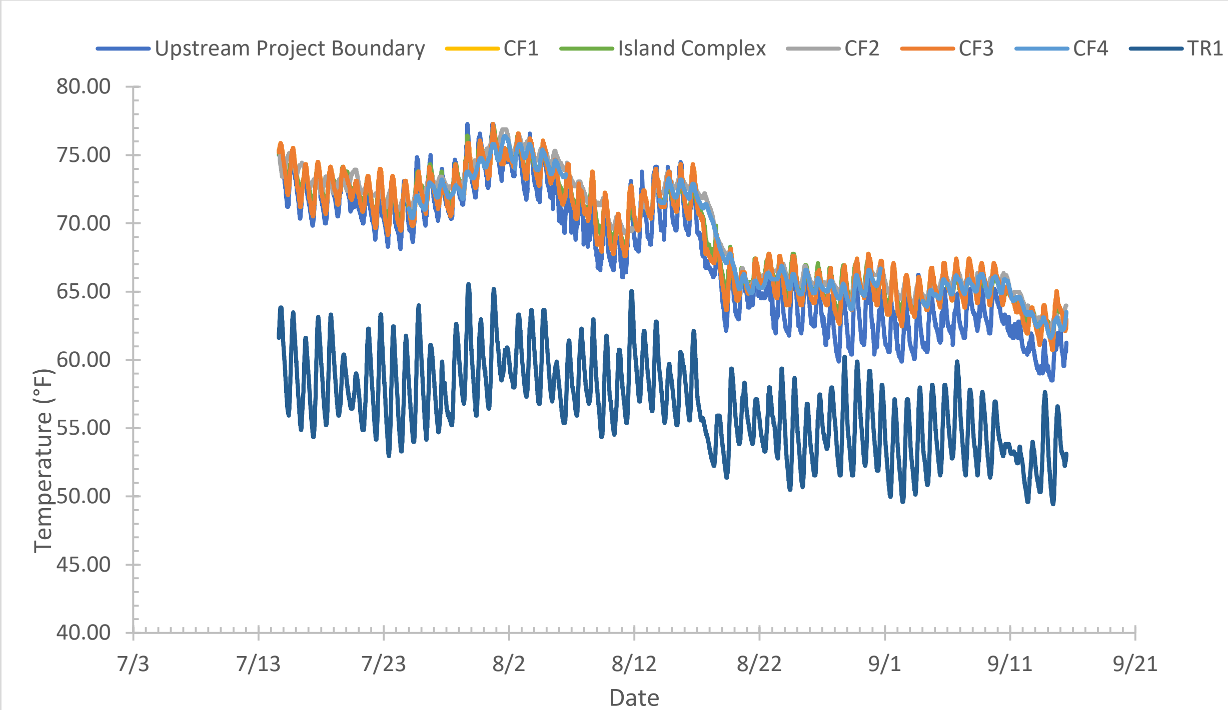


Figure 2-20. Thompson Falls Project water temperatures from July 15 through September 15, 2021.

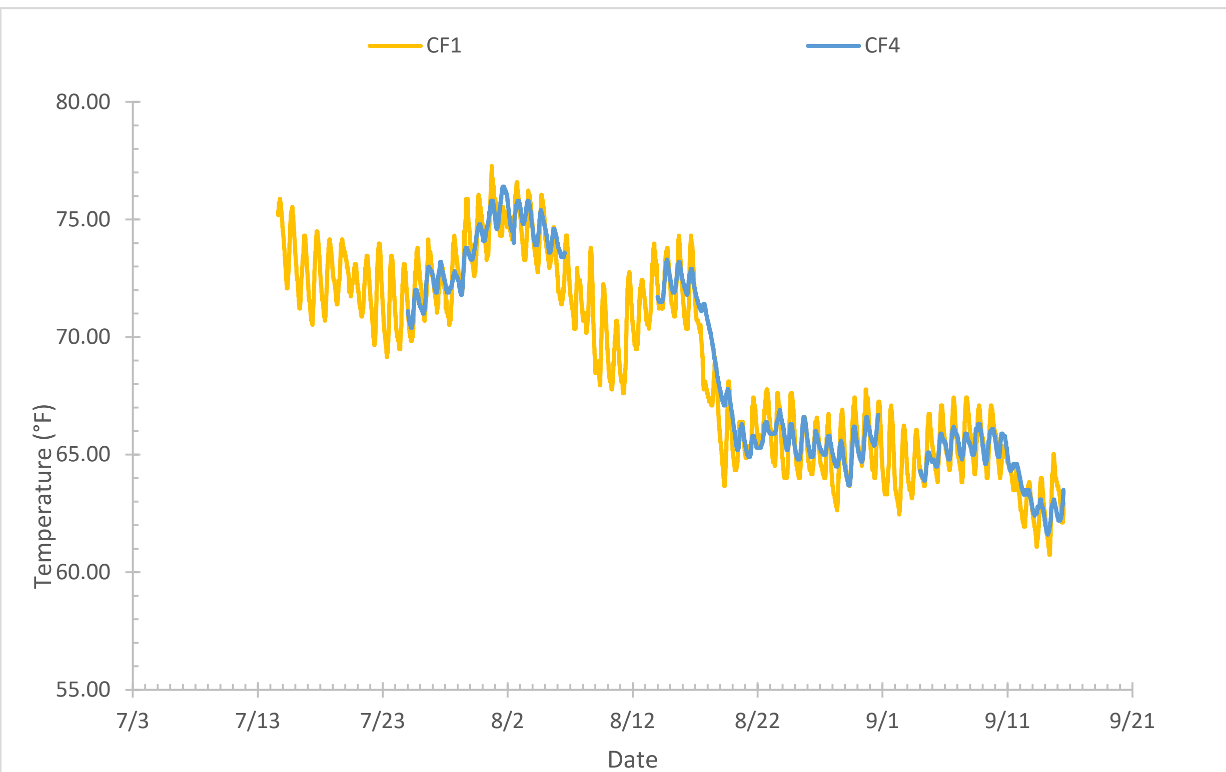


Figure 2-21. Upstream and downstream water temperature comparison from July 15 through September 15, 2021.

Section 2.2 – Sediment Chemistry

Four sediment bars were sampled in the lower portion of Thompson Falls Reservoir on July 13, 2020, using a core sampler to characterize the sediment in the lower reservoir. The reservoir was drafted 12 inches down that day to assist in accessing the sediment deposits via boat, and an attempt was made to sample the maximum possible depth of sediment at each location. Sediment sample depths were generally limited by substrate hardness and composition. Each sediment bar was sampled at three locations and those three samples were composited into one representative sample for each sediment bar, which were analyzed by Energy Laboratories and Pace Analytical for Metals, PCBs, and Dioxins.

Table 2-5 provides the location details and characteristics for each core sample, including the depth of the sample and the depth of water above the substrate at the sample location. This information is useful in determining the pond elevation in which that substrate becomes exposed.

Table 2-5. Locations and characteristics of Thompson Falls Reservoir sediment cores collected on 7/13/20.

Sediment Bar	Sample Number	Sample Depth (ft)	Water Depth (ft) After 12" Reservoir Draft	Latitude	Longitude
1	1	2.5	1.5	47.59211	-115.34028
1	2	2.5	1.5	47.59206	-115.34108
1	3	2.5	0.8	47.59230	-115.34370
2	1	1.0	1.0	47.58980	-115.34135
2	2	1.0	1.1	47.58969	-115.34044
2	3	1.5	0.0	47.58952	-115.33917
3	1	2.0	1.0	47.58947	-115.33701
3	2	1.3	0.5	47.59066	-115.33594
3	3	1.0	1.8	47.58933	-115.33310
4	1	2.0	1.0	47.59074	-115.33001
4	2	3.0	0.0	47.58842	-115.32886
4	3	1.5	1.4	47.58995	-115.32819

Figure 2-22 is a map showing the locations of each core sample from the lower reservoir in relation to the Town of Thompson Falls. The aerial imagery in **Figure 2-22** is from 2018 when the reservoir elevation was down to replace the stanchions on the dam and is not representative of the day that these samples were collected. This imagery was selected to show the extent of the sediment deposits in the lower reservoir; under normal full-pool reservoir elevations, the locations of these sample sites are underwater.

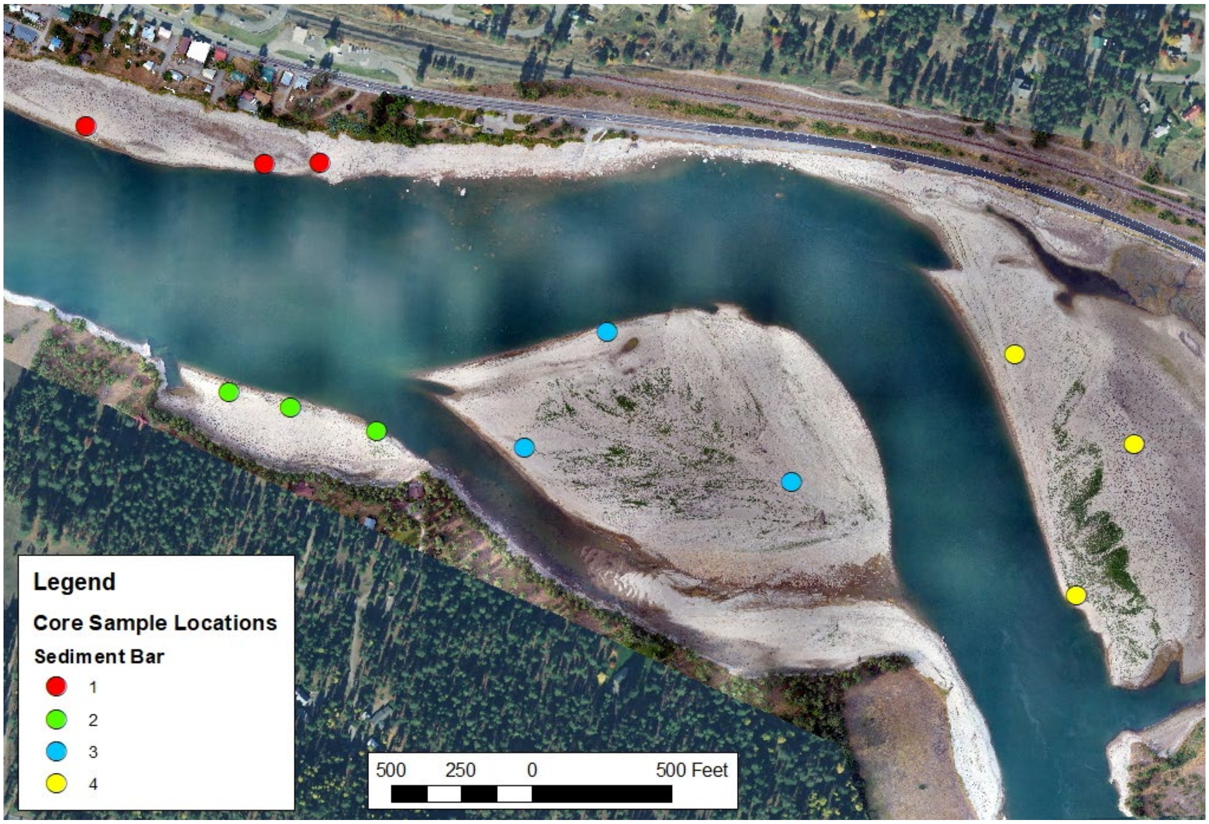


Figure 2-22. Sediment core sample locations in Thompson Falls Reservoir on 7/13/20.

Analytical results from the sediment core samples are shown in **Table 2-6 through Table 2-8**, below. **Table 2-6** shows the results of the Toxicity Characteristic Leaching Procedure (TCLP) metals analysis for each composite sample. TCLP is an analysis used to determine the potential for the leaching of a toxic substance from soil particles and is useful in understanding the toxic risk associated with a particular sediment sample. All sample results reported were below detectable levels for TCLP metals.

Table 2-6. TCLP metals analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20.

Metals TCLP Extractable (mg/L)								
Sediment Bar Sample	Mercury	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver
Bar 1	ND	ND	ND	ND	ND	ND	ND	ND
Bar 2	ND	ND	ND	ND	ND	ND	ND	ND
Bar 3	ND	ND	ND	ND	ND	ND	ND	ND
Bar 4	ND	ND	ND	ND	ND	ND	ND	ND

Note:
ND = that the sample result was not found at a detectable concentration

Table 2-7 shows the results from the Polychlorinated Biphenyl (PCB) analysis conducted on each composite sediment sample. All samples were reported to be at non-detectable levels for PCBs.

Table 2-7. PCB analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20

Polychlorinated Biphenyls (PCBs) (mg/kg-Dry)									
Sediment Bar Sample	**Arochlor 1016**	**Arochlor 1221**	**Arochlor 1232**	**Arochlor 1242**	**Arochlor 1248**	**Arochlor 1254**	**Arochlor 1260**	**Arochlor 1262**	**Arochlor 1268**
Bar 1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 2	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bar 4	ND	ND	ND	ND	ND	ND	ND	ND	ND

Note:
ND = that the sample result was not found at a detectable concentration

Each sample was also analyzed for dioxins, which are a group of toxic compounds that are generally found to originate from industrial activities. The two dioxin compounds of concern are 1,2,3,7,8,9-HxCDD and 2,3,7,8-TCDD, with 2,3,7,8-TCDD being the most toxic compound. Sample analysis results for both 1,2,3,7,8,9-HxCDD and 2,3,7,8-TCDD were at non-detectable levels (**Table 2-8**) for all samples.

Since 2,3,7,8-TCDD is the most toxic dioxin compound, all other remaining dioxins are grouped together and a total equivalence (TEQ) to 2,3,7,8-TCDD is calculated. For example, if a particular dioxin compound is 10 percent as toxic as 2,3,7,8-TCDD, then the measured concentration of that compound in nanograms per kilogram (ng/kg) is weighted by a factor of 0.1 and that number is added to the calculated toxic equivalencies of the other remaining dioxin compounds to calculate the overall TEQ for the sample.

The TEQ is used as a way to look at the combined toxicity of the remaining dioxin compounds, since all have varying levels of toxicity. The TEQ calculations for each composite sample were calculated by Pace Analytical, and the results can be found in **Table 2-8**. TEQ results for each composite sediment sample were well below the TEQ screening level of 22 ng/kg.

Table 2-8. Dioxin analysis results from Thompson Falls Reservoir sediment cores collected on 7/13/20.

Dioxin Screening (ng/kg)			
Sediment Bar Sample	**1,2,3,7,8,9-HxCDD**	**2,3,7,8-TCDD**	**TEQ**
Screening Level	*470*	*22*	*22*
Bar 1	ND	ND	0.52
Bar 2	ND	ND	0.59
Bar 3	ND	ND	0.51
Bar 4	ND	ND	0.57

Notes:
ND = the sample result was not found at a detectable concentration
TEQ = (Total 2,3,7,8-TCDD Equivalence) calculated by Pace Analytical

Based on the analytical results of the sediment core samples collected from the lower portion of Thompson Falls Reservoir on July 13, 2020, there does not appear to be any indication of toxicity related to the sediment collected at these sites. The sampling locations and core depths were representative of sediment deposits in the lower reservoir that might either be exposed and/or mobilized during normal reservoir operations.

Section 2.3 – Biological Monitoring

Biological indicators are an important part of monitoring the overall ecological health of a waterbody. These biological indicators typically respond to changes in water quality and can be studied to see a response to changing water quality conditions.

Aquatic macroinvertebrates and periphyton, the assemblage of aquatic organisms that attach to substrate, are strong bioindicators of stream health. Healthy streams support diverse macroinvertebrate communities of mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*), caddisflies (*Trichoptera*), true flies (*Diptera*), beetles (*Coleoptera*), and many others. Macroinvertebrate and periphyton assemblages reflect cumulative impacts of all pollutants, such as toxic substances, organic pollution, or excessive sediment loading.

Zooplankton found in a lake or reservoir can be an important food source for fish and other aquatic organisms. Their presence and species composition can be used as an indicator of biological community health of a lake or reservoir.

Fish species can accumulate environmental contaminants in their muscle tissue over time through bioaccumulation. Typically, top trophic level predator species have the highest concentrations of contaminants, while lower trophic level prey species have the lowest concentrations of contaminants. Monitoring and tracking the concentrations in fish tissue contaminants over time can be used as an indicator of the environmental health of a waterbody.

Section 2.3.1 – Monitoring Sites and Methods

Biological monitoring occurred at two sites for macroinvertebrate and periphyton collection, three sites for zooplankton collection, and a reservoir-wide sampling effort for fish tissue biocontaminants. (**Table 2-9**).

In 2019, macroinvertebrate and periphyton samples were collected at sites CF1 and CF3 to determine if there were any changes in the biological community upstream and downstream of the reservoir (refer to **Figure 2-1**). Macroinvertebrate sampling methods used were consistent with NorthWestern's large river macroinvertebrate sampling methodologies. Sites CF1 and CF3 were chosen because the riffle habitat at these sites was the only appropriate habitat available in the Project area that meets the large river sampling criteria.

In addition to the macroinvertebrate and periphyton samples collected upstream and downstream of the reservoir, zooplankton samples were also collected at three sites on the reservoir, TFR1, TFR2, and TFR3 to determine the existing species composition and densities (refer to **Figure 2-1**). These sites were chosen to be representative of the upper, middle, and lower areas of Thompson Falls Reservoir. Vertical plankton tows were collected using an 80 μm (micron, or micrometer) mesh Wisconsin plankton net, and tow lengths were from the reservoir bed to the water surface.

Fish tissue samples were collected in the fall of 2019 as a part of NorthWestern's Thompson Falls Reservoir fisheries surveys. Gillnets were placed at multiple locations in the reservoir to capture representative fish populations throughout the reservoir. An attempt was made to analyze tissue from multiple species including both predator species and bottom-dwelling prey species. Multiple fish were collected of each species and each predator fish (Rainbow Trout and Northern Pike) was filleted and the fillets were composited by species to run as one representative composite sample per species. Bottom-dwelling prey species (Largescale Sucker) were processed whole and composited for one representative sample for that species.

Table 2-9. Description of methods and parameters measured at water chemistry monitoring sites.

Site Name	Site Purpose	Sampling Method	Samples Collected
CF1	Biological communities upstream of the reservoir	Kicknet, Scrape method	Macroinvertebrates, Periphyton
CF3	Biological communities downstream of the reservoir	Kicknet, Scrape method	Macroinvertebrates, Periphyton
TFR1	Upper reservoir sampling site	Wisconsin plankton net	Zooplankton
TFR2	Middle reservoir sampling site	Wisconsin plankton net	Zooplankton
TFR3	Lower reservoir sampling site	Wisconsin plankton net	Zooplankton
Thompson Falls Reservoir	Representative fish community sample	Gillnet	Fish tissue

Section 2.3.2 – Biological Monitoring Results

Section 2.3.2.1 - Aquatic Macroinvertebrates

Macroinvertebrate data were collected upstream (site CF1) and downstream (site CF3) of Thompson Falls Reservoir in 2019 to compare the biological communities and look at any effects on those communities from the Project. **Table 2-10** shows a comparison of the macroinvertebrate data collected at monitoring sites CF1 and CF3. The 2019 biological monitoring found that the Clark Fork River upstream (CF1) and downstream of Thompson Falls (CF3) support very similar macroinvertebrate benthic densities. Late-July density estimates at

CF3 reported 5,560 (±563) benthic macroinvertebrates per square meter (1,390 per sample), while upstream (CF1) densities averaged 5,115 (±950) per m^2.

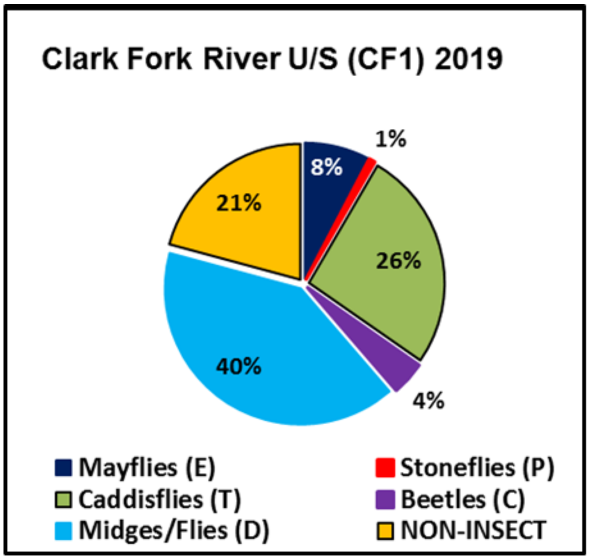
In years of higher-than-normal discharge, macroinvertebrate densities are typically lower due to the flushing effect of high flows. Higher flows can reduce benthic macroinvertebrate densities by directly removing less velocity tolerant organisms (scuds, snails) or by removing silt in the gravels that favor midges and aquatic worms. Although higher than normal flows were observed in 2018 and 2019, midges (Diptera family: Chironomidae) still dominated the samples at both sites (Montana Biological Survey/Stag Benthics, 2019).

Table 2-10. Mean macroinvertebrate values for 8 metrics used in the bioassessment scores for 2019 samples.

Metric	CF1	CF3
Taxa Richness	37	38.4
EPT Richness	16.4	19.6
Shannon Diversity (log2)	3.6	3.4
Biotic Index	5.3	5.0
% EPT	36%	44%
% Chironomidae	40%	48%
% Filterers	49%	67%
EPT/EPTC	47%	48%
Mean Densities (per m^2)	5,115 (± 956)	5,568 (± 563)
Metals Tolerance Index	2.5	2.9

Note:
An average of 37 benthic macroinvertebrate taxa, including 16 EPT (*Ephemeroptera*, *Plecoptera*, and *Tricoptera*) species were collected per sample upstream of Thompson Falls, while 38 total taxa and 20 EPT taxa were collected downstream in 2019**.**

Macroinvertebrate community composition was also fairly similar upstream and downstream of Thompson Falls Dam except for a higher relative abundance of non-insect taxa reported at the CF1 site (**Figure 2-23**). The large non-insect taxa component at CF1 was largely comprised of *Lymnaeidae* and *Physidae* snails in the genera *Fossaria* and *Physella*, respectively. Dipterans accounted for 40 and 52 percent of the benthic community composition for CF1 and CF3 in 2019, respectively; this was largely composed of the midges, *Chironomidae*. Riffle beetles (*Coleoptera*: family *Elmidae*) made up a small, but not insignificant, component of the benthic community at each Clark Fork River site (Montana Biological Survey/Stag Benthics, 2019).



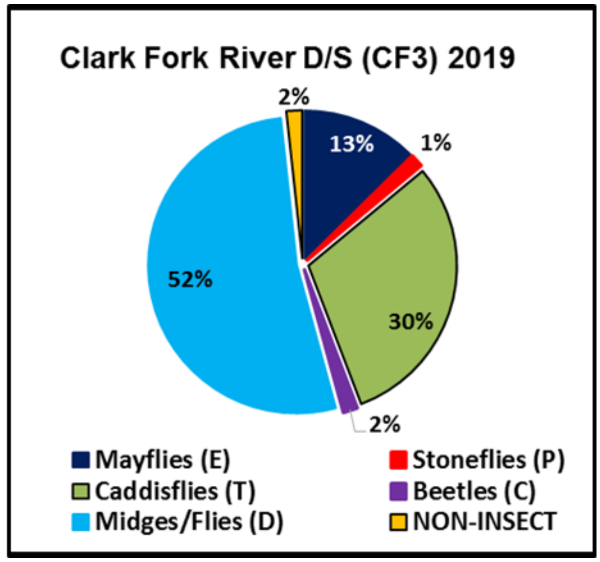


Figure 2-23. Macroinvertebrate community composition for sites CF1 and CF3.

Mayflies and caddisflies are important components of the Clark Fork River benthic community and to the bioassessment metrics, while Stoneflies represent a relatively small component (~1%) (**Figure 2-23**). Caddisflies were the most abundant of the EPT taxa in the Clark Fork River samples collected in 2019, representing 26 and 30 percent of the upstream (CF1) and downstream (CF3) communities, respectively. Of the 11 species of caddisflies collected at these sites, populations of three net-spinning caddisflies (*Cheumatopsyche, Hydropsyche occidentalis* and *H. morosa gr.*) were most abundant below the dam at site CF3, while the net-spinner, *Cheumatopsyche* and the long-horned caddisflies, *Ceraclea* and *Oecetis* were most abundant upstream of the reservoir at site CF1 (Montana Biological Survey/Stag Benthics, 2019).

Mayflies were the third most abundant invertebrate group at the downstream site (CF3) in 2019, while upstream (CF1) they were the fourth most abundant group (**Figure 2-23**). Of the 13 species of mayflies reported at site CF3, the most common were Tricos (mayflies in the genera *Tricorythodes*), *Tricorythodes minutus,* Blue-winged Olives *Acentrella and Baetis tricaudatus* and *Macaffertium* in the family *Heptageniidae*. A few *Attenella margarita* have been collected at this site. Site CF1 reported 8 species of mayflies with the dominant being Tricos, two *Heptageniidae* species, *Macaffertium* and *Heptagenia* and *Attenella margarita* (Montana Biological Survey/Stag Benthics, 2019).

Section 2.3.2.2 – Periphyton

In the periphyton assemblage, there were two predominant taxa found upstream and downstream of the reservoir, *Achnanthidium minutissimum* and *Achnanthidium subatomus*. These two species comprised of 57.17 percent of the upstream sample and 55.97 percent of the downstream sample. There was little change between the upstream and downstream metric scores, which ranged from good to excellent (**Table 2-11**).

Table 2-11. 2019 Clark Fork periphyton metric scores upstream and downstream of Thompson Falls Reservoir.

Site Name	Site Description	Date of Sample	Metric	Value	Rating
CF1	Clark Fork River upstream of Thompson Falls Reservoir	7/31/19	Shannon H	3.394	Excellent
			Species Richness	44	Excellent
			Dominant Taxon Percent	40.82%	Good
			Siltation Taxa Percent (Sediment)	11.24%	Excellent
			Pollution Index (Nutrients)	2.792	Excellent
			Disturbance Taxa Percent (Metals)	40.82%	Good
			Abnormal Cells Percent (Metals)	0.00%	Excellent
			Bioindex (Montana DEQ Mountains)	N/A	Good
CF3	Clark Fork River downstream of Old Powerhouse	7/31/19	Shannon H	3.670	Excellent
			Species Richness	52	Excellent
			Dominant Taxon Percent	30.22%	Good
			Siltation Taxa Percent (Sediment)	9.83%	Excellent
			Pollution Index (Nutrients)	2.729	Excellent
			Disturbance Taxa Percent (Metals)	30.22%	Good
			Abnormal Cells Percent (Metals)	0.00%	Excellent
			Bioindex (Montana DEQ Mountains)	N/A	Good

Section 2.3.2.3 - Zooplankton

Zooplankton were collected at three sites in Thompson Falls Reservoir in July 2019, using a vertical plankton tow. Results of the zooplankton tows are displayed in **Table 2-12**. Zooplankton concentrations in the reservoir were quite low, which is not surprising given the short residence time of water in the reservoir. Reservoir residence times of greater than 18 days are generally required to support a sustainable zooplankton population (Brook and Woodward, 1956). This time is needed for the zooplankton to successfully reproduce before being flushed downstream. Typical residence times of water in Thompson Falls Reservoir range from less than 4 hours in June to approximately 17 hours in September (refer to **Figure 1-2**).

Table 2-12. Zooplankton data collected from Thompson Falls Reservoir in 2019.

Taxon		Site TFR1 (Upstream end of TF Reservoir) 2019		Site TFR2 (Mid TF Reservoir) 2019		Site TFR3 (Downstream end of TF Reservoir) 2019	
		Count	**Cells / ml**	**Count**	**Cells / ml**	**Count**	**Cells / ml**
Cladocera	Chydoridae	0	0	0	0	1	0.00000161
Copepoda	Cyclopoida	1	0.00000189	4	0.00000821	5	0.00000804
Copepoda	Harpacticoida	0	0	1	0.00000205	0	0
Rotifera	Conochilus	0	0	2	0.00000411	0	0
Rotifera	Euchlanis	3	0.00000568	9	0.00001848	6	0.00000965
Rotifera	*Filinia longiseta*	2	0.00000378	0	0	0	0
Rotifera	*Filinia terminalis*	0	0	4	0.00000821	7	0.00001126
Rotifera	*Gastropus hyptopus*	1	0.00000189	0	0	1	0.00000161
Rotifera	*Kellicottia longispina*	9	0.00001703	3	0.00000616	4	0.00000643
Rotifera	*Keratella cochlearis*	5	0.00000946	1	0.00000205	4	0.00000643
Rotifera	*Keratella testudo*	9	0.00001703	0	0	7	0.00001126
Rotifera	Lecane	0	0	0	0	2	0.00000322
Rotifera	Monostyla lunaris	0	0	0	0	1	0.00000161
Rotifera	Pompholyx	0	0	2	0.00000411	3	0.00000483
Rotifera	Rotifera	4	0.00000757	6	0.00001232	8	0.00001287
Rotifera	Synchaeta	1	0.00000189	0	0	0	0
Rotifera	*Trichotria tetractis*	1	0.00000189	0	0	0	0

Section 2.3.2.4 - Fish Tissue Biocontaminants

In the fall of 2019, fish tissue samples were collected in Thompson Falls Reservoir for the purpose of quantifying concentrations of biocontaminants in fish. Eleven fish in total were collected as a part of this effort. Lengths and weights were recorded for each fish, and the fish from each species were composited into a single representative sample for the species (**Table 2-13**). Two predator species were represented in this sampling, Northern Pike and Rainbow Trout, and one bottom-dwelling prey species was represented, Largescale Sucker for a total of three representative composite samples.

Table 2-13. Individual fish length and weight data for composited fish tissue samples collected in 2019.

Fish Species	Length (mm)	Weight (g)
Largescale Sucker	230	140
Largescale Sucker	265	222
Largescale Sucker	260	218
Largescale Sucker	250	196
Northern Pike	720	3238
Northern Pike	640	2592
Northern Pike	625	2138
Northern Pike	530	908
Northern Pike	495	723
Rainbow Trout	420	1098
Rainbow Trout	460	1080

Results of the fish tissue analysis are shown below in **Table 2-14**. These data were provided to Montana Fish Wildlife and Parks (Montana FWP) to supplement their fish consumption advisory dataset. Montana FWP samples Thompson Falls Reservoir once every 5 years to maintain and update any fish consumption advisories that may be in place. Currently, there are fish consumption advisories for Northern Pike, Rainbow Trout, Smallmouth Bass, and Yellow Perch from Thompson Falls Reservoir due to the presence of Mercury (Montana FWP, 2021).

Table 2-14. 2019 Fish tissue biocontaminant analysis results by species.

Analyte	Rainbow Trout	Northern Pike	Largescale Sucker
Strontium	ND	0.8	26.2
Copper	1	1	4
Manganese	ND	2	36
Nickel	ND	ND	ND
Zinc	17	18	61
Arsenic	ND	ND	0.4
Cadmium	ND	ND	ND
Chromium	ND	ND	0.4

Analyte	Rainbow Trout	Northern Pike	Largescale Sucker
Selenium	0.9	0.6	0.7
Mercury	0.32	0.57	ND
Aluminum	ND	ND	47
Iron	30	17	115
Lead	ND	ND	ND

Notes:
ND = that the sample result was not found at a detectable concentration
All results are presented in mg-kg dry

Section 3.0 – Summary and Discussion

The Thompson Falls Project is the first impoundment in a series of three dams in the lower Clark Fork River and is the furthest upstream dam on the Clark Fork River (refer to **Figure 1-1**). NorthWestern collected a wide array of water quality data to characterize the current water quality conditions of the Project. Data were collected in 2019, 2020, and 2021 as a part of this effort, and included water chemistry and field parameters, water temperature, sediment chemistry, and biological data.

Water chemistry changes very little across the Project from upstream to downstream. This is mostly due to the very short residence time of the reservoir (3-17 hours) (refer to **Figure 1-2**). Nutrient concentrations remain low throughout the Clark Fork sites (CF1, CF2, CF3, and CF4) as well as the tributary sites on the Thompson River and Prospect Creek. Metals concentrations were generally low throughout the Clark Fork sites with the exception of lead concentrations at site CF4, which is downstream of the Project at Birdland Bay Bridge. Synoptic source assessment monitoring conducted in October 2020 was able to determine that the source of lead was occurring somewhere between Thompson Falls State Park (Site CF3.3) and Birdland Bay Bridge (site CF4). This lead source occurs outside of the Project, and the actual source remains unknown at this point. Prospect Creek, a tributary that enters the Clark Fork River downstream of Thompson Falls Dam, was found to contain high concentrations of cadmium, but it appears to be diluted by the time the water reaches site CF4 on the Clark Fork River.

Specific conductivity, pH, and turbidity remain relatively consistent throughout the Clark Fork sites, and dissolved oxygen saturation increases slightly downstream of the Project at site CF4 during the high flow season when the spillway is in use. Water temperatures show a slight decrease moving downstream through the Project, and the water temperature of the Thompson River is significantly cooler than that of the Clark Fork River.

Sediment chemistry samples collected in the lower portion of Thompson Falls Reservoir showed TCLP metals and PCBs were all at non-detectable concentrations. Dioxin analysis results for both 1,2,3,7,8,9-HxCDD and 2,3,7,8-TCDD were at non-detectable levels for all samples, and the calculated TEQs for all samples were found to be well below the screening level.

Macroinvertebrate taxa richness, EPT taxa richness, percent EPT taxa, and mean densities were higher downstream of Thompson Falls Reservoir than they were upstream of the reservoir, but percent *Chironomidae* were also higher downstream and were the dominant taxa at both monitoring sites. Periphyton metric scores were similar at both the upstream and downstream sites and had ratings of “good” or “excellent” for all metrics. Zooplankton were collected at three sites in Thompson Falls Reservoir, but due to the low residence time of the water in the reservoir, the reservoir does not support much of a zooplankton community. Fish consumption advisories have historically been in place for Thompson Falls Reservoir due to mercury, and 2019 fish tissue analysis confirmed the presence of mercury in both the Rainbow Trout and Northern Pike specimens that were sampled, but not in bottom-dwelling fish like Largescale Suckers.

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Appendix A

Table A-1. List of water chemistry analyses performed for water samples.

Analyte Group	Analyte	Method	Reporting Limit
Physical Properties	pH	A4500-H B	0-0.1 s.u.
Physical Properties	Total Dissolved Solids	A2540 C	10 mg/L
Physical Properties	Total Suspended Solids	A2540 D	10 mg/L
Inorganics	Alkalinity	A2320 B	4 mg/L
Inorganics	Anions by Ion Chromatography	E300.0	1 mg/L
Nutrients	Nitrogen, Nitrate+Nitrite	E353.2	0.01 mg/L
Nutrients	Nitrogen, Total Persulfate	A4500 N-C	0.01 mg/L
Nutrients	Phosphorus, Total	E365.1	0.005 mg/L
Metals, Dissolved	Arsenic	E200.7_8	0.001 mg/L
Metals, Dissolved	Cadmium	E200.7_8	0.0001 mg/L
Metals, Dissolved	Calcium	E200.7_8	1 mg/L
Metals, Dissolved	Copper	E200.7_8	0.001 mg/L
Metals, Dissolved	Iron	E200.7_8	0.03 mg/L
Metals, Dissolved	Lead	E200.7_8	0.001 mg/L
Metals, Dissolved	Magnesium	E200.7_8	1 mg/L
Metals, Dissolved	Manganese	E200.7_8	0.001 mg/L
Metals, Dissolved	Potassium	E200.7_8	1 mg/L
Metals, Dissolved	Sodium	E200.7_8	1 mg/L
Metals, Dissolved	Zinc	E200.7_8	0.01 mg/L
Metals, Total Recoverable	Arsenic	E200.7_8	0.001 mg/L
Metals, Total Recoverable	Cadmium	E200.7_8	0.0001 mg/L
Metals, Total Recoverable	Copper	E200.7_8	0.001 mg/L
Metals, Total Recoverable	Iron	E200.7_8	0.03 mg/L
Metals, Total Recoverable	Lead	E200.7_8	0.001 mg/L
Metals, Total Recoverable	Manganese	E200.7_8	0.001 mg/L
Metals, Total Recoverable	Zinc	E200.7_8	0.01 mg/L

Table A-2. List of water chemistry field parameters collected.

Analyte Group	Analyte	Method
Field Parameters	pH	Hydrolab HL7 Sonde
Field Parameters	Turbidity	Hydrolab HL7 Sonde
Field Parameters	Dissolved Oxygen	Hydrolab HL7 Sonde
Field Parameters	Temperature	Hydrolab HL7 Sonde
Field Parameters	Specific Conductance	Hydrolab HL7 Sonde
Field Parameters	Depth	Hydrolab HL7 Sonde

Appendix B - Wetland Assessment Report

July 20, 2023

NORTHWESTERN ENERGY

Thompson Falls Reservoir

Wetland Assessment Report

PROJECT NUMBER:
0239852_0000

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POWER ENGINEERS

Wetland Assessment Report

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ACRONYMS AND ABBREVIATIONS

AA	Assessment Areas
APT	Antecedent Precipitation Tool
CWA	Clean Water Act
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEMA	Federal Emergency Management Agency
HGM	Hydrogeomorphic
MNHP	Montana Natural Heritage Program
MWAM	Montana Wetland Assessment Method
NAIP	National Agriculture Imagery Program
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NWE	NorthWestern Energy
NWI	National Wetland Inventory
OBL	Obligate Wetland
OHWM	Ordinary High Water Mark
POWER	POWER Engineers, Inc.
PWS	Professional Wetland Scientist
SP	Sampling Point
SOC	Species of Concern (Montana Natural Heritage Program)
T&E	Threatened and Endangered
UPL	Upland
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WOTUS	Waters of the United States

1.0 INTRODUCTION

POWER Engineers, Inc. (POWER) was retained by NorthWestern Energy (NWE) to complete a delineation and evaluation of potentially regulated wetlands (i.e., identifying boundaries of aquatic resources potentially regulated by the federal government along the Thompson Falls Reservoir that may be influenced by changes in water surface elevation due to reservoir operations (Assessment Area). The legal description of the Project includes portions of Sections 8, 9, 13, 16, and 23, Township 21 North, Range 29 West, and portions of Sections 15, 16, 17, 18, and 22, Township 21 North, Range 28 West, Sanders County, Montana.

This report presents the professional opinion of POWER regarding the presence/absence/assessment of potentially regulated wetlands above the approximated ordinary high water mark (OHWM) of the Thompson Falls Reservoir. The final determination of the limits, jurisdictional status, and assessment of on-site wetlands is under the purview of the United States Army Corps of Engineers (USACE) and may require an on-site inspection with the USACE. Of note, this review did not include the delineation or assessment of waterways draining into the Assessment Area, as these features will not be affected by changes in water surface elevation of the reservoir.

1.1 Site Description

The Assessment Area considered wetland areas along the water's edge of Thompson Falls Reservoir, from the dam at Thompson Falls on the west to approximately 10 miles upstream of the dam along the Clark Fork River on the east, between approximate river miles 208 and 218. This investigation focused on riparian wetlands apparently affected by water impounded behind the dam. The Clark Fork River forms the boundary between the Cabinet Mountains to the northeast and the Coeur d'Alene Mountains to the southwest. The Assessment Area is situated within the Natural Resources Conservation Service (NRCS) Northern Rocky Mountain Valleys Major Land Resource Area (NRCS 2022a). Surrounding hillslopes are generally covered by a mature mixed conifer forest. Habitat types within the Assessment Area include open channel/water, alpine-montane wet meadow, emergent marsh, mesic montane mixed conifer forest, ponderosa pine woodland and savanna, lower montane grassland, and lower montane riparian woodland and shrubland (MTNHP 2017). Land uses surrounding the Assessment Area include low intensity residential, commercial/industrial, railroad, undeveloped vacant, and forestland. Topography across the Assessment Area includes stream terraces, flood plains, alluvial fans, side and mid-channel gravel bars, and valley bottoms. Elevations within the Assessment Area range from approximately 2,398 to 2,415 feet above mean sea level. A topographic map of the Assessment Area is provided as Figure 1 and aerial maps as Figure 2 (National Agriculture Imagery Program [NAIP] 2021).

1.2 Jurisdictional Authority

The USACE has primacy over the regulation of federal jurisdictional waters under Sections 9 and 10 of the Rivers and Harbors Act of 1899 and federal jurisdictional waters under Section 404 of the Clean Water Act (CWA). Federal jurisdictional waters include navigable waters and all other waters that are regulated by the USACE, which together are referred to as "WOTUS." Impacts to WOTUS are regulated by the USACE through Section 404 of the CWA (33 United States Code [U.S.C.] § 1344) and Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403). In addition, prior to federal authorization for impacts to waters or wetlands, a water quality certification must first be obtained from the applicable state as defined in Section 401 of the CWA (33 U.S.C. § 1341).

The USACE administers the Clean Water Act (CWA) Section 404 permitting program, and issues permits pursuant to Sections 9 and 10 of the Rivers and Harbors Act of 1899. 33 U.S.C. § 1344; 33 U.S.C. § 403. These permitting programs address impacts to Federally jurisdictional waters, or waters of the United

States (WOTUS). Pursuant to Section 401 of the CWA, Montana must issue or waive a water quality certification prior to USACE issuing a permit. 33 U.S.C. § 1341.

The definition of WOTUS is in the process of being revised. On January 18, 2023, the United States Environmental Protection Agency (USEPA) and the USACE published the final "Revised Definition of Waters of the United States" rule, which took effect on March 20, 2023. 88 Fed. Reg. 3004 (Jan. 18, 2023). However, on May 25, 2023, the United States Supreme Court issued a ruling rejecting the "significant nexus" standard that supported key components of the March 20, 2023 rule. *Sackett v. USEPA*, (U.S. EPA 2023). On June 26, 2023, USEPA announced that it will interpret WOTUS consistent with the *Sackett* decision and issue a new rule defining WOTUS by September 1, 2023.

For purposes of this report, Power followed USACE guidance that it will not assert jurisdiction over swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow), ditches (including roadside ditches) excavated wholly in and draining only uplands that do not carry a relatively permanent flow of water, prior converted cropland, waste treatment systems, artificially irrigated areas, artificial lakes or ponds, artificial reflecting pools or swimming pools, or waterfilled depressions created in dry land until the construction operation is abandoned and the resulting body of water meets the definition of WOTUS. Although uncertainty remains about the scope of federal jurisdiction, the *Sackett* decision holds that only relatively permanent waters with a continuous-surface water connection to traditional navigable bodies of water will warrant a WOTUS designation and thus be subject to federal permitting requirements.

2.0 METHODS

2.1 Analysis of Existing Data

Prior to the commencement of the on-site field investigation, POWER reviewed available technical documents, databases, and maps to determine the potential extent of wetlands and waterways within the Assessment Area. These data included:

- United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle Maps: Thompson Falls, Montana (USGS 1992); Eddy Mountain, Montana (USGS 1964)
- United States Department of Agriculture NAIP 2021 imagery (NAIP 2021)
- Google Earth Aerial Imagery (1985-2021)
- United States Department of Agriculture NRCS' Soil Survey Geographic database for Sanders County, and Parts Lincoln and Flathead Counties, Montana (NRCS 2022b) and partial database for Lolo National Forest Area, Montana (NRCS 2022c)
- United States. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Wetlands Mapper (USFWS 2023)
- USGS National Hydrography Dataset (NHD) mapper (USGS 2023)
- Federal Emergency Management Agency (FEMA) 100-year Floodplain maps (FEMA 2023)

2.2 Field Investigation

This review focused on determining the presence of wetlands within the limits of the Assessment Area. Field surveys were conducted in accordance with the "Routine Onsite Determination Method" described in the USACE *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010).

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated conditions. Under normal circumstances, three parameters must be present for an area to be considered a wetland: hydrophytic vegetation, wetland hydrology, and hydric soils.

The approximated OHWM of the Thompson Falls Reservoir generated by desktop analysis was used to define the extent of the Assessment Area and also to define the wetland boundary along the water's edge. A combination of the NWI data and on-the-ground knowledge of the Assessment Area by a Hydro Compliance Professional with NWE was used as a starting point for the field Assessment. Based on the desktop analysis, 46 investigation areas were identified for field surveys. The Assessment Area was navigated via motorboat, stopping periodically to evaluate vegetation, soils, and hydrology at all 46 potential wetland areas preidentified during the desktop analysis. A few areas were sampled that were not identified during the desktop analysis, due to obvious indicators observed in the field. The survey determined the presence of wetland indicators for each parameter (hydric soils, hydrophytic vegetation, and hydrology), according to methodologies outlined in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0) (USACE 2010). The boundaries of wetland areas determined to meet the three criteria were surveyed using a Trimble GeoXH global positioning system (GPS) unit with sub-meter accuracy. The specific methods for characterizing and evaluating vegetation, hydrology, and soils for determining the presence of wetland areas are identified below.

2.2.1 Soils

At the center of each data plot, the wetland scientist conducted borings with a hand-held auger to depths necessary to accurately determine a soil's hydric status (typically 18 to 24 inches below ground surface). The information collected for each soil profile included soil horizons, depth, texture, color, and hydric soil characteristics including organic content, accumulation of sulfides, gley formation, redoximorphic concentrations and depletions, and the visually detectable depletion of minerals such as iron and manganese. Colors of the soil matrix and concentrations/depletions were identified using Munsell Soil Color Charts (Munsell 2000). Hydric soil determinations were based on criteria established in the 1987 USACE *Wetlands Delineation Manual* (Environmental Laboratory 1987), along with *Field Indicators of Hydric Soils in the United States* (NRCS 2010), and the Regional Supplement (USACE 2010).

2.2.2 Vegetation

Species abundance in both upland and wetland communities were visually estimated. Dominant trees and shrubs/saplings were recorded within a 30-foot and 15-foot radius, respectively, from the center of each sampling point. Woody vines were recorded within a 30-foot radius of the plot. Dominant herbaceous vegetation was recorded within a 5-foot radius of the plot. The indicator status of each species was identified using the *National Wetland Plant List for the Western Mountains, Valleys, and Coast Region* (USACE 2020). The presence of hydrophytic vegetation within a representative plant community was positively identified if more than 50% of the dominant species within the community had an indicator status of Obligate Wetland (OBL), Facultative Wetland (FACW), or Facultative (FAC). This determination method is referred to as the dominance test. Dominant plant species are determined using the "50/20 rule" defined in the 1987 *Wetlands Delineation Manual* (Environmental Laboratory 1987). If the plant community failed the dominance test, but indicators for hydric soils or wetland hydrology were present, the plant community was examined for additional hydrophytic vegetation indicators. These hydrophytic vegetation indicators are identified in the Regional Supplement and include the prevalence index, evidence of morphological adaptations for growth in a wetland, and problematic hydrophytic vegetation (USACE 2010).

2.2.3 Hydrology

Site hydrology was evaluated during the field survey by initially observing whether the soil at the surface was inundated or saturated. If the ground surface was dry, the depth to freestanding groundwater or saturated soil was measured, and the presence or absence of other indicators of wetland hydrology (e.g., drift lines, water stained leaves) was noted. The wetland hydrology criterion was met if one or more primary or two or more secondary field indicators were present (Environmental Laboratory 1987). However, during the survey, those wetlands which lacked any hydrology indicators due to temporarily dry conditions, disturbance, or other factors and did not meet the 1987 USACE manual criteria were evaluated using criteria from the Regional Supplement (USACE 2010).

2.2.4 Wetland Classification

In the field, wetlands and waterways were classified according to the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979). The Cowardin classification is a taxonomic system that divides wetlands and deepwater habitats into five systems based on hydrologic factors: Marine, Estuarine, Riverine, Lacustrine, and Palustrine.

Additionally, wetlands were classified based on hydrogeomorphic (HGM) system (Brinson 1993). This approach considers wetland function and places an emphasis on geomorphic and hydrologic attributes, rather than using a system that is limited to biotic characteristics. This system recognizes water inputs and outputs which drive wetlands systems. This classification system includes seven major HGM classes (riverine, depressional, slope, mineral soil flats, organic soil flats, estuarine fringe, and lacustrine fringe wetlands).

2.2.5 Antecedent Precipitation

The Antecedent Precipitation Tool (APT) is a desktop tool developed by the USACE that is commonly used by the USACE and USEPA to support decisions as to whether field data collection and other site-specific observations occurred under normal climatic conditions. This tool streamlines the review of climatic data, which supports decision-making related to wetland delineations. The APT facilitates the comparison of antecedent or recent rainfall conditions for a given location to the range of normal rainfall conditions that occurred during the preceding 30 years. In addition to providing a standardized methodology to evaluate normal precipitation conditions (“precipitation normalcy”), the APT can also be used to assess the presence of drought conditions, as well as the approximate dates of the wet and dry seasons for a given location.

2.2.6 Functional Assessment

The 2008 MDT Montana Wetland Assessment Method (MWAM) (Berglund and McEldowney 2008) was used to evaluate functions and values of wetland areas identified during the field investigation. This method provides an objective means of assessing mitigation success based on wetland functions. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society and relate to ecological significance without regard to subjective human values (Berglund and McEldowney

2008). Field data for this assessment were collected during the site visit. A Wetland Assessment Form was completed for two Wetland Groups (WG).

3.0 RESULTS

3.1 Desktop Analysis

The desktop analysis completed by POWER included soils, waterways, topographic, wetlands, and floodplain data to determine the potential presence of wetland/waterway features. The results of the desktop analysis are provided in the following sections. A topographic map (Figure 1), aerial map (Figure 2), NRCS soils map (Figure 3), and NWI/NHD water resources map (Figure 4) were all reviewed as part of the desktop analysis and have been included in this report. Additionally, FEMA floodplain data were evaluated to identify potential wetlands and waterways.

3.1.1 Topographic Map

According to the USGS topographic map (Figure 1), the wetland Assessment Area is situated directly adjacent to the lower Clark Fork River along an approximate 10-mile reach and affected by the Thompson Falls Reservoir water impoundment. Through the Assessment reach, five unnamed intermittent channels, one unnamed perennial channel, and four named perennial drainages discharge into the Clark Fork River. Named perennial tributaries include Outlaw Creek, Cherry Creek, Moss Spring, and the Thompson River. As noted above, waterways were not delineated during this investigation. The topographic map shows multiple islands, lower terraces, and steep hillslopes along the assessed river corridor. A review of the topographic map indicated wetlands are likely present throughout the Assessment Area.

3.1.2 Aerial Map

The 2021 NAIP (Figure 2), the 2019 NAIP, and historic aerial photographs show variable bank conditions (exposed/inundated) with varying water levels. A slightly lower water level shown on the 2019 NAIP as compared to the 2021 NAIP displayed a slight increase in shoreline and island size, exposing areas of fine-textured sediment. Relatively stable water levels were observed on the Google Earth historic aerials between 1995 and 2020. Water levels impounded by the Thompson Falls Dam appear to support a relatively narrow shoreline, intermittently exposed gravel bars, and partially vegetated mid-channel and point bars. Based on a review of the aerial imagery from 1985 to current, river morphology has remained relatively constant throughout the Assessment Area. Vegetated bars, low-lying shoreline, and dark green vegetation signatures were evident in select areas along the reservoir's shoreline within the aerial imagery and indicate the presence of wetland resources within the Assessment Area.

3.1.3 Soils

Eight NRCS soil units and two other areas have been mapped within the Assessment Area in areas determined to be wetland during a field investigation conducted during May 2023. The two non-soil map units included "Water" and "Denied Access" where NRCS soil mapping were not available due to property access. The NRCS mapped units are listed in Table 1 and illustrated in Figure 3. Soils within these areas are generally formed in alluvium along floodplains, stream terraces, mountains, and valleys. One of the soil map units is rated as hydric by NRCS and occupies approximately 52% of the identified wetland areas.

TABLE 1 ON-SITE SOIL MAP UNITS

SOIL MAP UNIT NAME	SOIL MAP UNIT CODE	LANDFORM	DRAINAGE CLASS	HYDRIC RATING	PERCENT OF WETLAND AREAS
Riverwash	200	Floodplains	--	Yes (2 percent of map unit hydric)	52.5
Rock outcrop-Specie, extremely stony-Wilde, extremely stony, families, complex, stream breaklands	26UA	--	--	No	1.6
Bigarm gravelly loam, alluvial, 30 to 50 percent slopes	350F	Hills	Somewhat excessively drained	No	0.1
Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes	41B	Floodplains, mountains	Moderately well drained	No	0.4
Selon fine sandy loam, moist, 0 to 4 percent slopes	421B	Mountains, stream terraces	Well drained	No	3.7
Elkrock gravelly ashy silt loam, moist, 0 to 4 percent slopes	472B	Stream terraces, valleys	Somewhat excessively drained	No	0.8
Elkrock-Selon complex, 4 to 15 percent slopes	473D	Stream terraces	Somewhat excessively drained	No	1.3
Horseplains fine sandy loam, 0 to 2 percent slopes	93A	Floodplains, mountains	Somewhat excessively drained	No	4.3
Denied access	DA	--	--	--	25.1
Water	W	--	--	--	10.2

3.1.4 Wetlands

The NWI data for the Assessment Area in the vicinity of the identified wetlands is provided in Figure 4. Ten types of NWI wetland were mapped within the identified wetlands within the Assessment Area and include one type of lacustrine, six types of palustrine, and three types of riverine systems specifically classified as:

- Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded (L1UBHh)
- Palustrine, Emergent, Persistent, Temporarily Flooded (PEM1A)
- Palustrine, Emergent, Persistent, Temporarily Flooded, Diked/Impounded (PEM1Ah)
- Palustrine, Emergent, Persistent, Seasonally Flooded (PEM1C)
- Palustrine, Emergent, Persistent, Semipermanently Flooded (PEM1F)
- Palustrine, Forested, Broad-Leaved Deciduous, Temporary Flooded (PFO1A)
- Palustrine, Scrub-Shrub, Temporarily Flooded (PSSA)
- Riverine, Upper Perennial, Unconsolidated Shore, Seasonally Flooded (R3USC)
- Riverine, Upper Perennial, Unconsolidated Shore, Temporary Flooded (R3USA)

- Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded (R3UBH)

NWI data are typically based on aerial photography interpretation and are not always ground-truthed.

Mapped wetlands are identified throughout the length of the Assessment Area. Open water within the Clark Fork River is generally mapped as R3UBH. Open water within one mile upstream of the dam has been mapped as lacustrine (L1UBHh) and is strongly influenced by the dam impoundment. Wetland fringe areas around R3UBH are mapped along some of the island areas and in low-lying areas of shoreline as a mix of palustrine emergent, scrub-shrub, and forested wetland habitats. In most cases along the islands and shorelines, areas mapped as palustrine forest consist of cottonwoods (*Populus spp*.), firs (*Abies* spp.), spruce (*Picea* spp.) and pines (*Pinus* spp.) growing in upland habitat. Similarly, areas mapped as scrub-shrub commonly consisted of alders (*Alnus* spp.), dogwood (*Cornus sericea*), chokecherry (*Prunus virginiana*), rose (*Rosa* spp.), snowberry (*Symphoricarpos* spp.), Rocky Mountain juniper (*Juniperus scopulaorum*), and other upland woody shrubs. These areas commonly consisted of steeply-sloped banks with no apparent wetland hydrology.

As noted in the methods above, the NWI data was used to provide a foundation for field efforts and areas identified as NWI wetlands within the Assessment Area were targeted during the field investigation. Several areas mapped as wetland habitat by NWI were determined to be upland habitat during the field investigation.

3.1.5 Waterways

Although waterways were not surveyed as part of this wetland assessment, USGS topographical mapping and NHD data were evaluated to identify potential waterway features within the Assessment Area (Figure 1 and Figure 4, respectively). Waterway features within the Assessment Area are briefly discussed in Section 3.1.1.

3.1.6 Floodplains

FEMA floodplain data were evaluated to identify potential wetlands and waterways. The Assessment Area is located on FIRM Panels 30089C1375D and 30089C1400D (FEMA 2012). The majority of the site is mapped as flood hazard zone A. Zone A sites have a one percent annual chance of flooding. Based on the field survey and proximity of the wetland areas to the existing water surface, many of these areas appear to experience periodic flooding/inundation.

3.1.7 Antecedent Precipitation

Results of the APT analysis for the latitude and longitude of the Assessment Area are provided in Appendix A. Based on this analysis, “Drier than Normal” conditions were present at the time of the field survey. The drought index indicated that moderate drought conditions were present during this field survey, conducted during the wet season.

3.2 Field Investigation

A Professional Wetland Scientist (PWS) with POWER completed an on-site field investigation on May 2, 2023, to identify wetlands associated with the Assessment Area. The average reservoir elevation from 7am to 7pm on May 2 was 2,396.3 feet above mean seas level with a range from 2,395.9 to 2,396.6 The results of the investigation are discussed below.

Photographs and associated field observations of the vegetation, hydrology, and delineated wetland features identified within the Assessment Area are included as Appendix B. The location of wetland determination sampling points and the extent of the wetland boundaries that were identified in the field are depicted on Figure 5 at the end of this report. Completed USACE wetland determination data forms, for both wetland and adjacent upland areas, are provided in Appendix C.

3.2.1 Wetland Findings

Table 2 provides a summary for the wetland areas delineated within the Assessment Area. Details regarding observed wetland criteria are provided on the USACE wetland determination forms. Fourteen wetlands were delineated within the Assessment Area, totaling 11.33 acres of wetland habitat. In general, these wetland areas represent a narrow, vegetated fringe along the OHWM of the Thompson Falls Reservoir and are commonly found along the lower terraces and islands within the Assessment Area. These wetland areas generally share common characteristics and have been grouped for the purpose of discussion based on the source for wetland hydrology. The two general categories for the 14 wetland areas include Group 1 with wetland hydrology solely provided by water elevations within the reservoir and Group 2 which derive some level of hydrology for tributaries of the Clark Fork River. These two groups are discussed below.

TABLE 2 SUMMARY DATA FOR WETLANDS

WETLAND/ WATERWAY ID	WETLAND TYPE[1]	WETLAND TYPE (HGM)[2]	SIZE (ACRES)	LOCATION (LAT/LONG)
Wetland 1 (WL-1)	PEM1A	Lacustrine	2.67	47.567594 -115.170191
Wetland 2 (WL-2)	PEM1A	Lacustrine/Riverine	0.30	47.568338 -115.172296
Wetland 3 (WL-3)	PEM1A	Lacustrine	3.41	47.570334 -115.170783
Wetland 4 (WL-4)	PEM1A	Lacustrine	0.61	47.575110 -115.197502
Wetland 5 (WL-5)	PEM1A	Lacustrine/Riverine	0.21	47.575009 -115.222833
Wetland 6 (WL-6)	PEM1A	Lacustrine	0.59	47.576939 -115.240836
Wetland 7 (WL-7)	PEM1A	Lacustrine/Riverine	0.05	47.566325 -115.269681
Wetland 8 (WL-8)	PEM1A	Lacustrine	0.04	47.581088 -115.319736
Wetland 9a/b (WL-9a/b)	PEM1A	Lacustrine	2.74	47.581326 -115.324284
Wetland 10 (WL-10)	PEM1A	Lacustrine	0.26	47.583343 -115.323203
Wetland 11 (WL-11)	PEM1A	Lacustrine	0.03	47.583935 -115.324840
Wetland 12 (WL-12)	PEM1A	Lacustrine	0.20	47.585195 -115.330850
Wetland 13a/b (WL-13a/b)	PEM1A	Lacustrine	0.10	47.590272 -115.325960
Wetland 14 (WL-4)	PEM1A	Lacustrine	0.12	47.592389 -115.339686
--			11.33	--

Note: PEM1A = Palustrine, Emergent, Persistent, Temporarily Flooded.
1 Cowardin et al. 1979
2 Brinson 1993

Wetland Group 1 (WL-1, 3, 4, 6, 8-14)

Wetland Group 1 (WG-1) includes all wetland habitat that appears to be directly supported by water elevations impounded by the Thompson Falls Dam and consists of eleven wetland areas that total 10.78 acres of palustrine emergent wetland habitat. These wetland habitats typically occupy low benches and narrow fringes along the water's edge. The wetland hydrology indicators observed within WG-1 included surface water, high water table, saturation, sediment deposits, geomorphic position, and a positive FAC-neutral test. Hydrophytic vegetation observed within WG-1 primarily included reed canary grass (*Phalaris arundinacea*, FACW) with lesser amounts of Baltic rush (*Juncus balticus*, FACW), broad-leaf cat-tail (*Typha latifolia*, OBL), pale-yellow iris (*Iris pseudacorus*, OBL), Northwest Territory sedge (*Carex utriculata*, OBL), common spike rush (*Eleocharis palustris*, OBL), and hard-stem club-rush (*Schoenoplectus acutus*, OBL).

The hydrophytic vegetation indicators included a positive rapid test for hydrophytic vegetation, a positive dominance test, and prevalence index within the range indicating the presence of hydrophytic vegetation. Adjacent uplands were generally characterized by Rocky Mountain bee plant (*Cleome serrulate*, UPL), Canada goldenrod (*Solidago canadensis*, FACU), slender wild rye (*Elymus trachycaulus*, FAC), blue wild rye (*Elymus glaucus*, FACU), smooth brome (*Bromus inermis*, UPL), common tansy (*Tanacetum vulgare*, FACU), Kentucky bluegrass (*Poa pratensis*, FAC), western meadow-rue (*Thalictrum occidentale*, FACU), great mullein (*Verbascum thapsus*, FACU), orchard grass (*Dactylis glomerata*, FACU), common yarrow (*Achillea millefolium*, FACU), and common dandelion (*Taraxacum officinale*, FACU). The hydric soil indicators observed within WG-1 included sandy redox and depleted matrix and commonly exhibited distinct redoximorphic concentrations starting within eight inches of the soil surface. All wetland areas within WG-1 were observed to be hydrologically connected to the Thompson Falls Reservoir and the Clark Fork River.

Wetland Group 2 (WL-2, 5, and 7)

Wetland Group 2 (WG-2) includes wetland habitat identified along the water's edge of the reservoir that receive supplemental wetland hydrology from surface water draining from adjacent slopes into the Clark Fork River. WG-2 includes three areas of palustrine emergent habitat (approximately 0.55 acre). Surface water observed draining from the steep mountain slopes through WL-2 was presumably determined to be Outlaw Creek, based on NHD interpretation. Wetland hydrology for WL-5 appeared to be sustained by both impounded surface water and intermittent stream flow contributed from surface runoff of the mountainside above. WL-7 was identified as a very small wetland depression at the mouth of Cherry Creek. The wetland hydrology indicators for WG-2 included surface water, saturation, drainage patterns, geomorphic position, and a positive FAC-neutral test. Dominant hydrophytic vegetation observed within WL-2 included pale-yellow iris and reed canary grass. The hydrophytic vegetation indicators included a positive rapid test for hydrophytic vegetation, a positive dominance test, and prevalence index within the range indicating the presence of hydrophytic vegetation. Adjacent uplands were generally characterized by blue wild rye, common tansy, western meadow-rue, and smooth brome. The hydric soil indicators observed within WL-2 included sandy redox and depleted matrix. All wetlands within WG-2 were observed to be hydrologically connected to the Thompson Falls Reservoir and the Clark Fork River.

3.2.2 Functional Assessment

The two wetland groups were assessed on separate MWAM forms and include WG-1 and WG-2. Completed forms are provided in Appendix D and a summary of wetland functions and value ratings is provided in Table 3. According to the functional assessments, both WGs were classified as Category III wetlands. Descriptions of each WG evaluation are provided below.

TABLE 3 MWAM FUNCTIONAL ASSESSMENT SUMMARY

Function and Value Parameters from the 2008 MDT Wetland Assessment Method[1]	Wetland Group 1		Wetland Group 2	
	WL-1, 3, 4, 6, 8-14		WL-2, 5, 7	
	Rating	Points	Rating	Points
Listed/Proposed T&E Species Habitat	Low	0	Low	0
MNHP State Species of Concern Habitat	Low	0	Low	0
General Wildlife Habitat	Moderate	0.7	Moderate	0.7
General Fish/Aquatic Habitat	N/A	--	N/A	--
Flood Attenuation	Moderate	0.5	High	0.8
Short and Long Term Surface Water Storage	High	0.9	Moderate	0.4
Sediment/Nutrient/Toxicant Removal	High	1	High	1
Sediment/Shoreline Stabilization	High	1.0	High	1.0
Production Export/Food Chain Support	Moderate	0.5	Moderate	0.7
Groundwater Discharge/Recharge	Moderate	0.7	High	1.0
Uniqueness	Low	0.3	Low	0.3
Recreation/Education Potential	Moderate	0.1	Moderate	0.1
Actual Points/Possible Points	5.7/10.0		6.0/10.0	
% of Possible Score Achieved	57%		60%	
Overall Category	III		III	
Total Acreage of Assessed Wetlands	10.78		0.55	
Function Unit Total (actual points x estimate AA acreage)	61.5		3.3	
Total Projected Function Units on this Project	64.8			

[1]See completed MDT functional assessment forms in Appendix D for detailed ratings.

WG-1

Wetland Group 1 consists of 11 wetland areas totaling 10.78 acres. According to the MWAM, WG-1 is a Category III wetland. WG-1 received low ratings for listed/proposed threatened and endangered (T&E) species, Montana Natural Heritage Program (MNHP) state species of concern (SOC) habitat, and uniqueness. Of note, the area assessed in WG-1 did not include habitat below the OHWM of the reservoir and therefore did not include bull trout or aquatic SOC habitat. WG-1 received moderate ratings for general wildlife habitat, flood attenuation, production export/food chain support, groundwater discharge/recharge, and recreation/education potential and high ratings for short and long term surface water storage, sediment/nutrient/toxicant removal, and sediment/shoreline stabilization. WG-1 received 5.7 out of 10 possible points (57%) and a total of 61.5 functional units.

WG-2

WG-2 consists of three wetland areas totaling 0.55 acres. According to the MWAM, WG-2 is a Category III wetland. WG-2 received low ratings for listed/proposed threatened and endangered (T&E) species, MNHP SOC habitat, and uniqueness. WG-2 received moderate ratings for general wildlife habitat, flood attenuation, production export/food chain support, and recreation/education potential and high ratings for short and long term surface water storage, sediment/nutrient/toxicant removal, sediment/shoreline stabilization, and groundwater discharge/recharge. WG-2 received 6.0 out of 10 possible points (60%) and a total of 3.3 functional units.

4.0 SUMMARY

POWER completed an assessment of wetland areas along an approximate 10-mile stretch of the Clark Fork River impounded by the Thompson Falls Dam within Sanders County, Montana. This assessment included wetland areas potentially affected by a water elevation change within the reservoir. Based on the NWI database and NWE personnel experience, 46 Assessment Areas were evaluated via motorboat on May 2, 2023. Based on the field investigation, several of these areas did not support wetland habitat.

A total of 14 wetland areas were delineated along the water’s edge of the reservoir and included a few areas not within the initial investigation areas. Only wetland boundaries above the OHWM of the Thompson Falls Reservoir were surveyed. A total of 11.33 acres of palustrine emergent wetland habitat were delineated as part of this assessment. Wetland areas surveyed within the Assessment Area shared similar habitats, vegetation communities, and general functions and were evaluated based on similarities in wetland hydrology. WG-1 included areas where wetland hydrology was supported solely by water levels within the reservoir; WG-2 included areas that also received wetland hydrology from adjacent tributaries. Based on an assessment of functions and values of these two wetland groups, wetlands identified along the Assessment Area are classified as Category III based on the MWAM.

All wetlands identified within the Assessment Area were were observed to be hydrologically connected to the Thompson Falls Reservoir and the Clark Fork River. The preliminary wetland boundaries identified within the Assessment Area, and their assessments, are based on POWER’s professional opinion. Any impacts to jurisdictional waters within the Assessment Area may require authorization under Sections 404 and 401 of the CWA. Current regulations may require authorization of any impacts to these features from the USACE and the Montana Department of Environmental Quality.

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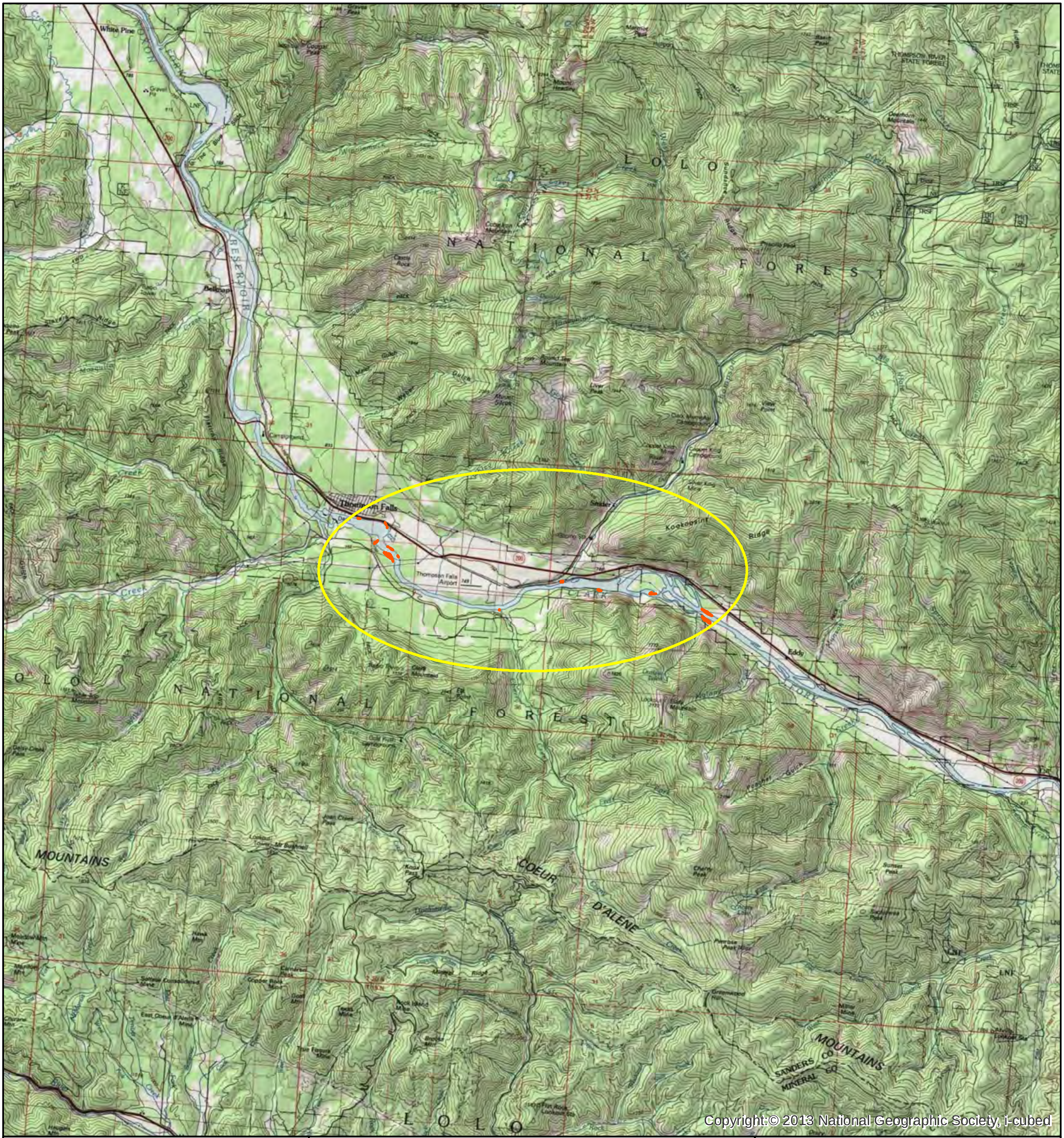
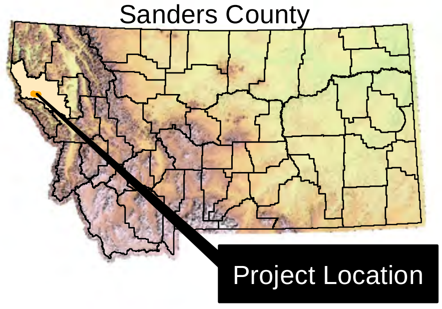




Legend

- Approximate Investigation Area
- Thompson Falls Reservoir Wetland Areas

Thompson Falls

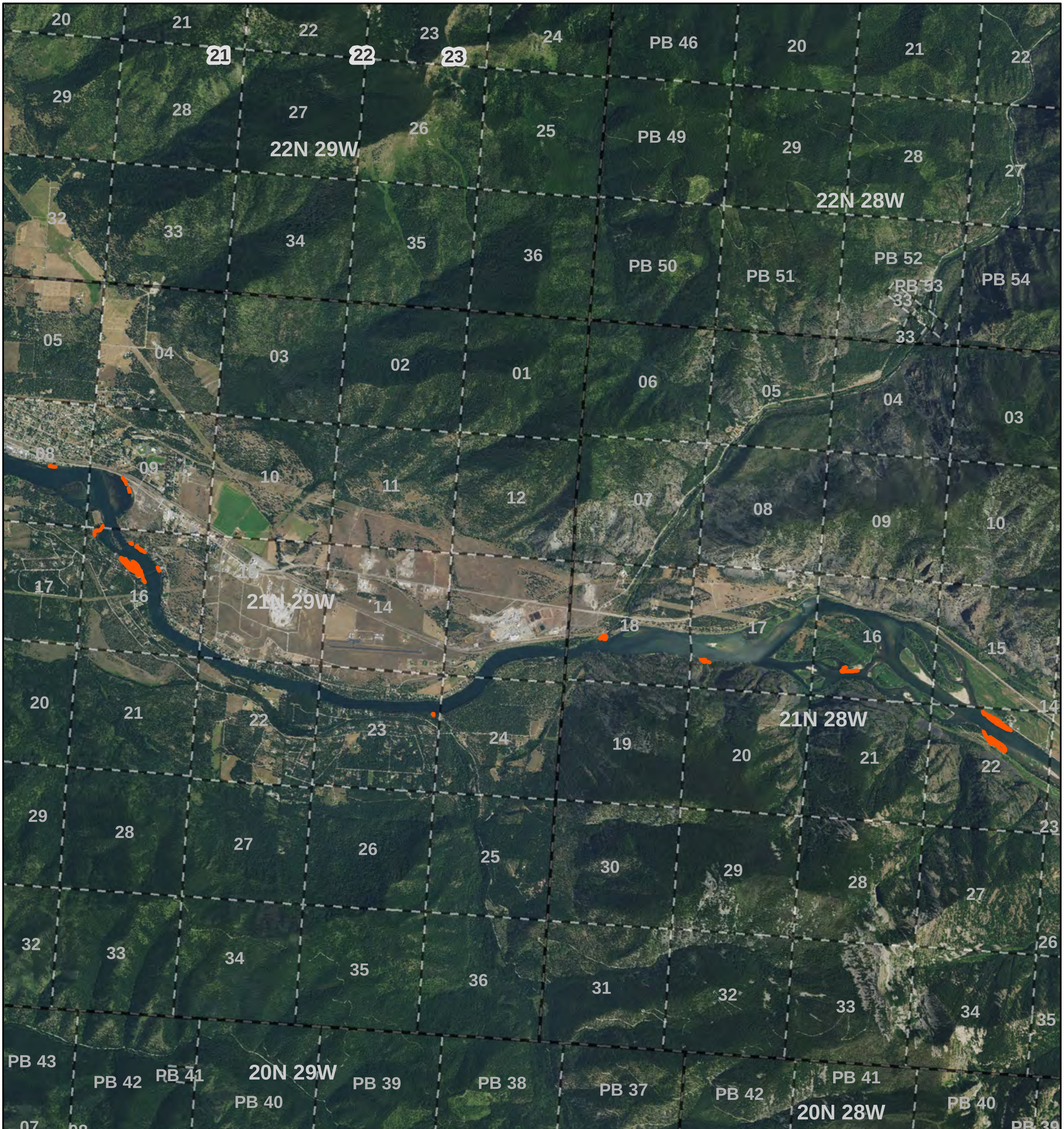
Figure 1:
Topographic/Vicinity Map

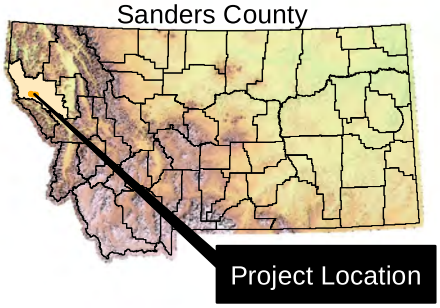
0 1.25 2.5 5

Miles

N

POWER ENGINEERS





Legend

- Thompson Falls Reservoir Wetland Areas
- PLSS Township
- PLSS Section

Thompson Falls

Figure 2:
2019 NAIP Map

0 0.5 1 2
Miles

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

200 - Riverwash

421B - Selon fine sandy loam, moist, 0 to 4 percent slopes

W - Water

MAP 1 of 8

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500

Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

200 - Riverwash

W - Water

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 2 of 8

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

26UA - Rock outcrop-Specie, extremely stony-Wilde, extremely stony, families, complex, stream break*

W - Water

MAP 3 of 8

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

350F - Bigarm gravelly loam, alluvial, 30 to 50 percent slopes

93A - Horseplains fine sandy loam, 0 to 2 percent slopes

W - Water

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

41B - Oldtrail-Glaciercreek-Larchpoint complex, 0 to 8 percent slopes

NRCS Soils

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

421B - Selon fine sandy loam, moist, 0 to 4 percent slopes

472B - Elkrock gravelly ashy silt loam, moist, 0 to 4 percent slopes

DA - Denied access

W - Water

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

472B - Elkrock gravelly ashy silt loam, moist, 0 to 4 percent slopes

473D - Elkrock-Selon complex, 4 to 15 percent slopes

DA - Denied access

W - Water

Thompson Falls

Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

NRCS Soils

473D - Elkrock-Selon complex, 4 to 15 percent slopes

W - Water

Thompson Falls

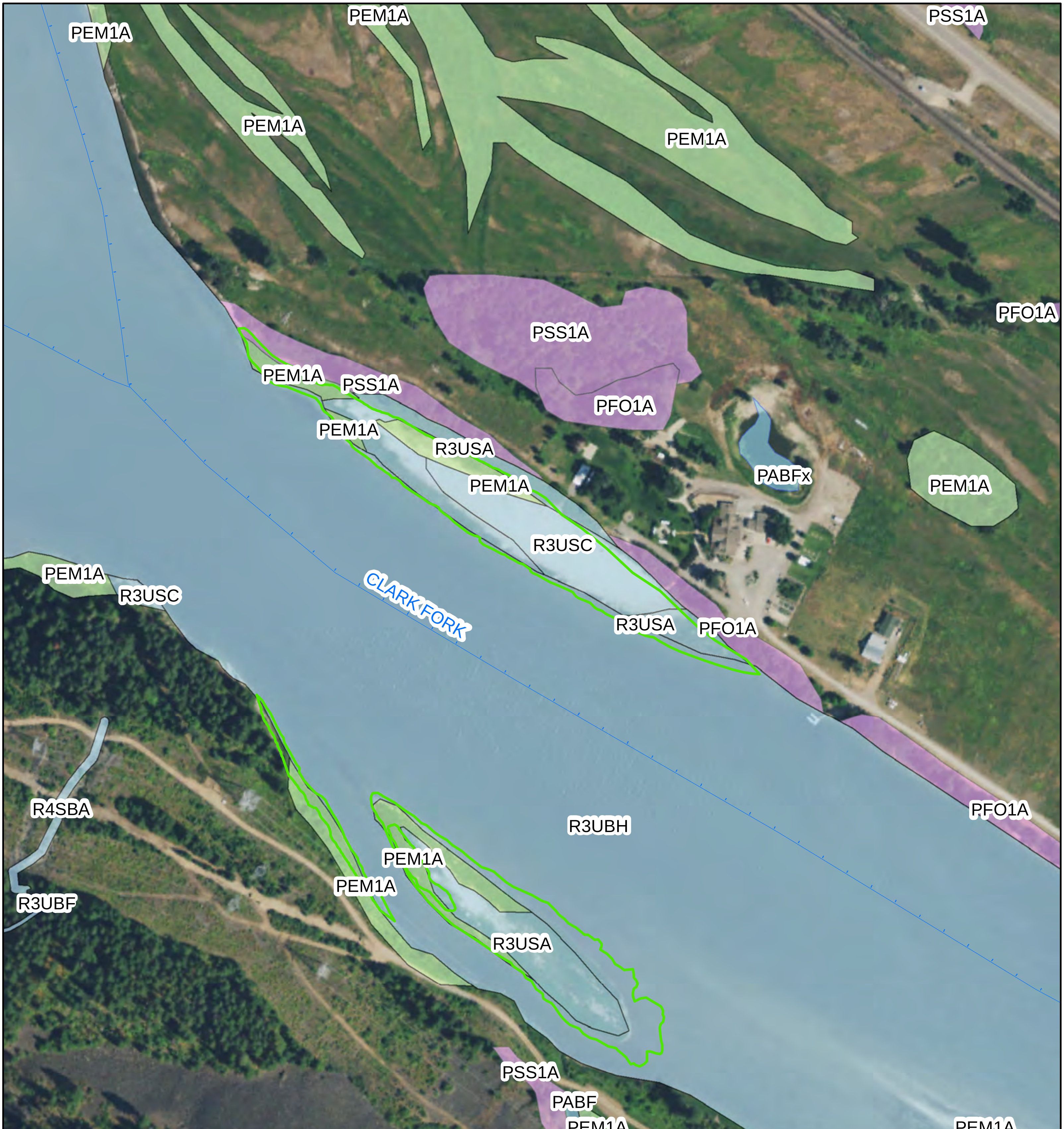
Figure 3:
NRCS Soils Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 8 of 8



Legend

Thompson Falls Reservoir Wetland Areas

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Riverine

MAP 1 of 8

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

- Thompson Falls Reservoir Wetland Areas
- Perennial Stream/River
- Artificial Path

NWI Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine

MAP 2 of 8

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

- Thompson Falls Reservoir Wetland Areas
- Intermittent Stream/River
- Artificial Path

NWI Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Riverine

MAP 3 of 8

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Riverine

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 4 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Intermittent Stream/River

Perennial Stream/River

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Riverine

MAP 5 of 8

Thompson Falls

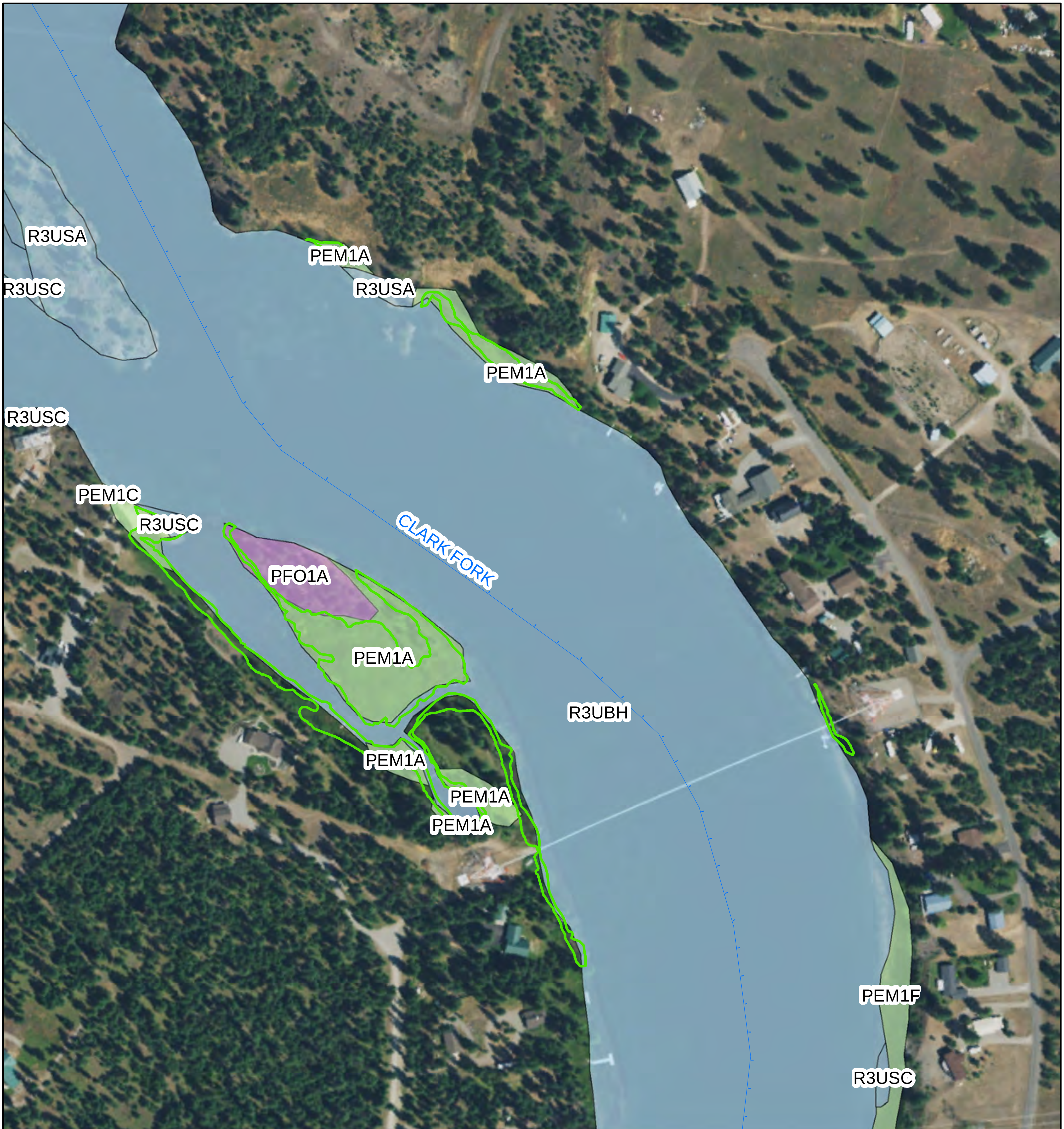
Figure 4:
NWI/NHD Map

0 125 250 500

Feet

N

POWER ENGINEERS



Legend

Thompson Falls Reservoir Wetland Areas

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Riverine

Thompson Falls

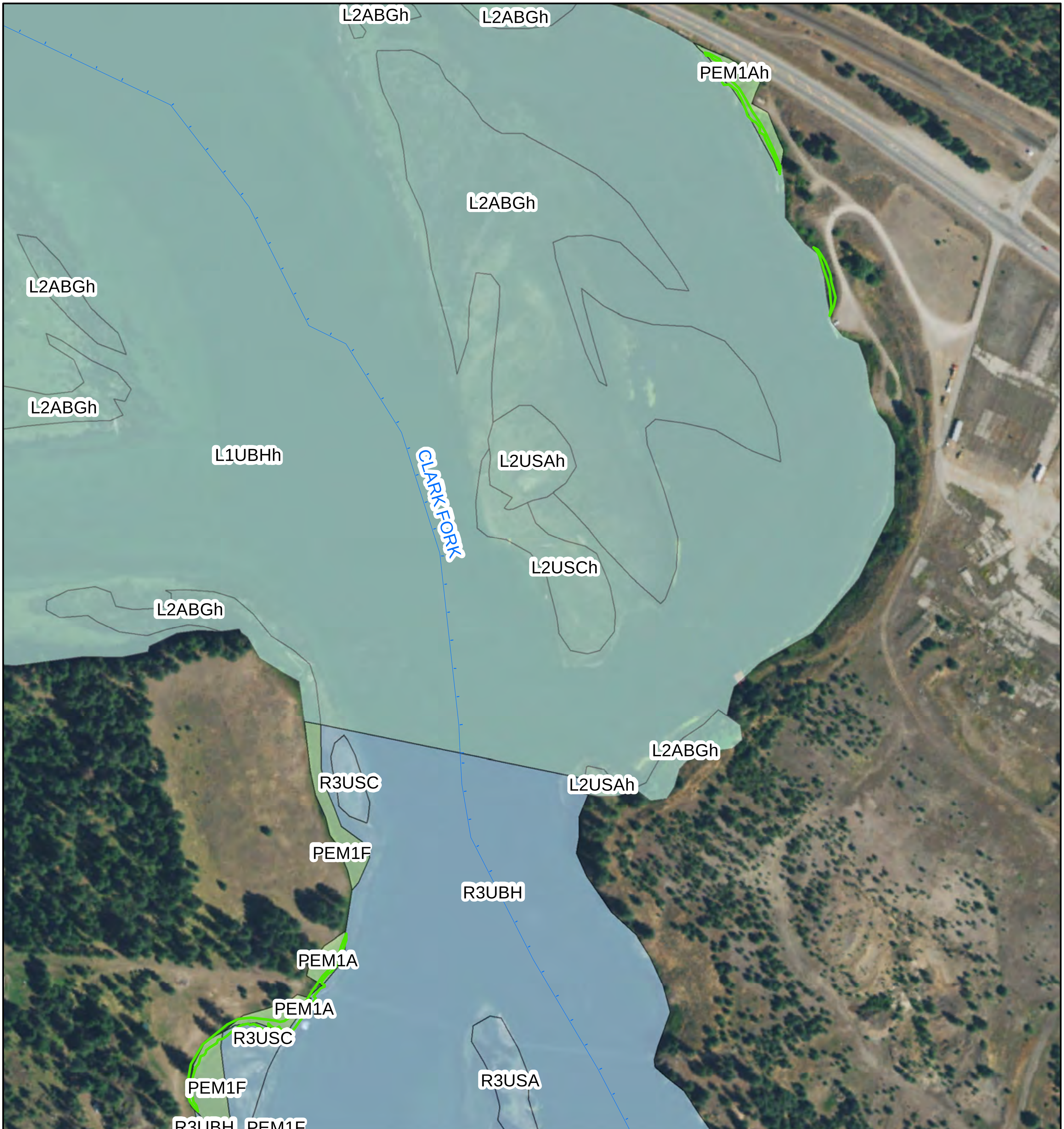
Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 6 of 8



Legend

Thompson Falls Reservoir Wetland Areas

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Lake

Riverine

MAP 7 of 8

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500

Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

Artificial Path

NWI Wetland Type

Freshwater Emergent Wetland

Lake

MAP 8 of 8

Thompson Falls

Figure 4:
NWI/NHD Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 1 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 2 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 3 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 4 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 5 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

N

POWER ENGINEERS

MAP 7 of 8

Legend

Thompson Falls Reservoir Wetland Areas

Thompson Falls

Figure 5:
Surveyed Wetlands Map

0 125 250 500
Feet

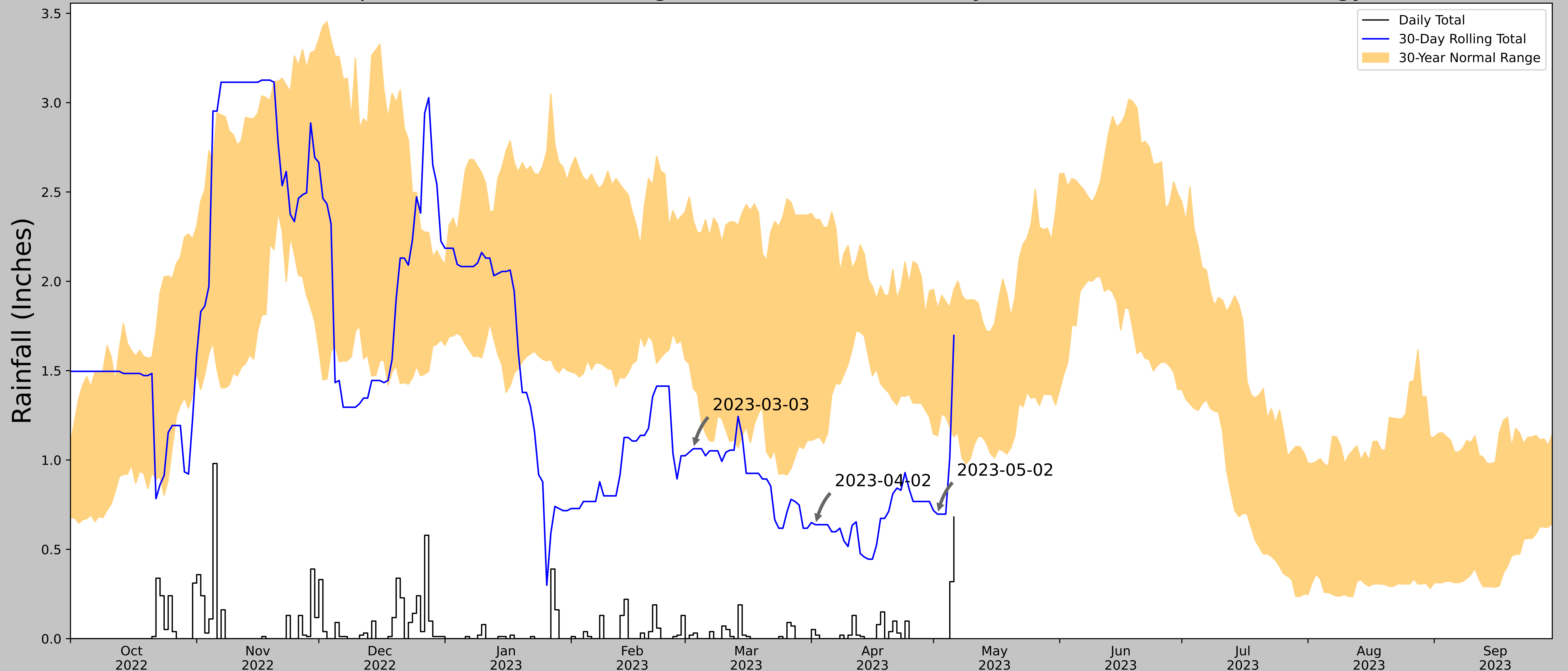
N

POWER ENGINEERS

MAP 8 of 8

APPENDIX A ANTECEDENT PRECIPITATION TOOL RESULTS

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	47.568362, -115.171635
Observation Date	2023-05-02
Elevation (ft)	2402.827
Drought Index (PDSI)	Moderate drought (2023-04)
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2023-05-02	1.136614	1.844488	0.69685	Dry	1	3	3
2023-04-02	1.119291	2.345276	0.637795	Dry	1	2	2
2023-03-03	1.401181	2.338583	1.062992	Dry	1	1	1
Result							Drier than Normal - 6

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
THOMPSON FALLS PH	47.5933, -115.3594	2379.921	8.919	22.906	4.218	11091	89
THOMPSON FALLS 9.3 NW	47.6939, -115.4767	2595.144	8.839	215.223	5.88	185	1
TROUT CREEK RS	47.8664, -115.6272	2410.105	22.604	30.184	10.854	70	0
HAUGAN 1 W	47.3889, -115.4225	3160.105	14.427	780.184	17.748	6	0
PLAINS 5.2 N	47.536, -114.8893	2894.029	22.271	514.108	21.472	1	0

APPENDIX B PHOTOGRAPHS

Photo 1: View northwest at SP1, wetland data point within WL-1.

Photo 2: View southeast at SP2, upland data point.

Photo 3: View south at SP3, wetland data point within WL-2.

Photo 4: View north at SP4, upland data point.

Photo 5: View southeast at SP5,wetland data point within WL-3.

Photo 6: View southwest at SP6, upland data point.

Photo 7: View east at SP7, wetland data point within WL-4.

Photo 8: View east at SP8, upland data point.

Photo 9: View west at SP9, wetland data point within WL-5.

Photo 10: View south at SP10, upland data point.

Photo 11: View west at SP11, wetland data point within WL-6.

Photo 12: View south at SP12, upland data point.

Photo 13: View northwest at SP13, wetland data point within WL-7.

Photo 14: View west at SP14, upland data point.

Photo 15: View southwest at SP15, wetland data point WL-8.

Photo 16: View west at SP16, upland data point.

Photo 17: View west at SP17, wetland data point within WL-9a.

Photo 18: View east at SP18, upland data point.

Photo 19: View west at SP19, wetland data point within WL-10.

Photo 20: View southwest at SP20, upland data point.

Photo 21: View south at SP21, wetland data point within WL-11.

Photo 22: View south at SP22, upland data point.

Photo 23: View southeast at WL-1.

Photo 24: View south at WL-2.

Photo 25: View northwest at WL-3.

Photo 26: View west at WL-5.

Photo 27: View north at WL-8.

Photo 28: View northwest at WL-9a.

Photo 29 View north at WL-9b.

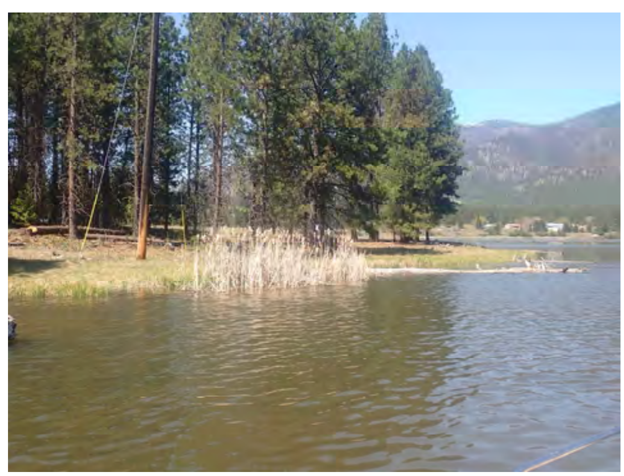


Photo 30: View west at WL-12.

Photo 31: View north at WL-13a.

Photo 32: View north at WL-13b.

Photo 33: View east at WL-14.

APPENDIX C USACE WETLAND DETERMINATION DATA SHEETS

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023

Applicant/Owner: NWE | State: MT | Sampling Point: SP1

Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 22, T21N, R28W

Landform (hillslope, terrace, etc.): Bank/water's edge | Local relief (concave, convex, none): Convex | Slope (%): 2-5

Subregion (LRR): LRR E, MLRA 62 | Lat: 47.568362 | Long: -115.171635 | Datum: WGS84

Soil Map Unit Name: 200-Riverwash | NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is the Sampled Area within a Wetland? **Yes** X **No** ____

Remarks: The NWPL 2020 wetland ratings were used.

This point was determined to be within a wetland due to the presence of all three wetland criteria.

Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **1** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x 1 =	**0**
FACW species	**80**	x 2 =	**160**
FAC species	**0**	x 3 =	**0**
FACU species	**0**	x 4 =	**0**
UPL species	**0**	x 5 =	**0**
Column Totals:	**80** (A)		**160** (B)

Prevalence Index = B/A = **2.00**

Hydrophytic Vegetation Indicators:

- **X** 1 - Rapid Test for Hydrophytic Vegetation
- **X** 2 - Dominance Test is >50%
- **X** 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).

A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).

A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 5/2	100	None		—	—	Sand	
6-12	10YR 7/2	95	10YR 4/6	5	C	M	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment — City/County: Sanders Co. — Sampling Date: 05/02/2023

Applicant/Owner: NWE — State: MT — Sampling Point: SP2

Investigator(s): Brian Sandefur, PWS — Section, Township, Range: Sec. 22, T21N, R28W

Landform (hillslope, terrace, etc.): Island — Local relief (concave, convex, none): Convex — Slope (%): 0-1

Subregion (LRR): LRR E, MLRA 62 — Lat: 47.568219 — Long: -115.171553 — Datum: WGS84

Soil Map Unit Name: 200-Riverwash — NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___

Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		**X**
Hydric Soil Present?		**X**
Wetland Hydrology Present?		**X**
Is the Sampled Area within a Wetland?		**X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	15	Yes	FACU
2.			
3.			
4.			
5.			
= Total Cover	15		
Herb Stratum (Plot size: 5 ft.)			
1. *Cleome serrulata*	40	Yes	UPL
2. *Solidago canadensis*	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	60		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum	40		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **0** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **0.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	35	x 4 = 140
UPL species	40	x 5 = 200
Column Totals:	75 (A)	340 (B)

Prevalence Index = B/A = **4.53**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP2

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/3	100	None		—	—	Sand	
5-16	10YR 7/3	100	None	—	—	—	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth(inches): ________

Hydric Soil Present? **Yes** ____ **No** **X**

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____

Water Table Present? Yes ____ No **X** Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP3
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 22, T21N, R28W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Linear Slope Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.568306 Long: -115.172285 Datum: WGS84
Soil Map Unit Name: 421B-Selon fine sandy loam, moist, 0 to 4% slopes NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Iris pseudacorus*	20	Yes	OBL
2. *Phalaris arundinacea*	80	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum ___			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	20	x 1 = 20
FACW species	80	x 2 = 160
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	100 (A)	180 (B)

Prevalence Index = B/A = **1.80**

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP3

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100	None		—	—	Loamy Sand	
6-16	10YR 5/2	95	10YR 4/6	5	C	M	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?	X		0.5
Water Table Present?		X	
Saturation Present? (includes capillary fringe)	X		0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023

Applicant/Owner: NWE State: MT Sampling Point: SP4

Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 22, T21N, R28W

Landform (hillslope, terrace, etc.): Upper terrace Local relief (concave, convex, none): Convex Slope (%): 2-5

Subregion (LRR): LRR E, MLRA 62 Lat: 47.568252 Long: -115.172252 Datum: WGS84

Soil Map Unit Name: 421B-Selon fine sandy loam, moist, 0 to 4% slopes NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)

Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___

Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		**X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	20	Yes	FACU
2.			
3.			
4.			
5.			
= Total Cover	20		
Herb Stratum (Plot size: 5 ft.)			
1. *Tanacetum vulgare*	20	Yes	FACU
2. *Elymus glaucus*	50	Yes	FACU
3. *Thalictrum occidentale*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum	20		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**0**	(A)
Total Number of Dominant Species Across All Strata:	**3**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**0.00%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**0**	x 2 = **0**
FAC species	**0**	x 3 = **0**
FACU species	**100**	x 4 = **400**
UPL species	**0**	x 5 = **0**
Column Totals:	**100** (A)	**400** (B)

Prevalence Index = B/A = **4.00**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP4

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	100	None		—	—	Loamy Sand	
4-8	10YR 5/2	100	None	—	—	—	Sandy Loam	
8-18	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matrix (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ____ 2 cm Muck (A10)
- ____ Red Parent Material (TF2)
- ____ Very Shallow Dark Surface (TF12)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth(inches): ____________

Hydric Soil Present? **Yes** ____ **No** **X**

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ____ Salt Crust (B11)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Stunted or Stressed Plants (D1) **(LRR A)**
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)
- ____ Raised Ant Mounds (D6) **(LRR A)**
- ____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____

Water Table Present? Yes ____ No **X** Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP5
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 22, T21N, R28W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.571263 Long: -115.173182 Datum: WGS84
Soil Map Unit Name: 421B-Selon fine sandy loam, moist, 0 to 4% slopes NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No ___
Hydric Soil Present?	Yes **X**	No ___
Wetland Hydrology Present?	Yes **X**	No ___

Is the Sampled Area within a Wetland? **Yes X** **No** ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**1**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100.00%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x 1 =	**0**
FACW species	**80**	x 2 =	**160**
FAC species	**0**	x 3 =	**0**
FACU species	**0**	x 4 =	**0**
UPL species	**0**	x 5 =	**0**
Column Totals:	**80** (A)		**160** (B)

Prevalence Index = B/A = **2.00**

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No** ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100	None		—	—	Loamy Sand	
6-16	10YR 5/2	95	10YR 6/6	5	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____
Depth(inches): ____

Hydric Soil Present? **Yes** X **No** ____

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
X Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
____ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? **Yes** X **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP6
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 22, T21N, R28W
Landform (hillslope, terrace, etc.): Upper terrace Local relief (concave, convex, none): Linear Slope Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.571289 Long: -115.173074 Datum: WGS84
Soil Map Unit Name: 421B-Selon fine sandy loam, moist, 0 to 4% slopes NWI classification: PSS1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No **X**
Hydric Soil Present?	Yes ___	No **X**
Wetland Hydrology Present?	Yes ___	No **X**

Is the Sampled Area within a Wetland? **Yes** ___ **No** **X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	20	Yes	FACU
2. *Symphoricarpos albus*	30	Yes	FACU
3.			
4.			
5.			
= Total Cover	50		
Herb Stratum (Plot size: 5 ft.)			
1. *Cleome serrulata*	40	Yes	UPL
2. *Elymus trachycaulus*	25	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	65		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 35			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**4**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**25.00%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	**0**	x 1 =	**0**
FACW species	**0**	x 2 =	**0**
FAC species	**25**	x 3 =	**75**
FACU species	**50**	x 4 =	**200**
UPL species	**40**	x 5 =	**200**
Column Totals:	**115** (A)		**475** (B)

Prevalence Index = B/A = **4.13**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100	None		—	—	Sandy Loam	
8-16	10YR 5/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____
Depth(inches): ____

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____
Water Table Present? Yes ____ No **X** Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP7
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R28W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Convex Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.575020 Long: -115.198447 Datum: WGS84
Soil Map Unit Name: 200-Riverwash NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**80**	x 2 = **160**
FAC species	**0**	x 3 = **0**
FACU species	**0**	x 4 = **0**
UPL species	**0**	x 5 = **0**
Column Totals:	**80** (A)	**160** (B)

Prevalence Index = B/A = **2.00**

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/2	100	None		—	—	Loamy Sand	
4-16	10YR 5/2	95	10YR 4/6	5	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
_X_ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth(inches): ____________

Hydric Soil Present? **Yes** _X_ **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
_X_ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
_X_ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No _X_ Depth (inches): ___
Water Table Present? Yes ___ No _X_ Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No _X_ Depth (inches): ___

Wetland Hydrology Present? **Yes** _X_ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment   City/County: Sanders Co.   Sampling Date: 05/02/2023
Applicant/Owner: NWE   State: MT   Sampling Point: SP8
Investigator(s): Brian Sandefur, PWS   Section, Township, Range: Sec. 16, T21N, R28W
Landform (hillslope, terrace, etc.): Upper terrace   Local relief (concave, convex, none): Convex   Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62   Lat: 47.575076   Long: -115.198442   Datum: WGS84
Soil Map Unit Name: 200-Riverwash   NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed?   Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No **X**
Hydric Soil Present?	Yes ___	No **X**
Wetland Hydrology Present?	Yes ___	No **X**

Is the Sampled Area within a Wetland? **Yes** ___ **No** **X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Cleome serrulata*	20	Yes	UPL
2. *Elymus glaucus*	40	Yes	FACU
3. *Phalaris arundinacea*	20	Yes	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum	20		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**3**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**33.33%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**20**	x 2 = **40**
FAC species	**0**	x 3 = **0**
FACU species	**40**	x 4 = **160**
UPL species	**20**	x 5 = **100**
Column Totals:	**80** (A)	**300** (B)
Prevalence Index = B/A =	**3.75**	

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100	None		—	—	Loamy Sand	
8-16	10YR 6/3	100	None	—	—	—	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No **X**	Depth (inches): ___
Water Table Present?	Yes ___	No **X**	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes ___	No **X**	Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment   City/County: Sanders Co.   Sampling Date: 05/02/2023

Applicant/Owner: NWE   State: MT   Sampling Point: SP9

Investigator(s): Brian Sandefur, PWS   Section, Township, Range: Sec. 17, T21N, R28W

Landform (hillslope, terrace, etc.): Lower terrace   Local relief (concave, convex, none): Linear Slope   Slope (%): 0-1

Subregion (LRR): LRR E, MLRA 62   Lat: 47.575116   Long: -115.223190   Datum: WGS84

Soil Map Unit Name: 26UA-Rock outcrop   NWI classification: PSS1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed?   Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No ,Soil No ,or Hydrology No naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes X No ___**

Remarks: The NWPL 2020 wetland ratings were used.

This point was determined to be within a wetland due to the presence of all three wetland criteria.

Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	80	Yes	FACW
2. *Iris pseudacorus*	10	No	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	90 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **1** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:			Multiply by:
OBL species	10	x 1 =	10
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	90 (A)		170 (B)

Prevalence Index = B/A = **1.89**

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ___**

Remarks:

A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).

A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).

A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100	None		—	—	Loamy Sand	
6-12	10YR 5/2	95	10YR 4/6	5	C	M	Loamy Sand	
12-16	10YR 7/2	90	10YR 4/6	10	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth(inches): ______

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	
Saturation Present? (includes capillary fringe)	X		8

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023

Applicant/Owner: NWE State: MT Sampling Point: SP10

Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 17, T21N, R28W

Landform (hillslope, terrace, etc.): Upper terrace Local relief (concave, convex, none): Convex Slope (%): 2-5

Subregion (LRR): LRR E, MLRA 62 Lat: 47.575070 Long: -115.223101 Datum: WGS84

Soil Map Unit Name: 26UA-Rock outcrop NWI classification: PSS1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Cornus alba*	40	Yes	FACW
2.			
3.			
4.			
5.			
= Total Cover	40		
Herb Stratum (Plot size: 5 ft.)			
1. *Elymus glaucus*	60	Yes	FACU
2. *Phalaris arundinacea*	20	Yes	FACW
3. *Bromus inermis*	20	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **4** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **50.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	60	x 2 = 120
FAC species	0	x 3 = 0
FACU species	60	x 4 = 240
UPL species	20	x 5 = 100
Column Totals:	140 (A)	460 (B)

Prevalence Index = B/A = **3.29**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-6	10YR 4/3	100	None		—	—	Sandy Loam	
6-16	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________
Depth(inches): ________

Hydric Soil Present? **Yes** ____ **No** **X**

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____
Water Table Present? Yes ____ No **X** Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023
Applicant/Owner: NWE | State: MT | Sampling Point: SP11
Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 18, T21N, R28W
Landform (hillslope, terrace, etc.): Lower terrace | Local relief (concave, convex, none): Linear Slope | Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 | Lat: 47.576957 | Long: -115.240738 | Datum: WGS84
Soil Map Unit Name: W-Water | NWI classification: R3USC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes** X **No** ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	70	Yes	FACW
2. *Juncus balticus*	10	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across All Strata:	1	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.00%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	80 (A)		160 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP11

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100	None		—	—	Sand	
4-12	10YR 4/2	95	10YR 4/6	5	C	M	Loamy Sand	
12-16	10YR 6/2	90	10YR 4/6	10	C	M	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
X Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___
Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): **0.5**
Water Table Present? Yes X No ___ Depth (inches): **0**
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): **0**

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP12
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 18, T21N, R28W
Landform (hillslope, terrace, etc.): Island Local relief (concave, convex, none): Convex Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.576982 Long: -115.240658 Datum: WGS84
Soil Map Unit Name: 93A-Horseplains fine sandy loam, 0 to 2% slopes NWI classification: PSS1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Alnus incana*	15	Yes	FACW
2. *Cornus alba*	10	Yes	FACW
3.			
4.			
5.			
= Total Cover	25		
Herb Stratum (Plot size: 5 ft.)			
1. *Elymus glaucus*	30	Yes	FACU
2. *Achillea millefolium*	10	No	FACU
3. *Bromus inermis*	30	Yes	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	70		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 30			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **4** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **50.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	25	x 2 = 50
FAC species	0	x 3 = 0
FACU species	40	x 4 = 160
UPL species	30	x 5 = 150
Column Totals:	95 (A)	360 (B)

Prevalence Index = B/A = **3.79**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/3	100	None		—	—	Loamy Sand	
8-16	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____
Depth(inches): ____

Hydric Soil Present? **Yes** ____ **No** __X__

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No __X__ Depth (inches): ____
Water Table Present? Yes ____ No __X__ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No __X__ Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** __X__

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP13
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 23, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.566326 Long: -115.269690 Datum: WGS84
Soil Map Unit Name: 41B-Oldtrail-Glaciercreek-Larchpoint complex NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No
Hydric Soil Present?	Yes X	No
Wetland Hydrology Present?	Yes X	No

Is the Sampled Area within a Wetland? **Yes X** **No**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Phalaris arundinacea*	80	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**80**	x 2 = **160**
FAC species	**0**	x 3 = **0**
FACU species	**0**	x 4 = **0**
UPL species	**0**	x 5 = **0**
Column Totals:	**80** (A)	**160** (B)

Prevalence Index = B/A = **2.00**

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- __ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ 5 - Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP13

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100	None		—	—	Sandy Loam	
5-15	10YR 5/2	95	10YR 4/6	5	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___
Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes ___ No X Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023

Applicant/Owner: NWE | State: MT | Sampling Point: SP14

Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 23, T21N, R29W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): Linear Slope | Slope (%): 2-5

Subregion (LRR): LRR E, MLRA 62 | Lat: 47.566295 | Long: -115.269758 | Datum: WGS84

Soil Map Unit Name: 41B-Oldtrail-Glaciercreek-Larchpoint complex | NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		**X**

Remarks: The NWPL 2020 wetland ratings were used.

This point was determined not to be within a wetland due to the lack of all three wetland criteria.

Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Tanacetum vulgare*	20	Yes	FACU
2. *Bromus inermis*	60	Yes	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum	20		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **0** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **0.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**0**	x 2 = **0**
FAC species	**0**	x 3 = **0**
FACU species	**20**	x 4 = **80**
UPL species	**60**	x 5 = **300**
Column Totals:	**80** (A)	**380** (B)

Prevalence Index = B/A = **4.75**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ 5 - Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:

No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100	None		—	—	Loamy Sand	
8-16	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matrix (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ____ 2 cm Muck (A10)
- ____ Red Parent Material (TF2)
- ____ Very Shallow Dark Surface (TF12)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth(inches): ____________

Hydric Soil Present? **Yes** ______ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ____ Salt Crust (B11)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Stunted or Stressed Plants (D1) **(LRR A)**
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)
- ____ Raised Ant Mounds (D6) **(LRR A)**
- ____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No **X** Depth (inches): ______

Water Table Present? Yes ______ No **X** Depth (inches): ______

Saturation Present? Yes ______ No **X** Depth (inches): ______
(includes capillary fringe)

Wetland Hydrology Present? **Yes** ______ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP15
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.581226 Long: -115.319855 Datum: WGS84
Soil Map Unit Name: 421B-Selon fine sandy loam NWI classification: Non-Wetland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes X** **No ___**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Typha latifolia*	80	Yes	OBL
2. *Iris pseudacorus*	10	No	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	90		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	90	x 1 = 90
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	90 (A)	90 (B)

Prevalence Index = B/A = **1.00**

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ___**

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP15

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100	None		—	—	Loamy Sand	
6-12	10YR 5/2	95	10YR 4/6	5	C	M	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
X Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___
Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___
Water Table Present? Yes X No ___ Depth (inches): 8
Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 4

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment   City/County: Sanders Co.   Sampling Date: 05/02/2023
Applicant/Owner: NWE   State: MT   Sampling Point: SP16
Investigator(s): Brian Sandefur, PWS   Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Upper terrace   Local relief (concave, convex, none): Linear Slope   Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62   Lat: 47.581176   Long: -115.319776   Datum: WGS84
Soil Map Unit Name: 421B-Selon fine sandy loam   NWI classification: Non-Wetland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed?   Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No **X**
Hydric Soil Present?	Yes ___	No **X**
Wetland Hydrology Present?	Yes ___	No **X**

Is the Sampled Area within a Wetland? **Yes** ___ **No** **X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	5	Yes	FACU
2.			
3.			
4.			
5.			
= Total Cover	5		
Herb Stratum (Plot size: 5 ft.)			
1. *Bromus inermis*	50	Yes	UPL
2. *Elymus glaucus*	20	Yes	FACU
3. *Tanacetum vulgare*	10	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **0** (A)
Total Number of Dominant Species Across All Strata: **3** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **0.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**0**	x 2 = **0**
FAC species	**0**	x 3 = **0**
FACU species	**35**	x 4 = **140**
UPL species	**50**	x 5 = **250**
Column Totals:	**85** (A)	**390** (B)

Prevalence Index = B/A = **4.59**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP16

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	100	None		—	—	Loamy Sand	
6-16	10YR 6/3	100	None	—	—	—	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________
Depth(inches): ________

Hydric Soil Present? **Yes** ____ **No** **X**

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____
Water Table Present? Yes ____ No **X** Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP17
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Lowland Local relief (concave, convex, none): None Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.581388 Long: -115.324240 Datum: WGS84
Soil Map Unit Name: DA-Denied Access NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	
Is the Sampled Area within a Wetland?	X	

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Carex utriculata*	40	Yes	OBL
2. *Typha latifolia*	40	Yes	OBL
3. *Eleocharis palustris*	5	No	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	85		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 15			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	2	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	100.00%	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	85	x 1 =	85
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	85 (A)		85 (B)

Prevalence Index = B/A = 1.00

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	95	10YR 4/6	5	C	M	Sandy Loam	
6-12	10YR 5/2	95	10YR 4/6	5	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 8

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP18
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Valley bottom Local relief (concave, convex, none): None Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.581536 Long: -115.323915 Datum: WGS84
Soil Map Unit Name: DA-Denied Access NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No** ,Soil **No** ,or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus ponderosa*	40	Yes	FACU
2.			
3.			
4.			
	40 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	5	Yes	FACU
2. *Ribes aureum*	10	Yes	FAC
3.			
4.			
5.			
	15 = Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Elymus glaucus*	20	Yes	FACU
2. *Elymus trachycaulus*	20	Yes	FAC
3. *Poa pratensis*	20	Yes	FAC
4. *Thalictrum occidentale*	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 30			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **3** (A)
Total Number of Dominant Species Across All Strata: **6** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **50.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	50	x 3 = 150
FACU species	75	x 4 = 300
UPL species	0	x 5 = 0
Column Totals:	125 (A)	450 (B)

Prevalence Index = B/A = **3.60**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP18

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/3	100	None		—	—	Loamy Sand	
4-10	10YR 4/2	100	None	—	—	—	Loamy Sand	
10-16	10YR 5/2	95	10YR 4/6	5	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________
Depth(inches): ________

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	
Saturation Present? (includes capillary fringe)		X	

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP19
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace Local relief (concave, convex, none): Concave Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.583343 Long: -115.323194 Datum: WGS84
Soil Map Unit Name: 41B-Oldtrail-Glaciercreek-Larchpoint complex NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	**Is the Sampled Area within a Wetland?**	**Yes X No ___**
Hydric Soil Present?	Yes X	No ___		
Wetland Hydrology Present?	Yes X	No ___		

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Typha latifolia*	80	Yes	OBL
2. *Carex utriculata*	20	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum ___			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = **1.00**

Hydrophytic Vegetation Indicators:

X 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ___**

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/2	100	None		—	—	Loamy Sand	
4-12	10YR 4/2	95	10YR 4/6	5	C	M	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes X	No ___	Depth (inches): 12
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 8

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment — City/County: Sanders Co. — Sampling Date: 05/02/2023

Applicant/Owner: NWE — State: MT — Sampling Point: SP20

Investigator(s): Brian Sandefur, PWS — Section, Township, Range: Sec. 16, T21N, R29W

Landform (hillslope, terrace, etc.): Slope — Local relief (concave, convex, none): Linear Slope — Slope (%): 2-5

Subregion (LRR): LRR E, MLRA 62 — Lat: 47.583383 — Long: -115.323155 — Datum: WGS84

Soil Map Unit Name: 41B-Oldtrail-Glaciercreek-Larchpoint complex — NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation **No** ,Soil **No** ,or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation **No** ,Soil **No** ,or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Symphoricarpos albus*	5	Yes	FACU
2.			
3.			
4.			
5.			
= Total Cover	5		
Herb Stratum (Plot size: 5 ft.)			
1. *Bromus inermis*	60	Yes	UPL
2. *Poa pratensis*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum	20		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: **33.33%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	20	x 3 = 60
FACU species	5	x 4 = 20
UPL species	60	x 5 = 300
Column Totals:	85 (A)	380 (B)

Prevalence Index = B/A = **4.47**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** X

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP20

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100	None		—	—	Sandy Loam	
6-12	10YR 4/3	100	None	—	—	—	Loamy Sand	
12-16	10YR 6/3	100	None	—	—	—	Loamy Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___
Depth(inches): ___

Hydric Soil Present? **Yes** ___ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No **X** Depth (inches): ___
Water Table Present? Yes ___ No **X** Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No **X** Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment   City/County: Sanders Co.   Sampling Date: 05/02/2023
Applicant/Owner: NWE   State: MT   Sampling Point: SP21
Investigator(s): Brian Sandefur, PWS   Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace   Local relief (concave, convex, none): None   Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62   Lat: 47.583949   Long: -115.324894   Datum: WGS84
Soil Map Unit Name: 472B-Elkrock gravelly ashy silt loam   NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No, Soil No, or Hydrology No significantly disturbed?   Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No, Soil No, or Hydrology No naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? **Yes X** **No ___**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Typha latifolia*	40	Yes	OBL
2. *Eleocharis palustris*	10	No	OBL
3. *Juncus balticus*	10	No	FACW
4. *Carex utriculata*	30	Yes	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	90		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 10			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**2**	(A)
Total Number of Dominant Species Across All Strata:	**2**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**100.00%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:			Multiply by:
OBL species	**80**	x 1 =	**80**
FACW species	**10**	x 2 =	**20**
FAC species	**0**	x 3 =	**0**
FACU species	**0**	x 4 =	**0**
UPL species	**0**	x 5 =	**0**
Column Totals:	**90** (A)		**100** (B)

Prevalence Index = B/A = **1.11**

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No ___**

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP21

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100	None		—	—	Silt Loam	
4-10	10YR 4/2	95	10YR 4/6	5	C	M	Sandy Loam	
10-15	10YR 6/2	95	10YR 6/6	5	C	M	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type:

Depth(inches):

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___
Water Table Present?	Yes ___	No X	Depth (inches): ___
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 10

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP22
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Upper terrace Local relief (concave, convex, none): Linear Slope Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.583999 Long: -115.324936 Datum: WGS84
Soil Map Unit Name: 472B-Elkrock gravelly ashy silt loam NWI classification: Non-Wetland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ___	No **X**
Hydric Soil Present?	Yes ___	No **X**
Wetland Hydrology Present?	Yes ___	No **X**

Is the Sampled Area within a Wetland? **Yes** ___ **No** **X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pinus ponderosa*	5	Yes	FACU
2.			
3.			
4.			
	5 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *Rosa acicularis*	15	Yes	FACU
2.			
3.			
4.			
5.			
	15 = Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Verbascum thapsus*	10	No	FACU
2. *Equisetum arvense*	5	No	FAC
3. *Elymus glaucus*	30	Yes	FACU
4. *Poa pratensis*	40	Yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum 15

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **4** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **25.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	45	x 3 = 135
FACU species	60	x 4 = 240
UPL species	0	x 5 = 0
Column Totals:	105 (A)	375 (B)

Prevalence Index = B/A = **3.57**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ___ **No** **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100	None		—	—	Loam	
6-10	10YR 4/3	100	None	—	—	—	Sandy Loam	
10-15	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth(inches): ____________

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No **X** Depth (inches): ____
Water Table Present? Yes ____ No **X** Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No **X** Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP23
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Bank/water's edge Local relief (concave, convex, none): Linear Slope Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 Lat: 47.585260 Long: -115.330587 Datum: WGS84
Soil Map Unit Name: DA-Denied Access NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?**	**Yes X No**
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes X	No		

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Typha latifolia*	80	Yes	OBL
2. *Carex utriculata*	20	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **2** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	**100**	x 1 =	**100**
FACW species	**0**	x 2 =	**0**
FAC species	**0**	x 3 =	**0**
FACU species	**0**	x 4 =	**0**
UPL species	**0**	x 5 =	**0**
Column Totals:	**100** (A)		**100** (B)

Prevalence Index = B/A = **1.00**

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X No ___**

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP23

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	95	10YR 4/6	5	C	M	Loamy Sand	
8-16	10YR 4/2	95	10YR 4/6	5	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?	X		10
Saturation Present? (includes capillary fringe)	X		8

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023
Applicant/Owner: NWE | State: MT | Sampling Point: SP24
Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 16, T21N, R29W
Landform (hillslope, terrace, etc.): Fan | Local relief (concave, convex, none): Linear Slope | Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 | Lat: 47.585301 | Long: -115.330707 | Datum: WGS84
Soil Map Unit Name: 473D-Elkrock-Selon complex | NWI classification: PEM1A
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is the Sampled Area within a Wetland?		X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Poa pratensis*	80	Yes	FAC
2. *Dactylis glomerata*	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	**1**	(A)
Total Number of Dominant Species Across All Strata:	**2**	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	**50.00%**	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**0**	x 2 = **0**
FAC species	**80**	x 3 = **240**
FACU species	**20**	x 4 = **80**
UPL species	**0**	x 5 = **0**
Column Totals:	**100** (A)	**320** (B)
Prevalence Index = B/A =	**3.20**	

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No X

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

SOIL

Sampling Point: SP24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	100	None		—	—	Silt Loam	
6-16	10YR 6/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matrix (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ____ 2 cm Muck (A10)
- ____ Red Parent Material (TF2)
- ____ Very Shallow Dark Surface (TF12)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth(inches): ____________

Hydric Soil Present? **Yes** ____ **No** **X**

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1)
- ____ Sediment Deposits (B2)
- ____ Drift Deposits (B3)
- ____ Algal Mat or Crust (B4)
- ____ Iron Deposits (B5)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Sparsely Vegetated Concave Surface (B8)
- ____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ____ Salt Crust (B11)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Odor (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Tilled Soils (C6)
- ____ Stunted or Stressed Plants (D1) **(LRR A)**
- ____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Geomorphic Position (D2)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)
- ____ Raised Ant Mounds (D6) **(LRR A)**
- ____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ____	No **X**	Depth (inches): ____
Water Table Present?	Yes ____	No **X**	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No **X**	Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023
Applicant/Owner: NWE | State: MT | Sampling Point: SP25
Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 9, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace | Local relief (concave, convex, none): Concave | Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 | Lat: 47.590165 | Long: -115.325904 | Datum: WGS84
Soil Map Unit Name: W-Water | NWI classification: Non-Wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X**	No ___
Hydric Soil Present?	Yes **X**	No ___
Wetland Hydrology Present?	Yes **X**	No ___

Is the Sampled Area within a Wetland? **Yes X** **No** ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Schoenoplectus acutus*	90	Yes	OBL
2. *Iris pseudacorus*	10	No	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = **1.00**

Hydrophytic Vegetation Indicators:

- **X** 1 - Rapid Test for Hydrophytic Vegetation
- **X** 2 - Dominance Test is >50%
- **X** 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No** ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

SOIL

Sampling Point: SP25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/2	100	None		—	—	Silt Loam	
8-14	10YR 4/2	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___

Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?	X		0
Saturation Present? (includes capillary fringe)	X		0

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP26
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 9, T21N, R29W
Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Linear Slope Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.590172 Long: -115.325861 Datum: WGS84
Soil Map Unit Name: 472B-Elkrock gravelly ashy silt loam NWI classification: Non-Wetland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No ,Soil No ,or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No ,Soil No ,or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes ___	No X
Wetland Hydrology Present?	Yes ___	No X

Is the Sampled Area within a Wetland? **Yes** ___ **No** X

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of hydric soils and wetland hydrology.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft.)			
1. *Poa pratensis*	60	Yes	FAC
2. *Achillea millefolium*	5	No	FACU
3. *Taraxacum officinale*	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
	= Total Cover		
% Bare Ground in Herb Stratum 30			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **1** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **100.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	**0**	x 1 = **0**
FACW species	**0**	x 2 = **0**
FAC species	**60**	x 3 = **180**
FACU species	**10**	x 4 = **40**
UPL species	**0**	x 5 = **0**
Column Totals:	**70** (A)	**220** (B)

Prevalence Index = B/A = **3.14**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
X 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ___

Remarks:

A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).

SOIL

Sampling Point: SP26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/3	100	None		—	—	Silt Loam	
6-12	10YR 5/3	100	None	—	—	—	Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______
Depth(inches): ______

Hydric Soil Present? **Yes** ___ **No** X

Remarks:
No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No **X** Depth (inches): ___
Water Table Present? Yes ___ No **X** Depth (inches): ___
Saturation Present? (includes capillary fringe) Yes ___ No **X** Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
No positive indication of wetland hydrology was observed.

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment | City/County: Sanders Co. | Sampling Date: 05/02/2023
Applicant/Owner: NWE | State: MT | Sampling Point: SP27
Investigator(s): Brian Sandefur, PWS | Section, Township, Range: Sec. 8, T21N, R29W
Landform (hillslope, terrace, etc.): Lower terrace | Local relief (concave, convex, none): Concave | Slope (%): 0-1
Subregion (LRR): LRR E, MLRA 62 | Lat: 47.592383 | Long: -115.339571 | Datum: WGS84
Soil Map Unit Name: 473D-Elkrock-Selon complex | NWI classification: PEM1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)
Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soil Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is the Sampled Area within a Wetland? Yes X No ___

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined to be within a wetland due to the presence of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Tree Stratum (Plot size: 30 ft.)	Absolute % Cover	Dominant Species?	Indicator Status
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Juncus balticus*	20	Yes	FACW
2. *Eleocharis palustris*	10	No	OBL
3. *Iris pseudacorus*	10	No	OBL
4. *Carex utriculata*	40	Yes	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	80		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum 20			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	60	x 1 = 60
FACW species	20	x 2 = 40
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	80 (A)	100 (B)

Prevalence Index = B/A = 1.25

Hydrophytic Vegetation Indicators:

- X 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- X 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ___

Remarks:
A positive indication of hydrophytic vegetation was observed (Rapid Test for Hydrophytic Vegetation).
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC).
A positive indication of hydrophytic vegetation was observed (Prevalence Index is ≤ 3.0).

Sampling Point: SP27

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100	None		—	—	Loamy Sand	
5-15	10YR 5/2	95	10YR 4/6	5	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
X Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ___
Depth(inches): ___

Hydric Soil Present? **Yes** X **No** ___

Remarks:

A positive indication of hydric soil was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No **X** Depth (inches): ___
Water Table Present? Yes **X** No ___ Depth (inches): **0**
Saturation Present? (includes capillary fringe) Yes **X** No ___ Depth (inches): **0**

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

A positive indication of wetland hydrology was observed (at least one primary indicator).

A positive indication of wetland hydrology was observed (at least two secondary indicators).

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Thompson Falls Wetland Assessment City/County: Sanders Co. Sampling Date: 05/02/2023
Applicant/Owner: NWE State: MT Sampling Point: SP28
Investigator(s): Brian Sandefur, PWS Section, Township, Range: Sec. 8, T21N, R29W
Landform (hillslope, terrace, etc.): Slope Local relief (concave, convex, none): Linear Slope Slope (%): 2-5
Subregion (LRR): LRR E, MLRA 62 Lat: 47.592456 Long: -115.339543 Datum: WGS84
Soil Map Unit Name: 473D-Elkrock-Selon complex NWI classification: Non-Wetland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No **X** (If no, explain in Remarks.)
Are Vegetation **No**, Soil **No**, or Hydrology **No** significantly disturbed? Are "Normal Circumstances" present? Yes **X** No ___
Are Vegetation **No**, Soil **No**, or Hydrology **No** naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is the Sampled Area within a Wetland? Yes ___ No **X**

Remarks: The NWPL 2020 wetland ratings were used.
This point was determined not to be within a wetland due to the lack of all three wetland criteria.
Based on APT results, site was "drier than normal' during the May 2023 field survey.

VEGETATION - Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 15 ft.)			
1. *None Observed*			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 5 ft.)			
1. *Bromus inermis*	80	Yes	UPL
2. *Poa pratensis*	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
= Total Cover	100		
Woody Vine Stratum (Plot size: 30 ft.)			
1. *None Observed*			
2.			
= Total Cover			
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: **1** (A)
Total Number of Dominant Species Across All Strata: **2** (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: **50.00%** (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	20	x 3 =	60
FACU species	0	x 4 =	0
UPL species	80	x 5 =	400
Column Totals:	100 (A)		460 (B)

Prevalence Index = B/A = **4.60**

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ 5 - Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No **X**

Remarks:
No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FACU or drier).

Sampling Point: SP28

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/3	100	None		—	—	Loamy Sand	
8-16	10YR 5/3	100	None	—	—	—	Sandy Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth(inches): ________

Hydric Soil Present? **Yes** ____ **No** X

Remarks:

No positive indication of hydric soils was observed.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Tilled Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water-Stained Leaves (B9) **(MLRA 1, 2 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ FAC-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): ____
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No positive indication of wetland hydrology was observed.

APPENDIX D MONTANA WETLAND ASSESSMENT METHOD FORMS

MDT Montana Wetland Assessment Form (revised March 2008)

1. Project Name: Thompson Falls WG1 **2. MDT Project #:** NA **Control #:**

3. Evaluation Date: 05/11/2023 **4. Evaluator(s):** Brian Sandefur, PWS **5. Wetlands/Site #(s):** WG1: WL-1, 3, 4 6, 8-14

6. Wetland Location(s): i. Legal: T21N,R28W,16, 18, 22 ;T21N,R29W,8, 9, 16

Latitude/Longitude:
47.567594, -115.170191 : WL-1
47.570334, -115.170783 : WL-3
47.57511, -115.197502 : WL-4
47.576939, -115.240836 : WL-6
47.581088, -115.319736 : WL-8
47.581326, -115.324163 : WL-9
47.590272, -115.32596 : WL-13
47.583343, -115.323203 : WL-10
47.583935, -115.32484 : WL-11
47.585195, -115.33085 : WL-12
47.592389, -115.339686 : WL-14

ii. Approx. Stationing or Mileposts: NA

iii. Watershed: HUC12 170102130514

Watershed Name, County: Lower Clark Fork, Sanders

7. a. Evaluating Agency: POWER Engineers

b. Purpose of Evaluation:

1. __ Wetlands potentially affected by MDT project
2. __ Mitigation wetlands; pre-construction
3. __ Mitigation wetlands; post-construction
4. X Other: Wetland areas potentially impacted by change in water surface elevation of reservoir

8. Wetland size: 10.780 acres (measured)

9. Assessment area (AA): 10.780 acres (measured)

10. Classification of Wetland and Aquatic Habitats in AA

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% of AA
R	EM	I	SI	100.00

Abbreviations: *(see manual for definitions)*

HGM Classes: Riverine (**R**), Depressional (**D**), Slope (**S**), Mineral Soil Flats (**MSF**), Organic Soil Flats (**OSF**), Lacustrine Fringe (**LF**);

Cowardin Classes: Rock Bottom (**RB**), Unconsolidated bottom (**UB**), Aquatic Bed (**AB**), Unconsolidated Shore (**US**), Moss-lichen Wetland (**ML**), Emergent Wetland (**EM**), Scrub-Shrub Wetland (**SS**), Forested Wetland (**FO**)

Modifiers: Excavated (**E**), Impounded (**I**), Diked (**D**), Partly Drained (**PD**), Farmed (**F**), Artificial (**A**)

Water Regimes: Permanent / Perennial (**PP**), Seasonal / Intermittent (**SI**), Temporary / Ephemeral (**TE**)

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)

COMMON

12. General condition of AA:

i. Disturbance: (use matrix below to determine [circle] appropriate response – see instructions for Montana-listed noxious weed and aquatic nuisance vegetation species (**ANVS**) list)

Conditions within AA	*Predominant conditions adjacent to (within 500 feet of) AA*		
	Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed or ANVS cover is >=15%.	Land not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed or ANVS cover is <= 30%.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is > 30%.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed or ANVS cover is <= 15%.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed or ANVS cover is <=	moderate disturbance	**moderate disturbance**	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is > 30%.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): AA1 includes wetland areas around Thompson Falls reservoir that are directly supported by water elevations maintained by the reservoir. These areas appear to experience hydrological alterations based on water elevation fluctuations.

ii. Prominent noxious, aquatic nuisance, & other exotic vegetation species: Canadian thistle (Cirsium arvense), yellowflag iris (Iris psuedacorus), flowering rush (Butomus umbellatus).

iii. Provide brief descriptive summary of AA and surrounding land use/habitat: Landuse surrounding WG1 includes undeveloped forest, low-intensity residential, railroad, and highway.

13. Structural Diversity: (based on number of "Cowardin" ***vegetated*** classes present [do not include unvegetated classes], see #10 above)

Existing # of "Cowardin" Vegetated Classes in AA	Initial Rating	Is current management preventing (passive) existence of additional vegetated classes?		Modified Rating
>= 3 (or 2 if 1 is forested) classes	H	NA	NA	NA
2 (or 1 if forested) classes	M	NA	NA	NA
1 class, but not a monoculture	**M**	<-- NO	YES -->	L
1 class, monoculture (1 species comprises >= 90% of total cover)	L	NA	NA	NA

Comments: WG1 includes PEM1A wetland habitat.

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions): No usable habitat

Primary or critical habitat (list species) **Secondary habitat (list species)** **Incidental habitat (list species)**

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	*doc/primary*	*sus/primary*	*doc/secondary*	*sus/secondary*	*doc/incidental*	*sus/incidental*	*None*
Functional Points and Rating	1H	.9H	.8M	.7M	.3L	.1L	**0L**

Sources for documented use (e.g. observations, records, etc): USFWS IPaC, field survey

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions): No usable habitat

Primary or critical habitat (list species) **Secondary habitat (list species)** **Incidental habitat (list species)**

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	*doc/primary*	*sus/primary*	*doc/secondary*	*sus/secondary*	*doc/incidental*	*sus/incidental*	*None*
***S1 Species:** Functional Points and Rating*	1H	.8H	.7M	.6M	.2L	.1L	0L
***S2 and S3 Species:** Functional Points and Rating*	.9H	.7M	.6M	.5M	.2L	.1L	**0L**

Sources for documented use (e.g. observations, records, etc): MTNHP database, field survey

14C. General Wildlife Habitat Rating:

i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):

__ observations of abundant wildlife #s or high species diversity (during any period)
__ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ presence of extremely limiting habitat features not available in the surrounding area
__ interviews with local biologists with knowledge of the AA

Minimal (based on any of the following [check]):

__ few or no wildlife observations during peak use periods
__ little to no wildlife sign
__ sparse adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):

__ observations of scattered wildlife groups or individuals or relatively few species during peak periods
X common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ adequate adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

ii. Wildlife habitat features (Working from top to bottom, circle appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent vegetated classes must be within 20% of each other interms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms])

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in >=10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	M	H	**H**	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	Moderate	Moderate
Substantial	1E	.9H	.8H	.7M
Moderate	.9H	**.7M**	.5M	.3L
Minimal	.6M	.4M	.2L	.1L

Comments: Common waterfowl sightings

14D. General Fish Habitat Rating: (Assess this function if the AA is used by fish or the existing situation is “correctable” such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]. If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then mark <u>X</u> **NA** and proceed to 14E.)

Type of Fishery: Cold Water **(CW)** ___ Warm Water **(WW)** ___ **Use the CW or WW guidelines in the user manual to complete the matrix**

i. Habitat Quality and Known / Suspected Fish Species in AA (use matrix to arrive at [circle] the functional points and rating)

Duration of surface water in AA	Permanent / Perennial						Seasonal / Intermittent						Temporary / Ephemeral					
Aquatic hiding / resting / escape cover	Optimal		Adequate		Poor		Optimal		Adequate		Poor		Optimal		Adequate		Poor	
Thermal cover optimal / suboptimal	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S
FWP Tier I fish species	1E	.9H	.8H	.7M	.6M	.5M	.9H	.8H	.7M	.6M	.5M	.4M	.7M	.6M	.5M	.4M	.3L	.2L
FWP Tier II or Native Game fish species	.9H	.8H	.7M	.6M	.5M	.5M	.8H	.7M	.6M	.5M	.4M	.4M	.6M	.5M	.4M	.3L	.2L	.2L
FWP Tier III or Introduced Game fish	.8H	.7M	.6M	.5M	.5M	.4M	.7M	.6M	.5M	.4M	.4M	.3L	.5M	.4M	.3L	.2L	.2L	.1L
FWP Non-Game Tier IV or No fish species	.5M	.5M	.5M	.4M	.4M	.3L	.4M	.4M	.4M	.3L	.3L	.2L	.2L	.2L	.2L	.1L	.1L	.1L

Sources used for identifying fish sp. potentially found in AA:

ii. Modified Rating (NOTE: Modified score cannot exceed 1 or be less than 0.1)

a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed “Probable Impaired Uses” including cold or warm water fishery or aquatic life support, or do aquatic nuisance plant or animal species (see Appendix E) occur in fish habitat? ___ If yes, reduce score in i above by 0.1.

*b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for native fish or introduced game fish? ___ If yes, add 0.1 to the adjusted score in **i** or **iia.***

iii. Final Score and Rating: NA **Comments:** AA1 does not include any areas below the OHWM

14E. Flood Attenuation: (Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, mark ___ **NA** and proceed to 14F.)

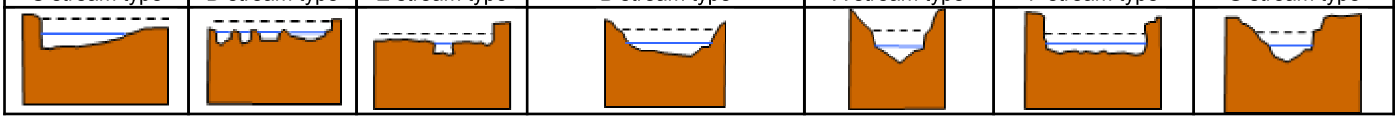
i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	Slightly entrenched - C, D, E stream types			Moderately entrenched – B stream type			Entrenched-A, F, G stream types		
% of flooded wetland classified as forested and/or scrub/shrub	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1H	.9H	.6M	.8H	.7M	**.5M**	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.8H	.5M	.7M	.6M	.4M	.3L	.2L	.1L

Entrenchment ratio (ER) estimation – see User’s Manual for additional guidance. Entrenchment ratio = (flood-prone width)/(bankfull width) Flood-prone width = estimated horizontal projection of where 2 x maximum bankfull depth elevation intersects the floodplain on each side of the stream.

950 /	650 =	**1.46**
Flood-prone width	*Bankfull width*	*Entrenchment ratio (ER)*

Slightly Entrenched ER = >2.2			**Moderately Entrenched ER = 1.41 – 2.2**	**Entrenched ER = 1.0 – 1.4**		
C stream type	D stream type	E stream type	B stream type	A stream type	F stream type	G stream type



ii. Are ≥10 acres of wetland in the AA subject to flooding **AND** are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA (circle)? ___ **Comments:** Wetland hydrology within AA1 supported by restricted outlet (Thompson Falls Reservoir Dam).

14F. Short and Long Term Surface Water Storage: (Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow. If no wetlands in the AA are subject to flooding or ponding, mark ___ **NA** and proceed to 14G.)

i. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			1.1 to 5 acre feet			<=1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **>= 5 out of 10 years**	1H	**.9H**	.8H	.8H	.6M	.5M	.4M	.3L	.2L
Wetlands in AA flood or pond **< 5 out of 10 years**	.9H	.8H	.7M	.7M	.5M	.4M	.3L	.2L	.1L

Comments: Surface water storage during high water periods.

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, mark ___ **NA** and proceed to 14H.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H=high, M=moderate, or L=low])

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with potential to deliver levels of sediments, nutrients, or compounds at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	>= 70%		< 70%		>= 70%		< 70%	
Evidence of flooding / ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	**1H**	.8H	.7M	.5M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.7M	.6M	.4M	.4M	.3L	.2L	.1L

Comments: Potential to receive sediment/nutrients

14H Sediment/Shoreline Stabilization: (Applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If 14H does not apply, mark ___ **NA** and proceed to 14I.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

*% Cover of **wetland** streambank or shoreline by species with stability ratings of >=6 (see **Appendix F**).*	*Duration of surface water adjacent to rooted vegetation*		
	Permanent / Perennial	Seasonal / Intermittent	Temporary / Ephemeral
>= 65%	**1H**	.9H	.7M
35-64%	.7M	.6M	.5M
35%	.3L	.2L	.1L

Comments: AA1 primarily includes hydrophytic species with stability rating of =6.

14I. Production Export/Food Chain Support:

i. Level of Biological Activity (synthesis of wildlife and fish habitat ratings [circle])

General Fish Habitat Rating (14D.iii.)	**General Wildlife Habitat Rating (14C.iii.)**		
	E/H	M	L
E/H	H	H	M
M	H	M	M
L	M	M	L
N/A	H	**M**	L

ii. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14I.i.); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P, S/I, and T/E are as previously defined, and A = "absent" [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component < 1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.7M	.8H	.5M	.6M	.4M	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.6M	.6M	.4M	.3L	.2L
S/I	.9H	.6M	.7M	**.4M**	.5M	.3L	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.4M	.5M	.2L	.3L	.1L	.6M	.4M	.4M	.2L	.2L	.1L

iii. Modified Rating (NOTE: Modified score cannot exceed 1 or be less than 0.1.) **Vegetated Upland Buffer (VUB):** Area with >= 30% plant cover, = 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).

a) Is there an average >= 50 foot-wide vegetated upland buffer around >= 75% of the AA circumference? **X** *If yes, add 0.1 to the score in ii above.*

iv. Final Score and Rating: 0.50M **Comments:** AA1 generally surrounded by =50 foot-wide buffer on boundary not adjacent to water's edge.

14J. Groundwater Discharge/Recharge: (check the appropriate indicators in i & ii below)

i. Discharge Indicators

_______ The AA is a slope wetland
_______ Springs or seeps are known or observed
_______ Vegetation growing during dormant season/drought
_______ Wetland occurs at the toe of a natural slope
_______ AA permanently flooded during drought periods
_______ Wetland contains an outlet, but no inlet
_______ Shallow water table and the site is saturated to the surface
_______ Other:

ii. Recharge Indicators

X Permeable substrate present without underlying impeding layer
_______ Wetland contains inlet but no outlet
_______ Stream is a known 'losing' stream; discharge volume decreases
_______ Other:

iii. Rating (use the information from i and ii above and the table below to arrive at [circle] the functional points and rating)

Criteria	**Duration of saturation at AA Wetlands *FROM GROUNDWATER DISCHARGE OR WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	P/P	S/I	T	None
Groundwater Discharge or Recharge	1H	**.7M**	.4M	.1L
Insufficient Data/Information	N/A			

Comments: Soils within AA1 typically sandy, sandy loam.

14K. Uniqueness:

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Replacement potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland **or** plant association listed as "S1" by the MTNHP			AA does not contain previously cited rare types **and** structural diversity (#13) is high **or** contains plant association listed as "S2" by the MTNHP			AA does not contain previously cited rare types or associations **and** structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1H	.9H	.8H	.8H	.6M	.5M	.5M	.4M	.3L
Moderate disturbance at AA (#12i)	.9H	.8H	.7M	.7M	.5M	.4M	.4M	**.3L**	.2L
High disturbance at AA (#12i)	.8H	.7M	.6M	.6M	.4M	.3L	.3L	.2L	.1L

Comments: No uncommon vegetation communities identified within AA1

14L. Recreation/Education Potential: (affords "bonus" points if AA provides recreation or education opportunity)

i. Is the AA a known or potential rec./ed. site: (circle) X (if 'Yes' continue with the evaluation; if 'No' then mark ___ **NA** and proceed to the overall summary and rating page)

ii. Check categories that apply to the AA: ___Educational/scientific study; ___Consumptive rec.; X Non-consumptive rec.; ___Other :

iii. Rating:

Known or Potential Recreation or Education Area	Known	Potential
Public ownership or public easement with general public access (no permission required)	.2H	.15H
Private ownership with general public access (no permission required)	.15H	**.1M**
Private or public ownership without general public access, or requiring permission for public access	.1M	.05L

Comments: General access to WG1 via open water.

General Site Notes
Wetlands within WG1 range in size from 0.03 to 3.41 acres in size,

FUNCTION & VALUE SUMMARY & OVERALL RATING FOR WETLAND/SITE #(S): WG1: WL-1, 3, 4 6, 8-14

Function & Value Variables	Rating	Actual Functional Points	Possible Functional Points	Functional Units: (Actual Points x Wetland Acreage)	Indicate the four most prominent functions with an asterisk (*)
A. Listed/Proposed T&E Species Habitat	L	0.00	1	0.00	
B. MT Natural Heritage Program Species Habitat	L	0.00	1	0.00	
C. General Wildlife Habitat	M	0.70	1	7.55	
D. General Fish Habitat	NA				
E. Flood Attenuation	M	0.50	1	5.39	
F. Short and Long Term Surface Water Storage	H	0.90	1	9.70	*
G. Sediment/Nutrient/Toxicant Removal	H	1.00	1	10.78	*
H. Sediment/Shoreline Stabilization	H	1.00	1	10.78	*
I. Production Export/Food Chain Support	M	0.50	1	5.39	
J. Groundwater Discharge/Recharge	M	0.70	1	7.55	*
K. Uniqueness	L	0.30	1	3.23	
L. Recreation/Education Potential (bonus points)	M	0.10	1	1.08	
Totals:		5.70	10.00	61.45	
Percent of Possible Score			57%		

Category I Wetland: (must satisfy one of the following criteria; otherwise go to Category II)
____ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
____ Score of 1 functional point for Uniqueness; **or**
____ Score of 1 functional point for Flood Attenuation and answer to Question 14E.ii is "yes"; **or**
____ Percent of possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied and meets any one of the following criteria; otherwise go to Category IV)
____ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
____ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
____ Score of .9 or 1 functional point for General Fish Habitat; **or**
____ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish/Aquatic Habitat; **or**
____ Score of .9 functional point for Uniqueness; **or**
____ Percent of possible score > 65% (round to nearest whole #).

Category III Wetland: (Criteria for Categories I, II, or IV not satisfied)

Category IV Wetland: (Criteria for Categories I or II are not satisfied and all of the following criteria are met; otherwise go to Category III)
__X__ "Low" rating for Uniqueness; **and**
____ Vegetated wetland component 1 acre (do not include upland vegetated buffer); **and**
____ Percent of possible score 35% (round to nearest whole #).

OVERALL ANALYSIS AREA RATING: III

Summary Comments: AA1 includes 11 separate wetland areas along the reservoir potentially affected by water level elevation controlled by dam.

MDT Montana Wetland Assessment Form (revised March 2008)

1. Project Name: Thompson Falls WG2 **2. MDT Project #:** NA **Control #:**

3. Evaluation Date: 05/11/2023 **4. Evaluator(s):** Brian Sandefur, PWS **5. Wetlands/Site #(s):** WG 2:

6. Wetland Location(s): i. Legal: T21N,R28W,17 & 22 ;T21N,R29W,23 **Latitude/Longitude:** 47.568338, -115.172296 : WL-2
47.575009, -115.222833 : WL-5
47.566325, -115.269681 : WL-7

ii. Approx. Stationing or Mileposts: NA

iii. Watershed: HUC12 170102130512

Watershed Name, County: Lower Clark Fork, Sanders

7. a. Evaluating Agency: POWER Engineers

b. Purpose of Evaluation:

1. __ Wetlands potentially affected by MDT project
2. __ Mitigation wetlands; pre-construction
3. __ Mitigation wetlands; post-construction
4. X Other: Wetland areas potentially impacted by change in water surface elevation of reservoir

8. Wetland size: 0.550 acres (measured)

9. Assessment area (AA): 0.550 acres (measured)

10. Classification of Wetland and Aquatic Habitats in AA

HGM Class (Brinson)	Class (Cowardin)	Modifier (Cowardin)	Water Regime	% of AA
R	EM	I	PP	100.00

Abbreviations: *(see manual for definitions)*

HGM Classes: Riverine (**R**), Depressional (**D**), Slope (**S**), Mineral Soil Flats (**MSF**), Organic Soil Flats (**OSF**), Lacustrine Fringe (**LF**);
Cowardin Classes: Rock Bottom (**RB**), Unconsolidated bottom (**UB**), Aquatic Bed (**AB**), Unconsolidated Shore (**US**), Moss-lichen Wetland (**ML**), Emergent Wetland (**EM**), Scrub-Shrub Wetland (**SS**), Forested Wetland (**FO**)
Modifiers: Excavated (**E**), Impounded (**I**), Diked (**D**), Partly Drained (**PD**), Farmed (**F**), Artificial (**A**)
Water Regimes: Permanent / Perennial (**PP**), Seasonal / Intermittent (**SI**), Temporary / Ephemeral (**TE**)

11. Estimated relative abundance: (of similarly classified sites within the same Major Montana Watershed Basin, see definitions)
COMMON

12. General condition of AA:

i. Disturbance: (use matrix below to determine [circle] appropriate response – see instructions for Montana-listed noxious weed and aquatic nuisance vegetation species (**ANVS**) list)

Conditions within AA	*Predominant conditions adjacent to (within 500 feet of) AA*		
	Managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or buildings; and noxious weed or ANVS cover is >=15%.	Land not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to minor clearing; contains few roads or buildings; noxious weed or ANVS cover is <= 30%.	Land cultivated or heavily grazed or logged; subject to substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is > 30%.
AA occurs and is managed in predominantly natural state; is not grazed, hayed, logged, or otherwise converted; does not contain roads or occupied buildings; and noxious weed or ANVS cover is <= 15%.	low disturbance	low disturbance	moderate disturbance
AA not cultivated, but may be moderately grazed or hayed or selectively logged; or has been subject to relatively minor clearing, fill placement, or hydrological alteration; contains few roads or buildings; noxious weed or ANVS cover is <=	moderate disturbance	**moderate disturbance**	high disturbance
AA cultivated or heavily grazed or logged; subject to relatively substantial fill placement, grading, clearing, or hydrological alteration; high road or building density; or noxious weed or ANVS cover is > 30%.	high disturbance	high disturbance	high disturbance

Comments: (types of disturbance, intensity, season, etc.): AA2 includes wetland areas directly adjacent to Thompson Falls Reservoir that receive supplemental hydrology from Clark Fork River tributaries.
ii. Prominent noxious, aquatic nuisance, & other exotic vegetation species: Yellowflag iris (Iris psuedacorus)
iii. Provide brief descriptive summary of AA and surrounding land use/habitat: Landuse surrounding AA2 include undeveloped forest, utility corridor, and low-intensity residential.

13. Structural Diversity: (based on number of "Cowardin" ***vegetated*** classes present [do not include unvegetated classes], see #10 above)

Existing # of "Cowardin" Vegetated Classes in AA	Initial Rating	Is current management preventing (passive) existence of additional vegetated classes?		Modified Rating
>= 3 (or 2 if 1 is forested) classes	H	NA	NA	NA
2 (or 1 if forested) classes	M	NA	NA	NA
1 class, but not a monoculture	**M**	<-- NO	YES -->	L
1 class, monoculture (1 species comprises >= 90% of total cover)	L	NA	NA	NA

Comments: Primarily PEM1A wetland habitat.

SECTION PERTAINING to FUNCTIONS & VALUES ASSESSMENT

14A. Habitat for Federally Listed or Proposed Threatened or Endangered Plants or Animals:

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions): No usable habitat

Primary or critical habitat (list species) **Secondary habitat (list species)** **Incidental habitat (list species)**

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	*doc/primary*	*sus/primary*	*doc/secondary*	*sus/secondary*	*doc/incidental*	*sus/incidental*	*None*
Functional Points and Rating	1H	.9H	.8M	.7M	.3L	.1L	**0L**

Sources for documented use (e.g. observations, records, etc): USFWS IPaC, field survey.

14B. Habitat for plant or animals rated S1, S2, or S3 by the Montana Natural Heritage Program: (not including species listed in14A above)

i. AA is Documented (D) or Suspected (S) to contain (circle one based on definitions contained in instructions): No usable habitat

Primary or critical habitat (list species) **Secondary habitat (list species)** **Incidental habitat (list species)**

ii. Rating (use the conclusions from i above and the matrix below to arrive at [circle] the functional points and rating)

Highest Habitat Level	*doc/primary*	*sus/primary*	*doc/secondary*	*sus/secondary*	*doc/incidental*	*sus/incidental*	*None*
***S1 Species:** Functional Points and Rating*	1H	.8H	.7M	.6M	.2L	.1L	0L
***S2 and S3 Species:** Functional Points and Rating*	.9H	.7M	.6M	.5M	.2L	.1L	**0L**

Sources for documented use (e.g. observations, records, etc): MTNHP database, field survey.

14C. General Wildlife Habitat Rating:

i. Evidence of overall wildlife use in the AA (circle substantial, moderate, or low based on supporting evidence):

Substantial (based on any of the following [check]):

__ observations of abundant wildlife #s or high species diversity (during any period)
__ abundant wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ presence of extremely limiting habitat features not available in the surrounding area
__ interviews with local biologists with knowledge of the AA

Minimal (based on any of the following [check]):

__ few or no wildlife observations during peak use periods
__ little to no wildlife sign
__ sparse adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

Moderate (based on any of the following [check]):

__ observations of scattered wildlife groups or individuals or relatively few species during peak periods
X common occurrence of wildlife sign such as scat, tracks, nest structures, game trails, etc.
__ adequate adjacent upland food sources
__ interviews with local biologists with knowledge of the AA

ii. Wildlife habitat features (Working from top to bottom, circle appropriate AA attributes in matrix to arrive at rating. Structural diversity is from #13. For class cover to be considered evenly distributed, the most and least prevalent vegetated classes must be within 20% of each other interms of their percent composition of the AA (see #10). Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; T/E = temporary/ephemeral; and A = absent [see instructions for further definitions of these terms])

Structural diversity (see #13)	High								Moderate								Low			
Class cover distribution (all vegetated classes)	Even				Uneven				Even				Uneven				Even			
Duration of surface water in >=10% of AA	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A	P/P	S/I	T/E	A
Low disturbance at AA (see #12i)	E	E	E	H	E	E	H	H	E	H	H	M	E	H	M	M	E	H	M	M
Moderate disturbance at AA (see #12i)	H	H	H	H	H	H	H	M	H	**H**	M	M	H	M	M	L	H	M	L	L
High disturbance at AA (see #12i)	M	M	M	L	M	M	L	L	M	M	L	L	M	L	L	L	L	L	L	L

iii. Rating (use the conclusions from i and ii above and the matrix below to arrive at [circle] the functional points and rating)

Evidence of wildlife use (i)	*Wildlife habitat features rating (ii)*			
	Exceptional	High	Moderate	Moderate
Substantial	1E	.9H	.8H	.7M
Moderate	.9H	**.7M**	.5M	.3L
Minimal	.6M	.4M	.2L	.1L

Comments: Observed waterfowl usage.

14D. General Fish Habitat Rating: (Assess this function if the AA is used by fish or the existing situation is "correctable" such that the AA could be used by fish [i.e., fish use is precluded by perched culvert or other barrier, etc.]. If the AA is not used by fish, fish use is not restorable due to habitat constraints, or is not desired from a management perspective [such as fish entrapped in a canal], then mark X **NA** and proceed to 14E.)

Type of Fishery: Cold Water **(CW)** __ Warm Water **(WW)** __ **Use the CW or WW guidelines in the user manual to complete the matrix**

i. Habitat Quality and Known / Suspected Fish Species in AA (use matrix to arrive at [circle] the functional points and rating)

Duration of surface water in AA	Permanent / Perennial						Seasonal / Intermittent						Temporary / Ephemeral					
Aquatic hiding / resting / escape cover	Optimal		Adequate		Poor		Optimal		Adequate		Poor		Optimal		Adequate		Poor	
Thermal cover optimal / suboptimal	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S
FWP Tier I fish species	1E	.9H	.8H	.7M	.6M	.5M	.9H	.8H	.7M	.6M	.5M	.4M	.7M	.6M	.5M	.4M	.3L	.2L
FWP Tier II or Native Game fish species	.9H	.8H	.7M	.6M	.5M	.5M	.8H	.7M	.6M	.5M	.4M	.4M	.6M	.5M	.4M	.3L	.2L	.2L
FWP Tier III or Introduced Game fish	.8H	.7M	.6M	.5M	.5M	.4M	.7M	.6M	.5M	.4M	.4M	.3L	.5M	.4M	.3L	.2L	.2L	.1L
FWP Non-Game Tier IV or No fish species	.5M	.5M	.5M	.4M	.4M	.3L	.4M	.4M	.4M	.3L	.3L	.2L	.2L	.2L	.2L	.1L	.1L	.1L

Sources used for identifying fish sp. potentially found in AA:

ii. Modified Rating (NOTE: Modified score cannot exceed 1 or be less than 0.1)

a) Is fish use of the AA significantly reduced by a culvert, dike, or other man-made structure or activity or is the waterbody included on the current final MDEQ list of waterbodies in need of TMDL development with listed "Probable Impaired Uses" including cold or warm water fishery or aquatic life support, or do aquatic nuisance plant or animal species (see Appendix E) occur in fish habitat? __ If yes, reduce score in i above by 0.1.

*b) Does the AA contain a documented spawning area or other critical habitat feature (i.e., sanctuary pool, upwelling area, etc.- specify in comments) for native fish or introduced game fish? __ If yes, add 0.1 to the adjusted score in **i** or **iia.***

iii. Final Score and Rating: NA **Comments:** AA2 does not include any area below the OHWM.

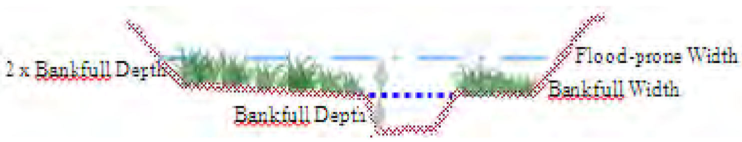
14E. Flood Attenuation: (Applies only to wetlands subject to flooding via in-channel or overbank flow. If wetlands in AA are not flooded from in-channel or overbank flow, mark __ **NA** and proceed to 14F.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

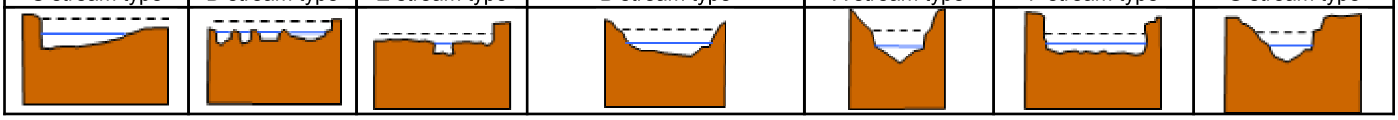
Estimated or Calculated Entrenchment (Rosgen 1994, 1996)	Slightly entrenched - C, D, E stream types			Moderately entrenched – B stream type			Entrenched-A, F, G stream types		
% of flooded wetland classified as forested and/or scrub/shrub	75%	25-75%	<25%	75%	25-75%	<25%	75%	25-75%	<25%
AA contains **no outlet or restricted outlet**	1H	.9H	.6M	**.8H**	.7M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.8H	.5M	.7M	.6M	.4M	.3L	.2L	.1L

Entrenchment ratio (ER) estimation – see User's Manual for additional guidance. Entrenchment ratio = (flood-prone width)/(bankfull width) Flood-prone width = estimated horizontal projection of where 2 x maximum bankfull depth elevation intersects the floodplain on each side of the stream.

8 /	5 =	**1.60**
Flood-prone width	*Bankfull width*	*Entrenchment ratio (ER)*



Slightly Entrenched ER = >2.2			**Moderately Entrenched ER = 1.41 – 2.2**	**Entrenched ER = 1.0 – 1.4**		
C stream type	D stream type	E stream type	B stream type	A stream type	F stream type	G stream type



ii. Are ≥10 acres of wetland in the AA subject to flooding **AND** are man-made features which may be significantly damaged by floods located within 0.5 mile downstream of the AA (circle)? __ **Comments:** AA2 includes wetland areas supported by tributaries with unrestricted outlet draining into reservoir with restricted outlet.

14F. Short and Long Term Surface Water Storage: (Applies to wetlands that flood or pond from overbank or in-channel flow, precipitation, upland surface flow, or groundwater flow. If no wetlands in the AA are subject to flooding or ponding, mark ___**NA** and proceed to 14G.)

i. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Abbreviations for surface water durations are as follows: P/P = permanent/perennial; S/I = seasonal/intermittent; and T/E = temporary/ephemeral [see instructions for further definitions of these terms].)

Estimated maximum acre feet of water contained in wetlands within the AA that are subject to periodic flooding or ponding	>5 acre feet			1.1 to 5 acre feet			<=1 acre foot		
Duration of surface water at wetlands within the AA	P/P	S/I	T/E	P/P	S/I	T/E	P/P	S/I	T/E
Wetlands in AA flood or pond **>= 5 out of 10 years**	1H	.9H	.8H	.8H	.6M	.5M	**.4M**	.3L	.2L
Wetlands in AA flood or pond **< 5 out of 10 years**	.9H	.8H	.7M	.7M	.5M	.4M	.3L	.2L	.1L

Comments: Hydrology within AA2 supplementally supported by water flowing from tributaries.

14G. Sediment/Nutrient/Toxicant Retention and Removal: (Applies to wetlands with potential to receive sediments, nutrients, or toxicants through influx of surface or ground water or direct input. If no wetlands in the AA are subject to such input, mark ___**NA** and proceed to 14H.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating [H=high, M=moderate, or L=low])

Sediment, nutrient, and toxicant input levels within AA	AA receives or surrounding land use with potential to deliver levels of sediments, nutrients, or compounds at levels such that other functions are not substantially impaired. Minor sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.				Waterbody on MDEQ list of waterbodies in need of TMDL development for "probable causes" related to sediment, nutrients, or toxicants or AA receives or surrounding land use with potential to deliver high levels of sediments, nutrients, or compounds such that other functions are substantially impaired. Major sedimentation, sources of nutrients or toxicants, or signs of eutrophication present.			
% cover of wetland vegetation in AA	>= 70%		< 70%		>= 70%		< 70%	
Evidence of flooding / ponding in AA	Yes	No	Yes	No	Yes	No	Yes	No
AA contains **no or restricted outlet**	**1H**	.8H	.7M	.5M	.5M	.4M	.3L	.2L
AA contains **unrestricted outlet**	.9H	.7M	.6M	.4M	.4M	.3L	.2L	.1L

Comments: Wetland hydrology supported by high water elevations/seasonal runoff.

14H Sediment/Shoreline Stabilization: (Applies only if AA occurs on or within the banks or a river, stream, or other natural or man-made drainage, or on the shoreline of a standing water body which is subject to wave action. If 14H does not apply, mark ___**NA** and proceed to 14I.)

i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

*% Cover of **wetland** streambank or shoreline by species with stability ratings of >=6 (see **Appendix F**).*	*Duration of surface water adjacent to rooted vegetation*		
	Permanent / Perennial	Seasonal / Intermittent	Temporary / Ephemeral
>= 65%	**1H**	.9H	.7M
35-64%	.7M	.6M	.5M
35%	.3L	.2L	.1L

Comments: AA2 directly adjacent to open-water channels and impounded reservoir.

14I. Production Export/Food Chain Support:

i. Level of Biological Activity (synthesis of wildlife and fish habitat ratings [circle])

General Fish Habitat Rating (14D.iii.)	**General Wildlife Habitat Rating (14C.iii.)**		
	E/H	M	L
E/H	H	H	M
M	H	M	M
L	M	M	L
N/A	H	**M**	L

ii. Rating (Working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating. Factor A = acreage of vegetated wetland component in the AA; Factor B = level of biological activity rating from above (14I.i.); Factor C = whether or not the AA contains a surface or subsurface outlet; the final three rows pertain to duration of surface water in the AA, where P/P, S/I, and T/E are as previously defined, and A = "absent" [see instructions for further definitions of these terms].)

A	Vegetated component >5 acres						Vegetated component 1-5 acres						Vegetated component < 1 acre					
B	High		Moderate		Low		High		Moderate		Low		High		Moderate		Low	
C	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
P/P	1H	.7M	.8H	.5M	.6M	.4M	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.6M	**.6M**	.4M	.3L	.2L
S/I	.9H	.6M	.7M	.4M	.5M	.3L	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.5M	.5M	.3L	.3L	.2L
T/E/A	.8H	.5M	.6M	.3L	.4M	.2L	.7M	.4M	.5M	.2L	.3L	.1L	.6M	.4M	.4M	.2L	.2L	.1L

iii. Modified Rating (NOTE: Modified score cannot exceed 1 or be less than 0.1.) **Vegetated Upland Buffer (VUB):** Area with >= 30% plant cover, = 15% noxious weed or ANVS cover, and that is not subjected to periodic mechanical mowing or clearing (unless for weed control).

a) Is there an average >= 50 foot-wide vegetated upland buffer around >= 75% of the AA circumference? **X** *If yes, add 0.1 to the score in ii above.*

iv. Final Score and Rating: 0.70M **Comments:** Vegetated buffer around areas of AA2 not directly adjacent to reservoir.

14J. Groundwater Discharge/Recharge: (check the appropriate indicators in i & ii below)

i. Discharge Indicators

______ The AA is a slope wetland
______ Springs or seeps are known or observed
______ Vegetation growing during dormant season/drought
______ Wetland occurs at the toe of a natural slope
______ AA permanently flooded during drought periods
______ Wetland contains an outlet, but no inlet
______ Shallow water table and the site is saturated to the surface
______ Other:

ii. Recharge Indicators

X Permeable substrate present without underlying impeding layer
______ Wetland contains inlet but no outlet
______ Stream is a known 'losing' stream; discharge volume decreases
______ Other:

iii. Rating (use the information from i and ii above and the table below to arrive at [circle] the functional points and rating)

Criteria	**Duration of saturation at AA Wetlands *FROM GROUNDWATER DISCHARGE OR WITH WATER THAT IS RECHARGING THE GROUNDWATER SYSTEM***			
	P/P	S/I	T	None
Groundwater Discharge or Recharge	**1H**	.7M	.4M	.1L
Insufficient Data/Information	N/A			

Comments: Groundwater recharge potential based on coarse soil texture with high hydraulic conductivity.

14K. Uniqueness:
i. Rating (working from top to bottom, use the matrix below to arrive at [circle] the functional points and rating)

Replacement potential	AA contains fen, bog, warm springs or mature (>80 yr-old) forested wetland **or** plant association listed as "S1" by the MTNHP			AA does not contain previously cited rare types **and** structural diversity (#13) is high **or** contains plant association listed as "S2" by the MTNHP			AA does not contain previously cited rare types or associations **and** structural diversity (#13) is low-moderate		
Estimated relative abundance (#11)	rare	common	abundant	rare	common	abundant	rare	common	abundant
Low disturbance at AA (#12i)	1H	.9H	.8H	.8H	.6M	.5M	.5M	.4M	.3L
Moderate disturbance at AA (#12i)	.9H	.8H	.7M	.7M	.5M	.4M	.4M	**.3L**	.2L
High disturbance at AA (#12i)	.8H	.7M	.6M	.6M	.4M	.3L	.3L	.2L	.1L

Comments: No unique vegetation communities identified within AA2.

14L. Recreation/Education Potential: (affords "bonus" points if AA provides recreation or education opportunity)
i. Is the AA a known or potential rec./ed. site: (circle) **X** (if 'Yes' continue with the evaluation; if 'No' then mark ___ **NA** and proceed to the overall summary and rating page)
ii. Check categories that apply to the AA: ___Educational/scientific study; **X** Consumptive rec.; ___Non-consumptive rec.; ___Other :
iii. Rating:

Known or Potential Recreation or Education Area	Known	Potential
Public ownership or public easement with general public access (no permission required)	.2H	.15H
Private ownership with general public access (no permission required)	.15H	**.1M**
Private or public ownership without general public access, or requiring permission for public access	.1M	.05L

Comments: Access to shoreline provided by open water travel

General Site Notes
Wetlands within AA2 range in size from 0.04 to 0.30 acre.

FUNCTION & VALUE SUMMARY & OVERALL RATING FOR WETLAND/SITE #(S): WG2:

Function & Value Variables	**Rating**	**Actual Functional Points**	**Possible Functional Points**	**Functional Units:** (Actual Points x Wetland Acreage)	**Indicate the four most prominent functions with an asterisk (*)**
A. Listed/Proposed T&E Species Habitat	L	0.00	1	0.00	
B. MT Natural Heritage Program Species Habitat	L	0.00	1	0.00	
C. General Wildlife Habitat	M	0.70	1	0.39	
D. General Fish Habitat	NA				
E. Flood Attenuation	H	0.80	1	0.44	*
F. Short and Long Term Surface Water Storage	M	0.40	1	0.22	
G. Sediment/Nutrient/Toxicant Removal	H	1.00	1	0.55	*
H. Sediment/Shoreline Stabilization	H	1.00	1	0.55	*
I. Production Export/Food Chain Support	M	0.70	1	0.39	
J. Groundwater Discharge/Recharge	H	1.00	1	0.55	*
K. Uniqueness	L	0.30	1	0.17	
L. Recreation/Education Potential (bonus points)	M	0.10	1	0.06	
Totals:		6.00	10.00	3.32	
Percent of Possible Score			60%		

Category I Wetland: (must satisfy one of the following criteria; otherwise go to Category II)

____ Score of 1 functional point for Listed/Proposed Threatened or Endangered Species; **or**
____ Score of 1 functional point for Uniqueness; **or**
____ Score of 1 functional point for Flood Attenuation and answer to Question 14E.ii is "yes"; **or**
____ Percent of possible score > 80% (round to nearest whole #).

Category II Wetland: (Criteria for Category I not satisfied and meets any one of the following criteria; otherwise go to Category IV)

____ Score of 1 functional point for MT Natural Heritage Program Species Habitat; **or**
____ Score of .9 or 1 functional point for General Wildlife Habitat; **or**
____ Score of .9 or 1 functional point for General Fish Habitat; **or**
____ "High" to "Exceptional" ratings for **both** General Wildlife Habitat **and** General Fish/Aquatic Habitat; **or**
____ Score of .9 functional point for Uniqueness; **or**
____ Percent of possible score > 65% (round to nearest whole #).

Category III Wetland: (Criteria for Categories I, II, or IV not satisfied)

Category IV Wetland: (Criteria for Categories I or II are not satisfied and all of the following criteria are met; otherwise go to Category III)

__**X**__ "Low" rating for Uniqueness; **and**
__**X**__ Vegetated wetland component 1 acre (do not include upland vegetated buffer); **and**
____ Percent of possible score 35% (round to nearest whole #).

OVERALL ANALYSIS AREA RATING: III

Summary Comments: AA2 includes three separate wetland areas supported by stream flow from tributaries draining into the reservoir.